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Labour Flows into and out of Polish Agriculture: A Micro-Level Analysis

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Abstract

Notwithstanding its admission to the EU, agricultural restructuring and sustainable rural development remain as major transition challenges confronting Poland. Achieving these joint goals will necessitate major labour flows from farming into other occupations and sectors. This paper employs a multinomial logit model on Labour Force Survey data to analyse mobility in the agricultural labour market. Its major finding is that of a largely stagnant pool of farm workers into and out of which are small flows that are insufficient to bring about the requisite change without explicit, perhaps radical policy intervention.

Keywords

Agriculture, Restructuring, Labour Market Transitions, Mobility

1. Introduction

The agricultural sector is probably the most idiosyncratic feature of the Polish economy. Small, semi-subsistence farms remained in private ownership under state socialism and have survived largely intact into the twenty-first century. While more than eight hundred thousand agricultural jobs have been lost since the start of the transition process, the decline is due purely to the collapse of the state farms. In contrast, employment in private sector farming has been static since the onset of economic reform (Ingham and Ingham, 2004). Thus Poland currently has in excess of four million individuals operating almost two million holdings, more than half of which occupy less than five hectares of land (GUS, 2003: 147 & 370).[1]

However, while jobs in agriculture accounted for almost 28 per cent of total employment in 2002, the sector contributed less than three per cent to GDP (GUS, *op. cit*: 147 & 584). What is more, private sector agricultural workers are amongst the nation's poorest employees, receiving only two-thirds of the national average wage (GUS, *op. cit.*: 176). With the land devoted to farming concentrated in space, the sector represents a serious threat to the balanced development of the country. Furthermore, the per capita income of farming households was only eighty-six per cent of the national average (GUS, *op. cit.*: 203-4). In addition, the sector imposes a severe strain on the state budget, mainly as a result of the generous farmers' retirement scheme (KRUS), over ninety per cent of which is financed from central funds (Krzyzanowska *et al*., 2002).

In theory, a certain degree of equalisation across sectors and space in the years following 1989 might have been expected through the relocation of labour to higher paying jobs and of capital to exploit low wages. However, this has evidently not occurred

to the extent that might have been foreseen. Moreover, Poland has received substantial funding from international agencies such as the European Union (EU), the World Bank, the EBRD and US Aid over the last decade, significant amounts of which have been earmarked for agriculture. The latter monies have been channelled into education and training, food quality and the marketing of agricultural produce. Once again though, the overall impact of the schemes has been limited and the sector continues to retard the modernisation of the economy. In the usual case, the failure of both the market and external assistance to stimulate change is attributed to impediments to mobility including poor infrastructure in the rural areas, imperfections in the housing market and the dearth of suitably skilled labour in farming communities (e.g. ILO, 1999).

Poland has now entered the EU, but with an economic structure radically different from those of its partners. As of 2003, agriculture accounted for only 4.1 per cent of total employment in the then fifteen member states (Eurostat, 2004) and no other country that entered in 2004 has such a high concentration of jobs in farming. This raises difficult issues in two key areas of EU policy. First, economic and social cohesion is a primary goal espoused formally in the Amsterdam Treaty (EC, 1997), but one that proved illusive even in the context of the EU-15 (Ingham *et al*., 2002). Second, rural development is now officially the second pillar of the Common Agricultural Policy (CAP) and one that stresses the need for diversified employment structures and environmentally friendly farming practices. The clear imperative is therefore that Poland's economy becomes less dependent on agriculture, with a significant proportion of the rural workforce transferring to higher value added activities. While fiscal transfers will flow from Community programmes to assist in this process, many will be contingent on matching domestic

finance. This, however, creates problems for Poland's obligations under the Stability Pact and for its preparations to enter the euro-zone.

The dilemma posed by this conflict of objectives reinforces the need for effective policy targeting. In this context, however, the profile of net job flows typically available from official statistics has severe limitations. In order to cast further light on the potential for restructuring Polish agriculture, this paper uses micro-data to examine the pattern of individual gross worker flows into and out of the sector. The identification of those characteristics associated with successful moves into non-agricultural employment made possible by the analysis could provide useful information for determining where limited resources might most effectively be channelled. Likewise, modelling flows into the sector might allow further insight into the nature of the agricultural sector's role as a 'buffer zone', absorbing workers displaced from other sectors of the economy (Orlowski, 2002). In particular, it could provide a guide to the design of policies for the redeployment of those workers in industries that are uncompetitive within the European arena who are most at risk of slipping into hidden unemployment on farms.

The next section covers the preliminaries, including a brief explanation of the methodology used in the paper and a discussion of the survey data employed to examine the labour market transitions that occupy the remainder of the work. The third section highlights the movements between different labour market states that occurred during the sample period and also describes the characteristics of the individuals involved. This overview is formalised in the fourth section, which reports the results of the multinomial regressions used to identify the factors that are important determinants of movements into and out of agriculture. The practical implications of the results are highlighted in section

five, which focuses on the agricultural exit probabilities of workers with particular characteristic vectors. The paper concludes with a summary discussion and certain policy recommendations.

2. Transition Rates and the Labour Force Survey

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

2.1 Transition Rates

The work identifies four mutually exclusive, exhaustive labour market states: working in agriculture (EA), working in a non-agricultural sector (E), unemployed (U) and economically inactive (N). The transition probabilities associated with movement between these states are based on the standard Markovian process described by Toikka (1976), which describes labour market flows between t_0 and t_1 in the following manner:

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

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

In the case of outflows, the probability of making any transition is given by the number of individuals in the flow divided by the number in the state of origin. 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, giving a transition probability matrix:

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

These probabilities represent one of the subjects of analysis in what follows. 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.

When inflows are under scrutiny, the foregoing approach must be modified slightly. In particular, the numbers in the destination state at t_1 form the denominator of each probability. As such, it is the columns rather than the rows of the matrix that sum to unity.

2.2 The Polish Labour Force Survey

Poland has conducted a quarterly Labour Force Survey (LFS) since May 1992. Between May 1992 and February 1999 the Survey was conducted during a reference week that included the fifteenth 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. Its design is similar to those conducted in European countries and it samples in excess of fifty thousand people aged 15 or more. The sample remained fixed for the first four surveys but, since the second quarter of 1993, it has been selected via a rotation system, which is divided into four rotation groups known as e-samples. 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, with the focus of this paper being on the latter. Two reasons underlie this choice. 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 influences into the data. 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, 2002: 60). On the other hand, yearly panels are susceptible to round tripping, since individuals who leave their origin state but return to it again within the year are recorded as non-movers. Using the constant sample available for the first four surveys, Góra and Lehmann (1995) were able to estimate the bias this introduced into the data. Their results indicated significant round tripping by the unemployed: almost one-quarter of those who were in this origin state and who exited it at some point during the year re-entered 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 analysed in the current instance runs from February 1998 to February 1999, the last produced prior to the introduction of continuous sampling. In the former LFS, 54.4 thousand individuals living in 21.7 thousand households were interviewed and the annual panel produced 25,208 usable responses, implying an attrition rate of less than five per cent (GUS, 1999). In terms of labour market status, two points of definition are

central when interpreting the results of the analysis. The first is that an individual is enumerated as being in employment according to the standard International Labour Organisation convention, which means that they are considered to be employed if they either worked for at least one hour during the reference week or if they formally held a job even if they did not work. 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). Second, the survey records an individual as being employed in agriculture if this is the sector in which they hold 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, 1998: 20), implying that the country has 1.7 million farmers for whom agriculture is either a secondary source of employment or a 'hobby' (GUS, 1999a).

3. Labour market transitions

As of February 1998, the panel to be analysed exhibited an activity rate of 55.4 per cent, which compares with the full survey figure of 57.1 per cent (GUS, 2002: 21). This implies that those individuals who are out of the labour force are slightly over-represented. The figures for the weight of agriculture also differ a little, with 21.8 per cent of total employment in the panel being in farming compared with 19.0 per cent overall (*ibid*.: 98). The panel and aggregate unemployment rates were, however, similar; 11.4 and 11.1 per cent, respectively (*ibid*.: 21).

Of course, the prospects for agricultural restructuring and the associated re-allocation of workers to other sectors of the economy depend in large part on the

prevailing macroeconomic climate. In this regard, it might be noted that the annual average LFS unemployment rate reached its lowest recorded level of 10.6 per cent in 1998. However, in subsequent years, there was a significant deterioration with figures of 13.9, 16.1, 18.3, 19.9 and 19.7 per cent being recorded in the years 1999-2003, respectively. Furthermore, this evolution occurred in spite of an economic activity rate that declined continuously throughout. 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.

The gross flows presented in Table 1 show the probability of an individual being in a particular labour market state in 1999, contingent upon their status in 1998. Over the period in question, the recorded status of the majority of individuals 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 changing their labour market status over the period. It should be noted, however, that seventeen per cent of those without work in 1998 subsequently left the labour force. Although there are differences, these aggregate findings are broadly in line with those reported in Góra and Lehmann (*op. cit*.) for Poland and with the results for 1980's Britain found by Wadsworth (1989), but 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 therefore the difference in the results is unsurprising.

Table 1 about here

Labour flows out of agriculture are given in the first row of the Table and they reveal that more than ninety per cent of those individuals in the sample who were working in the sector at the start of the period were still there one year later. In comparison with the work of Góra and Lehmann (*op. cit*.), who found that approximately eighty-three per cent of farm workers in the two panels they analysed did not change their labour market status, this suggests that mobility out of the sector actually declined during the nineteen-nineties. Less than two and one-half per cent of agricultural workers in the current panel succeeded in securing employment in another sector of the economy, while five per cent withdrew from the labour force and just over one per cent became unemployed. The latter finding will be driven, at least in part, by the unemployment benefit regulations prevailing under the provisions of the 1994 Act on Employment and Counteract[ing] Unemployment. These determined that any individual who either owned agricultural real estate or was working on a family holding in excess of two hectares, albeit without receiving an explicit wage, was ineligible for unemployment benefit (GUS, 1999b).

In contrast, Bellmann *et al*. (*op. cit*.) found that forty-five per cent of agricultural workers in the former East Germany left the sector during 1990-91 and, of these, approximately half found jobs elsewhere, twenty-seven per cent left the labour force, eighteen 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 (Ingham and Ingham *op. cit*.), but its overall significance was greatly reduced because of the importance of private sector farming. [2]

The inflow probabilities for the current sample, where these are conditioned on status in t_1, are given in Table 2 and they again reflect low levels of labour market mobility. As with outflows, the unemployed are the most mobile group; twenty-two per cent had been in non-agricultural employment one year earlier, while seventeen per cent had been economically inactive. Of those who were working in agriculture in February 1999, three per cent were previously economically inactive, almost two per cent were unemployed and one and one-half per cent were in employment in another sector of the economy. The latter finding is somewhat at variance with the popular notion that agriculture was absorbing excess labour which was being discarded by other sectors of the economy at the end of the nineteen-nineties.

Table 2 about here

Appendix Tables 1 and 2 provide summary details of these agricultural worker flows by age, sex, education and place of residence.

4. Modelling labour market transitions

The number of exits from Polish agriculture is too slow to satisfy the evident need for the modernisation of the country's rural economy and the sheer numbers involved means that there will be no simple short run remedy. Nevertheless, this section seeks to specify and test a formal multinomial logit model of the factors influencing the probability that an individual will undergo a particular labour market transition. The transitions of interest are those into and out of agriculture from or to the other three labour market states identified here. 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.

4.1 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, $\partial P_j/\partial x_i$ 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.[3] 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 applications to follow.

4.2 Model Specification

Most of the exogenous variables included in the initial specification of the model are self explanatory, with precise definitions provided in the Data Appendix, although some require elaboration. The first are the employment status measures, for which three dummy variables are included in the empirical specification. The first is *Self-employed*, which identifies individuals working on their own account, and the second is *Employed*, which identifies persons working for a public or private employer and receiving remuneration. In addition, an interaction term *State employee* is included that identifies those employees who work in the state sector. 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.[4]

The regional 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 first observed, and to which the locational measures relate, some degree of aggregation was necessary. One possibility would have been to gather 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, which are presented in the Data Appendix along with the resulting grouping,. The technique adopted (SAS FASTCLUS) is a non-hierarchical procedure that produced clusters of regions such that the similarity within and the dissimilarity between the groups was maximised, as described more fully in Ingham and Ingham (2002a).

The analysis produced an optimal solution 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), were more agricultural and were located more in the east and the south east of the country. In addition, the voivodship clusters are also incorporated into the *Peripheral* 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 opportunity set.

5. Results

The multinomial logit results for outflows from and inflows to agriculture are presented in Tables 3 and 4, respectively. Taking those who were employed in farming at both the initial and the terminal observation points as the base group leaves the three transitions reported there. Two columns are presented for each state change: the first set of coefficient values are the change in the log odds associated with a one-unit change in the independent variable to which they are attached, while the second are the terms $e^{\beta i}$, representing the factor by which the odds change when the i^{th} variable increases by one unit. The actual specifications reported in the tables represent the best fitting alternatives following the exclusion of poorly determined variables to reduce the number of null cells in order that parameter estimates could be obtained.

Two statistics are used 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). 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, a test that examines the significance, or otherwise, of the parameter estimates for the model as a whole, not just for those in individual equations. With 'large' samples the two tests are equivalent (Rao, 1973).

5.1 Outflows

The multinomial regression results for outflows are presented in Table 3, with each of the three pairs of columns relating to one of the possible transitions out of farming. 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.[5]

Table 3 about here

The first column of the Table contains the results for those individuals who managed to secure employment outside agriculture. The results for age and sex are what might be expected; men were more likely to make this transition than women, while older women were least likely of all to move to other employment. In fact, the probability of finding non-agricultural employment declined at an increasing rate beyond the age of thirty. The location variables included in the final model indicate, surprisingly, that living in a Tier 4 region enhanced an individual's chance of moving into alternative employment, whereas residence in a rural area retarded it. Also, as the distance of region of residence from a Tier 1 or Tier 2 area increased, so did the probability of gaining other work, although the effect was weak. However, the chances of such an exit declined as the prevailing unemployment rate increased. Similarly, the self-employed and those still employed by the state were less likely to secure alternative employment than were paid employees in the private sector. Finally, vocational education acted as a significant positive determinant of the probability of successfully leaving agriculture to work elsewhere. Indeed, such individuals were two and one-half times more likely to do so

than others. It should be noted that it was not possible to include a full set of educational dummies because of the four-way split for the independent variable. This resulted in a large number of zero cells caused, in part, by the scarcity of individuals with higher and post-secondary education working in farming.

Although the overall chances were very low, older women, people in paid private sector employment, those with vocational education and those living up to fifty-seven miles from a more advanced voivodship were more likely than others to flow into unemployment. In the latter two cases, it is tempting to surmise that such people were more confident that full-time job search would yield positive returns. In the case of those with vocational education, this conjecture might appear to be supported by their relatively high chance of moving directly into other employment. At the same time, higher jobless rates and residence in a Tier 4 region were associated with higher unemployment inflows from farming. Conversely, young women, those living in rural areas, the self-employed and those working in the state sector were less likely to become unemployed. In addition, the coefficients on the age variables indicate that the likelihood of moving from farming to the unemployment pool declined beyond the age of twenty and were negligible for those over fifty.

The probabilities of flowing from agriculture into inactivity were greatest for private sector employees and older women. The latter of these findings is perhaps a little surprising in view of the distribution of childcare responsibilities over the life cycle. However, it would be remiss to discount the possibility that discriminatory forces in the labour market were also at work. Those in Tier 4 and peripheral regions also exhibited higher propensities to leave farming and move out of the labour market, while the

coefficients on the age variables indicate that this transition became increasingly likely beyond the age of forty-three. On the other hand, the self-employed, state employees, those living in rural areas and those with vocational education all faced lower probabilities of moving out of the labour market than others.

5.2 Inflows

When applied to inflows to agriculture, the model worked less well and rather more variables had to be omitted in order for precise parameter estimates to be obtained. While the ensuing specification correctly predicts ninety-four per cent of the observations, the Nagelkerke R^2 is only 0.15 in this case. The results for the best fitting parsimonious form in which all but one coefficient achieves some degree of system wide significance are presented in Table 4.

Table 4 about here

Looking first at those moving into farming from other employment, the most striking result relates to those with vocational education who were almost four times more likely to have moved in this direction than others. Taken in conjunction with the earlier results on outflows from agriculture, this result suggests that those with such schooling histories represent a relatively mobile group in a rather stagnant labour market. Such job switchers were also more likely to be older and married. On the other hand, they were less likely to be female, particularly young women, and less likely to be resident in a rural area or in a Tier 3 region.

Incomers from the ranks of the unemployed were more prevalent in Tier 3 regions and were likely to have been below the age of twenty-nine. Although the flow was slight, the latter result is symptomatic of the difficulties confronting attempts to engineer the

orderly restructuring of Poland's farming sector. Women were unlikely to have followed this route, but any who did so are shown to have been young. Married people, those with vocational education and those from rural areas had low probabilities of moving from unemployment into farming. Entrants to the agricultural sector from inactivity were most likely to be female and over the age of forty-five. This is consistent with the finding that the likelihood of moving into the labour market to enter farming at first declined with age but began to increase again beyond the age of forty-three. The results also indicate that such movers were less likely to be married, residents from rural areas or Tier 3 regions or in possession of vocational education.

6. Outflow Simulations

Even if one accepts the narrow perspective of the size of Poland's agriculture sector imposed by LFS conventions, it is clear that it must shed large volumes of labour if genuine economic modernisation and convergence to the old core of Europe are to be achieved. Social cohesion and the prevention of yet further increases in the country's already large economic dependency rate would imply that this exodus should come about principally through flows into alternative employment. This section therefore focuses on the probabilities that individuals possessing particular vectors of characteristics had of flowing into other jobs within the sample analysed. A selection of the results obtained from conducting this exercise, based on the foregoing outflow model, is presented in Table 5. In the interests of brevity, the findings from a similar exercise undertaken for counter-flows into farming have been suppressed.

Table 5 about here

To keep the presentation manageable, the cases presented in Table 5 are restricted to those employed in the private sector as the remaining state sector farms accounted for only four per cent of all agricultural workers. Nevertheless, it will be recalled that such workers have much reduced chances of finding other work. Also, because the impact of their variation on outflows to alternative employment are relatively small, the voivodship unemployment rate is fixed at the median February 1998 registration figure of 12.7 per cent (GUS, 1998a) and the *Peripheral* variable has been set at one hundred miles.

For the vast majority of farmers, the chances of making a successful transition out of agriculture into other jobs are very low. Not one of the forty-eight individual characteristic vectors depicted in the table yields a greater than fifty per cent chance of doing so, which is the level that Greene (2003: 684-685) regards as the minimum for a predicted exit. At the other end of the scale, three of the individual types featured had chances of finding other work lying below one per cent, while half had a less than one-in-ten chance of successfully doing so.

In line with the results reported above, thirty-five year olds exhibited success rates which are very similar to those faced by someone ten years younger. However, by the age of forty-five, the chances had declined considerably. This finding is of some concern, given that the ten year age band 35-44 was both median and modal for agricultural workers at the time the panel was observed (GUS, 1998). By extension, even under the most favourable circumstances, a fifty-five year old has no more than a nine per cent chance of obtaining a job outside agriculture. Under less auspicious scenarios, this figure falls almost to zero.

Those who were paid employees on private farms comprised just one-tenth of the agricultural workforce (*ibid*.) but, as might be expected, they were much more likely to find alternative employment than those who owned their farm. This of course is a reflection of the widely recognised agricultural problem confronting Poland: small, fragmented landholdings whose owners, for a variety of reasons, resist rationalisation and reform (Ingham and Ingham, 2004; UN, 2000). Farming is an inherently rural activity, but seven per cent of the sector's workers were resident in urban areas at the time of the survey under study (GUS, *op*. *cit*.). Whether employees or working on their own account, this minority had by far the greater chance of moving to alternative employment.

One rather unexpected spatial finding highlighted in Table 5 is that, all else equal, agricultural workers in Tier 4 regions actually enjoyed an enhanced probability of moving to alternative employment over the life of the panel. This result might be rationalised in three ways. The first is quite simply that the numbers making the transition were small and that those territories, based on the widest employment count (GUS, 1999a), accounted for almost two-thirds of the total agricultural workforce. The second is that the economic structure of these regions remained sufficiently insular and backward that low skill job vacancies, all be they limited in recessionary times, persisted. The third is that workers in some of these areas benefited from Warsaw and Kraków contiguity effects that were imprecisely captured by the *Peripheral* measure. Both of these major urban voivodships experienced more or less full employment at the time of the panel, a situation that, particularly in the case of the former, had characterised almost all of the post-1989 epoch. On the other hand, the onset of the Russian crisis in the middle of 1998,

with its evident impacts on the markets of eastern Poland, increases the uncertainty regarding what the variable is capturing.

Another potentially surprising finding is that those farmers with vocational education, where, it will be recalled, no distinction is made in this paper between basic and secondary, experienced a large increase in their chances of securing alternative employment. Accounts of the inadequacy of vocational training in socialist countries are legion (e.g. Krajewska, 1995), geared as it was to fulfilling the short-term skills needs of an inefficient system centred on outmoded technology. However, in the current context, sight should not be lost of the findings of the February 1998 LFS that only three per cent of the agricultural workforce had university or general secondary education, forty-six per cent had vocational schooling, while the remainder had no more than primary education. Even taking those in work in rural areas as a whole only yielded figures of seven per cent, sixty-one per cent and thirty-two per cent, respectively (GUS, 1998). Vocational education in rural milieu could therefore possibly represent a positive signal. Furthermore, lacking as their skills might have been, such individuals were likely to have been over-qualified for much of the work available on farms and, in order to use their talents more fully, might have been the more active alternative job seekers.

The final point to note from the table is the difference between the sexes. In the case of a comparison between males and females below the age of forty-five, the former have a small, but nonetheless real, advantage in terms of successfully entering alternative employment. However, the disadvantage is much more significant for older women.

7. Concluding discussion

The magnitude and nature of the agricultural sector in Poland continues to differentiate the nation from both other recent accession countries and from longer established EU member states. The European Employment Strategy stresses the need for the transference of labour out of agriculture into the service sector, while European rural policy is centred on the existence of multifunctional rural areas with diversified employment opportunities. Market forces alone have failed to achieve this in the case of Poland; labour has not withdrawn from agriculture and migrated to urban areas in search of better job opportunities and capital has not flowed into the rural areas in order to exploit low wages. In the short term, this situation seems unlikely to change. First, migration to urban areas is not a viable option when such localities suffer from both chronic housing shortages (Juraś and Marzał, 1998) and high levels of unemployment. Second, the dearth of human and physical capital in the rural regions retards both indigenous and foreign investment. Third, neither farmers, nor the rural population at large, are prepared to sell land since not only do they believe that land prices will increase inside the EU, they also fear the threat of unemployment (Kolarska-Bobińska, 2002).

The findings of the analysis in this paper serve merely to confirm these beliefs. In particular, the LFS panel sample utilised indicated that, between February 1998 and February 1999, there was a net reduction of employment in the sector of just 2.5 per cent. If that rate of net exit continued into the future, it would take 25 years to halve the number working in the sector and forty years to reduce it by two-thirds. The latter situation would leave Poland with approximately six per cent of its workforce in agriculture according to LFS conventions, which would be more comparable to the

position within the old EU-15. In comparison, Ireland and Spain both halved the percentage of their employees working in agriculture between 1988 and 2000, while Greece and Portugal both managed a ten-percentage point reduction (Eurostat, 1993 and 2001).

Nevertheless, the analysis did provide some insights into those characteristics associated with agricultural labour market flows. Unsurprisingly, exits from agriculture to other jobs are negatively related to age, at least for those over thirty. Unfortunately, nearly half of all Poland's farmers are still over the age of forty-five and more than two-thirds are over thirty-five (GUS, 2004). Farmers without land fare relatively well on this score, but they represent a small proportion of the total agricultural workforce. Less benignly, the panel also revealed that inflows to agriculture still persist, particularly among women and those aged over forty from amongst the ranks of the previously inactive. However, there are at least compensating outflows by the same groups, although these again reflect exchanges between farming and non-participation whereas genuine and sustainable rural development will involve both agricultural restructuring and a reduction in the dependency rate (Ingham and Ingham, 2003).

One of the more notable findings of the analysis was that those with vocational education have, in relative terms at least, a high exit rate from farming, albeit both into other jobs and into unemployment. Unfortunately, only one-fifth of the country's farmers have this level of schooling or higher (GUS, *op*. *cit*.). The record of pre-accession assistance from the EU is therefore regrettable in this regard. In particular, the SAPARD (Special Accession Programme for Agriculture and Rural Development) programme that ran from 2000 to 2004 was biased towards agriculture as opposed to rural development.

Furthermore, in spite of the fact that only two per cent of students in higher education establishments come from the rural areas and that 58 per cent of farmers have neither secondary school education nor any formal agriculture training (Ingham and Ingham, 2004), less than five per cent of these funds were devoted to education programmes. This is notwithstanding the fact that the evidence suggests that both human and physical capital investments are necessary to promote economic growth (Kilkenny, 1998). Even Polish analysts were disappointed that the Commission declined to support programmes to educate rural youths under the SAPARD initiative (FAPA/SAEPR, 2000).

In addition, the compromise reached over the level and distribution of post-accession agricultural subsidies also threatens to retard restructuring in the sector. Under standard EU rules, these monies would have gone to a select group of producers. However, in the short term, the CAP monies received from Brussels are to be allocated according to a simplified system, meaning that all farmers with plots in excess of 0.3 hectares will receive funding. This approach provides incentives for a greater number of people to stay in farming. Second, Poland negotiated a compromise with the Commission that allows additional CAP funds, originally earmarked for rural development, to be transferred to agricultural subsidies. Again, this measure simply reinforces the attachment of farmers to their land and impedes the general development of the rural areas. Third, all semi-subsistence farms will be entitled to a flat-rate grant of €750 if they are able to produce a business plan. All of these concessions serve to impede restructuring and to exacerbate inequalities in the rural areas between those who own land and those who do not; occurrences that ironically the Commission was once so keen to avoid (CEC, 2002). In addition, Poland successfully argued its case for land sales to foreigners to be banned

for up to seven years post-accession. Even to be able to lease agricultural land, foreigners will need to prove that they have lived in Poland and worked in agriculture. Overall, it seems unlikely that accession will bring about rapid change in Poland's rural areas. If this to be achieved, the Commission must strengthen its resolve for radical changes in CAP funding. If it does not, the hope expressed in the EES that acceding member states will promote the steady movement of labour from agriculture and manufacturing to the service sector will remain well founded in principle, but optimistic in practice (Ingham and Ingham, 2003).

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Table 1 *Transition probabilities: Outflows*

Status at t_1	***E_A***	***E***	***U***	***N***	***Stock at t_0***
Status at t_0					
E_A	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

Note: The elements in this table represent the probability that a member of any origin state *i* moved to terminal stock *j*. Subject to rounding errors each row of the table sums to 1.

Table 2 *Transition probabilities: Inflows*

Status at t_1	***E_A***	***E***	***U***	***N***	***Stock at t_1***
Status at t_0					
E_A	0.9368	0.0067	0.0251	0.0119	2,626
E	0.0145	0.9136	0.2168	0.0331	9,795
U	0.0179	0.0423	0.5840	0.0239	1,476
N	0.0308	0.0374	0.1741	0.9311	11,311

Note: The elements in this table represent the probability that a member of the terminal stock in any state *j* originated in stock *i*. Subject to rounding errors each column sums to 1.

Table 3 Multinomial estimates of outflows from agriculture

	EA→E	***Exp(β)***	***EA→U***	***Exp(β)***	***EA→N***	***Exp(β)***
Constant[a]	-4.396[b]	-	-10.815[b]	-	-0.485	-
	(5.78)		(12.76)		(0.27)	
Age[a]	0.179	1.196	0.125	1.134	-0.086[b]	0.917
	(2.91)		(0.74)		(6.31)	
Age squared[a]	-0.003[b]	0.997	-0.003	0.997	0.001[b]	1.001
	(4.47)		(1.70)		(10.40)	
Peripheral[a]	0.005	1.005	0.114[b]	1.121	0.009	1.009
	(0.13)		(9.15)		(1.02)	
Peripheral squared[a]	0.000	1.000	-0.001[b]	0.999	0.000	1.000
	(0.42)		(8.29)		(1.73)	
Unemployment rate[a]	-0.054[c]	0.947	0.073	1.076	-0.008	0.992
	(2.78)		(2.11)		(0.11)	
Female[a]	-0.818	0.441	1.227[c]	3.412	0.549[b]	1.731
	(1.08)		(3.32)		(6.70)	
*Female*aged < 45*[a]	0.509	1.664	-2.289[b]	0.101	-0.891[b]	0.410
	(0.39)		(7.41)		(6.16)	
Employee[a]	1.031[b]	2.803	2.542[b]	12.710	0.567	1.762
	(4.97)		(14.33)		(2.20)	
Self employed[a]	-0.652[c]	0.521	-0.862	0.422	-0.607[b]	0.545
	(3.36)		(1.64)		(8.21)	
State employee[a]	-1.344[b]	0.261	-0.207	0.813	-2.377[b]	0.093
	(3.87)		(0.19)		(5.08)	
Vocational education[a]	0.948[b]	2.579	0.994[b]	2.701	-0.156	0.855
	(8.24)		(5.11)		(0.45)	
Rural[a]	-1.206[b]	0.299	-0.010	0.990	-1.068[b]	0.344
	(10.97)		(0.00)		(12.19)	
Tier 4 region	0.738[b]	2.092	0.105	1.111	0.158	1.171
	(5.12)		(0.06)		(0.48)	
N			2698			
Pseudo R^2						
Cox & Snell			0.112			
Nagelkerke			0.209			
McFadden			0.155			
Correct predictions			91%			
-2 Log likelihood						
Intercept only			2000.198			
Final model			1679.909			

Notes:

1. The model parameter significance tests are based on the change in the value of –2 log likelihood if 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; the '*b*' superscript indicates that the null hypothesis is rejected at the 5% level. Coefficients with a '*c*' superscript are significant at the 10% level.

Table 4 Multinomial estimates of inflows to agriculture

	E→EA	***Exp(β)***	***U→EA***	***Exp(β)***	***N→EA***	***Exp(β)***
Constant[a]	-3.940[b]	-	-3.015	-	3.359[b]	-
	(4.80)		(3.25)		(16.40)	
Age[a]	0.017	1.017	0.116	1.123	-0.259[b]	0.772
	(0.04)		(1.52)		(43.35)	
Age squared[a]	0.000	1.000	-0.002	0.998	0.003[b]	1.003
	(0.20)		(2.92)		(35.85)	
Female[a]	-0.823	0.439	-0.823	0.439	1.110[b]	3.034
	(1.65)		(1.08)		(13.70)	
*Female*aged < 45*	-0.758	0.469	0.619	1.856	-0.802[b]	0.449
	(0.84)		(0.53)		(4.00)	
Married[a]	0.492	1.635	-0.793[b]	0.452	-0.584[b]	0.557
	(1.12)		(4.98)		(4.18)	
Vocational education[a]	1.350[b]	3.856	-0.222	0.801	-0.278	0.757
	(9.36)		(0.50)		(1.00)	
Rural[a]	-0.857	0.425	-1.363[b]	0.256	-1.001[b]	0.367
	(2.94)		(10.94)		(6.60)	
Tier 3 region[d]	-0.692	0.501	0.536	1.710	-0.173	0.841
	(2.63)		(2.96)		(0.33)	
N			2626			
Pseudo R^2						
Cox & Snell			0.070			
Nagelkerke			0.154			
McFadden			0.120			
Correct predictions			94%			
-2 Log likelihood						
Intercept only			1171.954			
Final model			981.965			

Notes:

1. The model parameter significance tests are based on the change in the value of –2 log likelihood if the effect is removed from the final model. The '*a*' superscript indicates that the null hypothesis is rejected at the 5% level; and the '*d*' superscript indicates rejection at the 10% 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; the '*b*' superscript indicates that the null hypothesis is rejected at the 5% level. Coefficients with a '*c*' superscript are significant at the 10% level.

Table 5 Predicted probabilities for outflows from agriculture

Age	***25***	***35***	***45***	***55***
Characteristics				
Employed, male	0.2785	0.2765	0.1719	0.0583
Self-employed, male	0.0669	0.0663	0.0371	0.0114
Employed, male, rural	0.1036	0.1027	0.0585	0.0182
Self-employed, male, rural	0.0210	0.0208	0.0114	0.0034
Employed, male, rural, T4	0.1947	0.1931	0.1151	0.0372
Self-employed, male, rural, T4	0.0430	0.0426	0.0236	0.0071
Employed, male, rural, T4 vocational education	0.3841	0.3818	0.2512	0.0910
Self-employed, male, rural, T4, vocational education	0.1039	0.1029	0.0587	0.0183
Employed, female < 45, rural, T4, vocational education	0.3147	0.3119	n.a.	n.a.
Self-employed, female < 45, rural, T4, vocational education	0.0786	0.0777	n.a.	n.a.
Employed, female ≥ 45, rural, T4, vocational education	n.a.	n.a.	0.1290	0.0423
Self-employed, female ≥ 45, rural, T4, vocational education	n.a.	n.a.	0.0268	0.0081

Appendix Table 1 Outflows from agriculture by sex, age, education and place of residence

Status at t_1	***E_a***	***E***	***U***	***N***
Males	0.9108	0.0282	0.0188	0.0423
Females	0.9130	0.0199	0.0075	0.0597
<25	0.8528	0.0508	0.0305	0.0660
25-49	0.9263	0.0359	0.0183	0.0196
50-64	0.9130	0.0043	0.0057	0.0770
65+	0.8789	0.0000	0.0000	0.1211
Higher/post-secondary	0.9048	0.0714	0.0000	0.0238
Vocational secondary	0.8822	0.0640	0.0168	0.0370
General secondary	0.9508	0.0164	0.0000	0.0328
Basic vocational	0.9070	0.0377	0.0266	0.0288
Basic/less than basic	0.9197	0.0065	0.0057	0.0681
Large	0.7692	0.1923	0.0000	0.0385
Medium	0.8350	0.0388	0.0291	0.0971
Small	0.7188	0.0938	0.0313	0.1563
Rural	0.9188	0.0213	0.0130	0.0469

Appendix Table 2 Inflows to agriculture by sex, age, education and place of residence

Status at t_0	***Ea***	***E***	***U***	***N***
Males	0.9321	0.0213	0.0220	0.0247
Females	0.9427	0.0060	0.0128	0.0385
<25	0.7850	0.0187	0.0467	0.1495
25-49	0.9454	0.0186	0.0235	0.0124
50-64	0.9581	0.0090	0.0045	0.0284
65+	0.9561	0.0034	0.0000	0.0405
Higher/post-secondary	0.9048	0.0000	0.0714	0.0238
Vocational secondary	0.9225	0.0246	0.0246	0.0282
General secondary	0.9508	0.0000	0.0164	0.0328
Basic vocational	0.9307	0.0261	0.0216	0.0216
Basic/less than basic	0.9441	0.0059	0.0125	0.0375
Large	0.8000	0.0400	0.0400	0.1200
Medium	0.8866	0.0412	0.0412	0.0309
Small	0.8214	0.0000	0.1071	0.0714
Rural	0.9414	0.0133	0.0158	0.0295

Data Appendix

Covariates:

Age	Age in years
Distance	Straight-line distance in miles from the nearest Tier 1 or Tier 2 voivodship (see below)
Unemployment rate	The unemployment rate, in November 1998, in the voivodship where the individual was residing

Binary factors:

Female	1 if female, 0 otherwise
*Female*aged < 45*	1 if female and < 45, 0 otherwise; proxies for women with family responsibilities as LFS gives no information on number of children
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

Notes

[1] From 2002, GUS began publishing two figures for the number employed in private farming. The new one is an estimate of the total excluding workers on subsistence and semi-subsistence farms and is approximately half of the headline figure reported in the text. Without similar adjustments for under-employed and hidden unemployed workers in other sectors of the economy, it is far from evident that this is a legitimate exercise.

[2] Poland's first Labour Force Survey was not conducted until May 1992, by which time most state farms had already collapsed, so it not possible to produce directly comparable results.

[3] 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.

[4] The true cost of the workers concerned, who worked an average of 26 hours per week, can hardly be assumed to be zero.

[5] The Nagelkerke R^2 is a modification of the Cox and Snell R^2 and is preferable as a diagnostic as the latter measure can never equal one. The final statistic, McFadden's R^2, is the proportion of the kernel of the log likelihood explained by the model.