JOB CREATION AND JOB DESTRUCTION IN THE EU AGRICULTURE

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1. INTRODUCTION

European and other developed economies' agricultural sectors experienced dramatic structural labour adjustments in the post-war period. On the one hand, economic growth and rising agricultural productivity have led to continuous net labour outflow from agriculture. On the other hand, specialisation, changes in the demand structure and in the scale of production have led to structural shifts in the demand for the quantity and skills of agricultural labour.

There are two main approaches in the literature that contribute to explaining changes in employment: household models and job creation and destruction models. The models based on farm household utility maximisation are extensively used to explain the observed patterns of adjustment in agriculture (Huffman, 1980; Huffman and Lange, 1989; Sumner, 1982). In particular, farm household models are employed to explain the allocation of household labour between leisure, off-farm labour and farm labour (Ahearn et al., 2006; Bojnec and Dries, 2005; Gould and Saupe, 1989; Mishra and Goodwin, 1997; Rizov and Swinnen, 2004; Serra et al., 2005; Woldehanna et al., 2000).

Farm household models are well suited for explaining adjustments in aggregate/net employment. However, behind the aggregate and net employment figures, important structural adjustments in agricultural employment may be hidden. Evidence from the empirical literature shows that in most sectors sectoral labour behaviour is characterised by large simultaneous creation and destruction of jobs (Davis and Haltiwanger, 1992; Blanchflower and Burgess, 1996; Bilsen and Konings, 1998; Mortensen and Pissarides, 1999; Commander and Kollo, 2008). The farm household models, which in general assume representative/homogenous firms and/or homogenous shocks, are unable to explain the observed simultaneous divergence in job flows. Hence, in the context of our study, an important shortcoming of the farm household models is that they are unable to explain intra-sectoral job flows (job creation and job destruction).

Recent developments in the search and matching theory have put forward theoretical explanations of the creation and destruction of jobs in the overall economy as well as at sectoral level. The main drivers of job reallocation – i.e. labour adjustment – are *firm heterogeneity* given by firms' structural differences and/or *idiosyncratic shocks* faced by firms (McCall 1970; Mortensen and Pissarides 1994; Pissarides 2000; Petrongolo and Pissarides 2001; Klein, Schuh, and Triest 2003).

The present paper adopts the job creation and job destruction approach to study the agricultural labour adjustments in the EU over the period 1990-2005. The main advantage of this approach – vis-à-vis farm household models – is that it is able to disaggregate the employment patterns and job flows into more detailed intra-sectoral labour adjustment dynamics. The job creation and job destruction approach allows us to identify the sources of job growth and job losses among different types of farms, agricultural sub-sectors, labour types, and their variation over time. Moreover, this approach is able to identify structural changes in agricultural employment.

Despite that there are numerous studies that apply the job creation and job destruction methodology to the manufacturing and services sectors, a study analysing job creation and job destruction in the EU agriculture is still lacking. This is particularly surprising, given the significant farm labour adjustments that have been observed in EU agriculture in recent decades. As a result, the identification of the types of farms that create jobs and that lay off labour, the role of farm exit and farm specialisation, differences between family and hired labour adjustments, and their dynamics are not yet fully explored and understood.

Relying on the job creation and job destruction approach we analyse four issues: (i) the magnitude of job creation, job destruction and job reallocation in the EU agriculture; (ii) cross-sectoral and farm-type differences in job creation and job destruction; (iii) the variation of these indices over time; and (iv) differences in labour type being created and/or destructed. In addition to the descriptive analysis of these indicators, we apply a cell-based regression model to identify the main drivers of job creation and destruction in the EU agriculture. The empirical analysis is based on a unique farm level panel dataset from the Farm Accountancy Data Network (FADN).

Empirical findings from the existing literature on job creation and job destruction in non-agricultural sectors (Davis and Haltiwanger, 1992; Blanchflower and Burgess, 1996; Bilsen and Konings, 1998; Mortensen and Pissarides, 1994; Commander and Kollo, 2008), suggest a number of hypotheses that are tested in our paper. First, job reallocation is inversely correlated with capital intensity.[1] This suggests that job creation/destruction might be relatively low in agriculture, because agricultural production is relatively capital intensive. Given differences in capital intensity between agricultural sub-sectors, the empirical results may also yield different gross job creation and destruction rates across agricultural sub-sectors. Second, smaller and younger establishments create and destroy more jobs than larger and older firms. Third, firm entries and exits play a major role in explaining the aggregate job creation job and destruction. Fourth, at the individual level, the main cause of job turnover is idiosyncratic shocks, i.e. firm-specific shocks. Idiosyncratic shocks are particularly important in agriculture (e.g. farm household life crises, shocks related to health status of farm family members, local differences in weather, and spread of diseases). This suggests high job creation/destruction in agriculture due to idiosyncratic shocks. Finally, the job creation and destruction rates may differ across countries and even across regions within a country.

The remainder of the paper is organised as follows. First, we develop a theoretical framework for analysing job creation and destruction in agriculture. Second, we discuss some concepts that we use in the empirical estimations section, such as farm growth, job creation rate and job destruction rate. Next, we present empirical results on job destruction and creation in the EU agriculture. Furthermore, we develop an econometric model to identify the determinants of job creation and destruction. Finally, we discuss our findings and derive conclusions.

2. THEORETICAL FRAMEWORK

According to Klein, Schuh, and Triest (2003), there may be two sources of firm-specific gross job creation and destruction within a narrowly-defined industry. Firms may have *structural differences* or firms may have a common structure but face *idiosyncratic shocks*. In the context of the EU agriculture, the farm structural differences may arise due to the technological differences (e.g. labour versus capital intensive production), production structure (the mix of agricultural activities), labour type (family versus hired), and variation in the subsidisation across the agricultural sub-sectors. The idiosyncratic shocks include farm specific shocks, which vary across farms in a given period, such as regional differences in weather, crop and animal diseases, productivity changes, farm household life crises, and/or shocks related to health status of farm family members. These idiosyncratic shocks are important in the agricultural sector, because several shocks, such as weather, diseases and farm household life crises, are specific to agricultural production and hence they may expose the agricultural sector to larger employment adjustments than other industries.

[1] A general finding in the literature is that jobs are created and destroyed more rapidly for instance in services than in the manufacturing sector.

The main effects of the heterogeneity in the farm structure and idiosyncratic shocks between farms can be made explicit in a simple model. Assume that labour demand of farm *i* is given by:

(1) $D_i = D(p, v, r, s, T_i, H_i)$

where p is a vector of output price, v is the wage rate,[2] r is a vector of other input prices, s are subsidies, T is farm technology and H are other farm household specific characteristics which affect the labour demand.

In equation (1) structural differences are determined by the mix of output produced and farm specific technology, T_i. An asymmetric change in output prices, input prices or/and subsidies (e.g. due to changes in the market intervention policy) would induce a differentiated employment response between farms. For example, farms specialised in products for which the relative output prices increase, will create jobs, while farms specialised in products for which the relative prices decrease, will destroy jobs. The idiosyncratic shocks affect farm labour through the specific characteristics of the farm household, H_i, and through the farm specific technology, T_i. Farms affected, for example, by animal diseases or bad weather will destroy jobs, while farms experiencing good weather and no diseases will create jobs.

To illustrate the GJC and GJD effects in agriculture, we assume two types of farms: farm 1 (dairy farm) and farm 2 (crop farm) with their respective labour demand given by D_{10} and D_{20} (upper panel in Figure 1). The horizontal summation of D_{10} and D_{20} yields the aggregate labour demand, D. The equilibrium employment of farm 1 and farm 2, the aggregate employment, and the equilibrium wage are N_{10}^*, N_{20}^*, N^*, v^*, respectively.

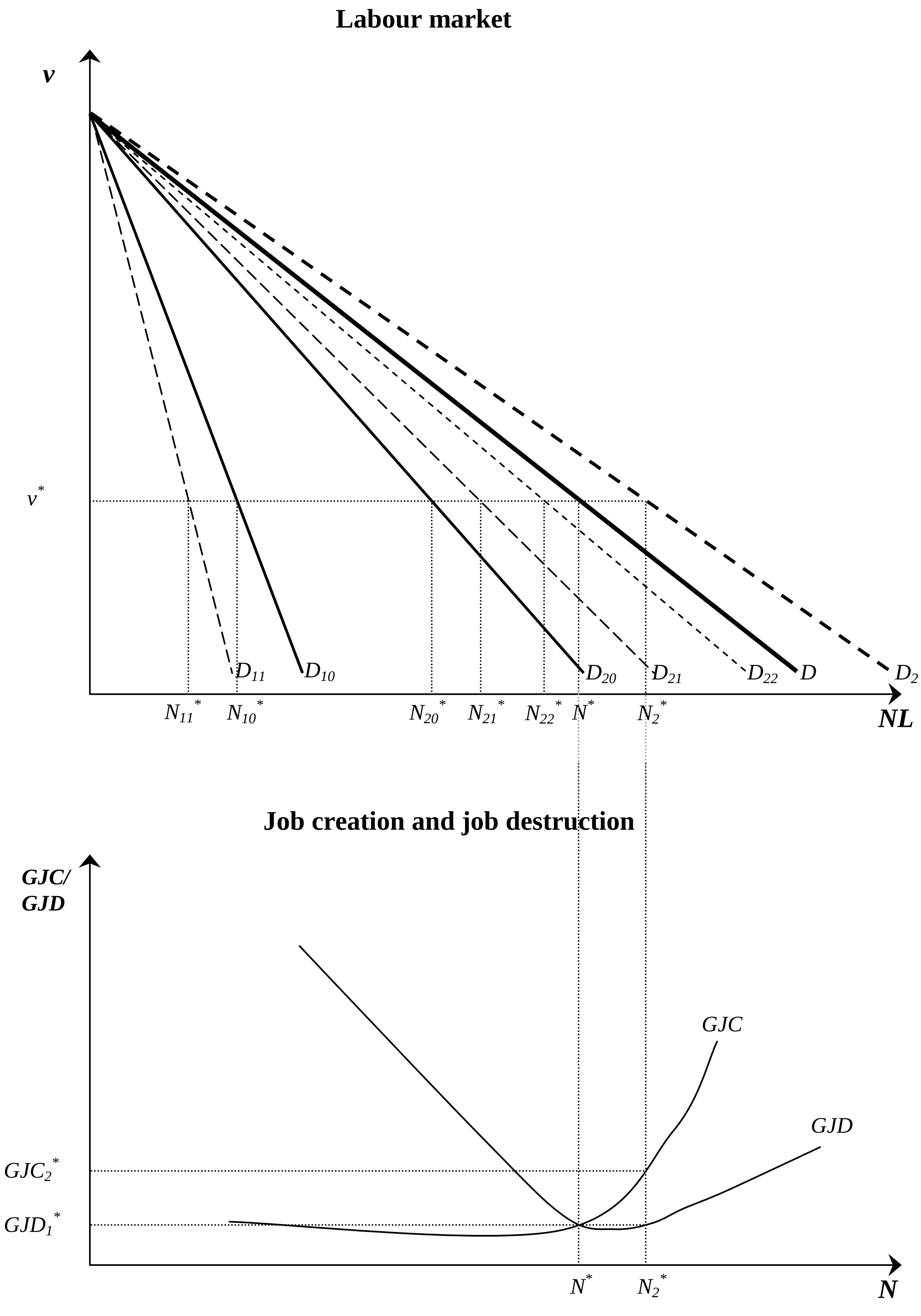
Consider an asymmetric change in the agricultural policy, s_1, which increases the support for the crop sector to s_{1C}, while it reduces the support for the dairy sector to s_{1D}. This implies that farm 1, which is specialised in dairy, will reduce its labour demand (from D_{10} to D_{11}), whereas farm 2, which is specialised in crop production, will increase its labour demand (from D_{20} to D_{21}). In equilibrium farm 1 destroys $N_{10}^* - N_{11}^*$ jobs, whereas farm 2 creates $N_{21}^* - N_{20}^*$ jobs. Because the GJC is equal to GJD ($N_{10}^* - N_{11}^* = N_{21}^* - N_{20}^*$), the equilibrium aggregate labour is not affected and remains at N^*. The lower panel in Figure 1 shows the GJC and GJD curves. Even though, aggregate employment is not affected, there are important (hidden) structural changes taking place in the agricultural employment. Jobs are destroyed in the dairy sector while new jobs are created in the crop sector, both equal to GJD_1^*, where $GJD_1^* = N_{10}^* - N_{11}^* = N_{21}^* - N_{20}^* = GJC_1^*$.

Next consider a policy sock s_2, which implies both an increase in the crop subsidisation ($s_{2C} > s_{1C}$), and an increase in the dairy subsidisation ($s_{2D} = s_{1D}$). Everything else equal, this implies that the same shift in the labour demand of farm 1 (from D_{10} to D_{11}), but a stronger increase in the labour demand of farm 2 (from D_{20} to D_{22}). Now the GJC exceeds the GJD ($N_{22}^* - N_{20}^* > N_{10}^* - N_{11}^*$) and the aggregate employment increases to N_2^*, which is given in the upper panel of Figure 1. The GJC curve is above the GJD curve if the asymmetric policy shock induces an increase in the aggregate farm

[2] We assume a small agricultural sector in the overall economy implying an exogenous wage rate.

employment, implying that more jobs are created than destroyed (the lower panel of Figure 1). The GJC curve is below the GJD curve, if the policy shock leads to a reduction in the aggregate agricultural employment. At N^* the GJC and GJD curves intersect. The type and the magnitude of shocks determine the shape and the position of the GJC and GJD curves. Different types of shocks may change the shape and/or may move the GJC and GJD curves up or down.

Figure 1. Job creation and job destruction



3. EMPIRICAL FRAMEWORK

3.1. Concepts and definitions[3]

For each farm *i*, we define employment at time *t* as N_{it}. Total employment (N^T) at time *t* can then be defined as:

$$(2)\quad N_t^T = \sum_{i \in F_t} w_{it} N_{it}$$

where F_t denotes the set of farms in the sample and w_{it} is the sample weight of farm *i*, which equals the reciprocal of its sampling probability. Sample weights are suppressed in what follows to simplify the notation but they are applied in the actual construction of the measures.

For each farm we define its size (x_{it}) as the average employment between periods *t* and *t*-1. Subsequently, farm growth (g_{it}) is measured as:

$$(3)\quad g_{it} = \frac{N_{it} - N_{it-1}}{x_{it}}$$

GJC in sub-sector *s* at year *t* is the sum of employment gains in year *t* at expanding farms in that sub-sector and GJD is the sum of employment losses in shrinking farms. In the empirical analysis we use job creation and destruction rates by dividing gross measures by the size of the sub-sector in year *t*[4]:

$$(4)\quad JCR_{st} = \frac{\sum_{i \in s, g_{it} > 0} N_{it} - N_{it-1}}{\sum_{i \in s} x_{it}}$$

$$(5)\quad JDR_{st} = \frac{\sum_{i \in s, g_{it} < 0} | N_{it} - N_{it-1} |}{\sum_{i \in s} x_{it}}$$

3.2. Data

The main source of data we use in the empirical analysis comes from the Farm Accountancy Data Network (FADN), which is compiled and maintained by the European Commission. The FADN is a European system of sample surveys that take place each year and collect structural and accountancy data on the farms. In total there is information about 150 variables on farm structure and yield, output, costs, subsidies and taxes, income, balance sheet, and financial indicators. The yearly FADN sample covers approximately 80,000 agricultural farms in the Member States. They represent a population of around 5,000,000 farms, covering approximately 90% of the total utilised agricultural area and accounting for more than 90% of the total agricultural production.

FADN provides a harmonised source of micro-economic data (the bookkeeping principles are the same across all EU Member States) and is representative of the commercial agricultural holdings in the EU. Holdings are selected to take part in the survey based on sampling plans established at the level of each region in the EU. FADN is a panel dataset, which means that farms that stay in the panel in consecutive years can be traced over time using a unique identifier.

Job creation and destruction in agriculture is analysed over the time period 1990 – 2005. Successive accession rounds within this time frame have changed the size and composition of the EU agricultural sector that is represented in the FADN panel.

[3] Based on Davis and Haltiwanger (1992)

[4] The size of the sub-sector is defined as average employment in the sub-sector between years *t* and *t*-1.

Therefore, we will focus our analysis on member states that were already included in the FADN panel in 1990.[5]

Farm exits and entry are likely to represent an important aspect of job creation and destruction in EU agriculture. The application of farm weights in the definition of JCR and JDR allows us to take the exits and entries – as well as on-farm labour adjustments – into account in the empirical estimation.[6] Farm weights are derived from the Farm Structure Survey (FSS).[7] Because these census data are only updated every two or three years,[8] we present average annual job creation and destruction rates in two- and three-year intervals.

3.3. Descriptive results

Table 1 presents average annual job creation and destruction rates for the EU-12 over the period 1990-2005. In line with our expectations and results from aggregate labour adjustment studies, we find that JDR tends to be larger than JCR. In other words, there is net labour outflow from agriculture. Figure 2 provides a graphical representation of this trend.

A second observation that can be derived from table 1 (and figure 2) is that our JCR and JDR estimates are in line with the estimates found in the literature for other sectors. We find that on average the JCR and JDR in agriculture are 11.0% and 14.2%, respectively. The variation between years ranges from 8.4% to 14.6% for JCR, and from 11.7% to 18.1% for JDR. In a study on several OECD countries by Contini et al. (1995), the JCR and JDR varied between 8% and 15% in the 1984-1992 period. Davis and Haltiwanger (1992) report JCR and JDR between 6% and 16% for the US manufacturing sector over the period 1972 and 1986. Smeets and Warzynski (2006) report slightly lower estimates for the Polish economy for the period between 1997 and 2000: 3% - 10%.

Table 1. Job creation and job destruction rate in agriculture, EU-12, 1990-2005

	JCR	JDR	NET
1990-1993	0.087	-0.117	-0.030
1993-1995	0.145	-0.181	-0.036
1995-1997	0.145	-0.138	0.007
1997-2000	0.091	-0.121	-0.031
2000-2003	0.084	-0.166	-0.082
2003-2005	0.146	-0.139	0.007

Source: Own calculations based on FADN data

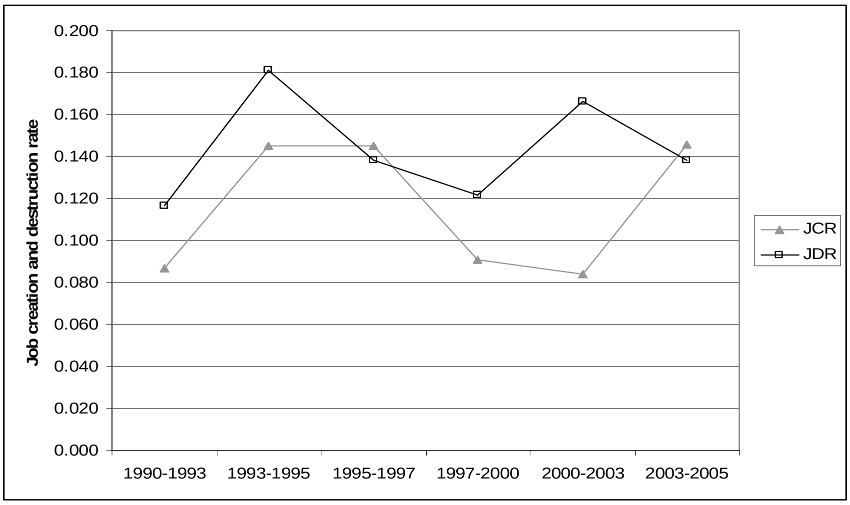
[5] We refer to this sub-sample as EU-12, including Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxemburg, The Netherlands, Portugal and the United Kingdom.

[6] It should be noted that weights have been adjusted after merging FADN samples in consecutive years. This was necessary because in each year *t* some farms from the *t*-1 sample are dropped, while some new *t* farms – that were not yet present in the *t*-1 sample – are included. Since we can only calculate employment changes in farms that are in the sample both at *t* and *t*-1, weights have to be adjusted.

[7] The FSS is carried out by all EU Member States every 10 years (the agricultural census) with intermediate sample surveys being carried out three times between the basic surveys (Eurostat 2010).

[8] The years when the FSS censuses/ intermediate sample surveys were organized are 1990, 1993, 1995, 1997, 2000, 2003, 2005 and 2007.

Figure 2. Job creation and job destruction rate in agriculture, EU-12, 1990-2005



Source: Own calculations based on FADN data

In general, one may expect higher JCR and JDR in agriculture compared to other sectors due to three reasons: larger (and more frequent) idiosyncratic shocks, seasonal labour and the relatively small size of establishments in agriculture. First, idiosyncratic shocks such as weather and diseases are largely specific to agriculture and may lead to large fluctuation in production and hence in employment compared to other sectors.

Second, agriculture, unlike most other sectors, relies heavily on seasonal labour. The employment of seasonal workers is easy to adjust since often seasonal labour is based on verbal agreements or contracted on a short-term basis only to cover the labour needs in the high season. Moreover, family labour which makes up an important share of agricultural employment is often flexible to adjust its labour allocation to on-farm activities. Since the farmer is a residual claimant, (s)he will have an incentive to flexibly allocate own labour between on-farm and off-farm employment and leisure according to the needs. In contrast, in other sectors of the economy, the long-term labour contracts often predominate.

Third, studies from other industries have often shown that smaller establishments create and destroy more jobs than larger plants (Acquisti and Lehmann 1999; Mortensen and Pissarides 1999). Given that in terms of employed labour, farms are relatively small enterprises, the JDR and JCR should be higher in agriculture.

However, the empirical findings from the existing literature find that the job flows are inversely correlated with capital intensity and firm age (Mortensen and Pissarides 1999). The agricultural sector is a capital intensive industry with asset such as buildings, machinery, equipment and breeding livestock dominating the fixed asset structure of farms particularly in developed economies (Barry and Robinson. 2001). At the same time ageing of labour and farmers is a widespread structural problem in the EU agriculture (Carbone and Subioli 2008). The relatively high comparability of JCR and JDR levels between our estimates for agriculture and the estimates for non-agriculture reported in literature may indicate that the capital intensity and the agricultural ageing may offset the effect of the idiosyncratic shocks, seasonal labour and the small size of agricultural establishments on the farm labour adjustments.

Tables 2 and 3 show that both family and hired labour have similar rates of labour flows as the aggregate rates shown in table 1. This could be due to the fact that both are relatively flexible: for hired labour it may be a result of the seasonal nature of their employment while for family labour this could be the result of higher flexibility of leisure, on-farm and off-farm employment decisions. However, the JCR appears to be slightly higher for hired labour than for family labour, while the JDR does not show consistent difference between the two types of labour. This structural difference may indicate a substitution of family for hired labour whereby the later type of labour tends to be preferred to the former one in satisfying the farm job needs. These finding are in line with the aggregate development of farm labour allocation. According to the FADN data, the average share of hired labour in total labour increased from around 18% in 1989 to around 26% in 2007 in EU-12.

Table 2. Job creation and job destruction rate family labour, EU-12, 1990-2005

Family Labour	JCR	JDR	NET
1990-1993	0.088	-0.119	-0.031
1993-1995	0.141	-0.193	-0.052
1995-1997	0.150	-0.139	0.011
1997-2000	0.091	-0.128	-0.037
2000-2003	0.087	-0.173	-0.086
2003-2005	0.146	-0.143	0.003

Source: Own calculations based on FADN data

Table 3. Job creation and job destruction rate hired labour, EU-12, 1990-2005

Paid Labour	JCR	JDR	NET
1990-1993	0.108	-0.132	-0.023
1993-1995	0.211	-0.156	0.055
1995-1997	0.158	-0.173	-0.014
1997-2000	0.116	-0.120	-0.004
2000-2003	0.096	-0.163	-0.067
2003-2005	0.172	-0.151	0.021

Source: Own calculations based on FADN data

Table 4 decomposes the overall job creation and destruction rates for farms in different size classes. The results reported in table 5 support the hypothesis that small farms relocate more jobs than big farms. This is consistent with empirical findings from the literature which find that smaller establishments create and destroy more jobs than larger plants (Acquisti and Lehmann 1999; Mortensen and Pissarides, 1999).

Table 4. Average annual job creation and job destruction rate per size class, 1990-2005

	JCR	JDR	NET
< 2 ESU	0.104	-0.191	-0.087
2 - < 4 ESU	0.088	-0.305	-0.217
4 - < 6 ESU	0.173	-0.172	0.001
6 - < 8 ESU	0.174	-0.141	0.032
8 - < 12 ESU	0.144	-0.126	0.018
12 - < 16 ESU	0.129	-0.136	-0.007
16 - < 40 ESU	0.095	-0.102	-0.007
40 - < 100 ESU	0.089	-0.086	0.003
100 - < 250 ESU	0.092	-0.082	0.010
>= 250 ESU	0.074	-0.102	-0.029

Source: Own calculations based on FADN data

There are three factors explaining these results: stronger idiosyncratic shocks in small farms, structural changes and labour contracts. First, small farms may face stronger idiosyncratic shocks. This can be due to the fact that small farms are more exposed to family crises (big farms are likely to use more hired labour than family labour in relative terms). Furthermore, small farms have fewer possibilities to diversify production and economies of scale in (quasi-)fixed production factors may allow big farms to reduce uncertainty over production outcomes (e.g. through irrigation, pest control, crop/animal disease prevention, fertilizer use, insurance).
Second, there is a trend of continuously increasing farm sizes in the EU over time implying more job destruction (less job creation) in small farms than in big farms. Finally, many big farms are commercial farms and a substantial share of labour may have a long-term employment contract which makes big farms more rigid in terms of labour adjustment leading to smaller fluctuations in labour flows.
Table 5 shows that there is a significant fluctuation in job creation and destruction rates between member states. Generally, the net flows are negative in the EU-12 with only one exception: Spain. Furthermore, the table shows that farm size is an important factor in explaining differences in job creation and destruction rates between member states. Member states with a lower average farm size have a higher JCR and JDR.

Table 5. Annual job creation and job destruction rate in different member states in relation to average farm size, EU-12, 1990-2005

	JCR	JDR	NET	Farm size*
Portugal	0.131	-0.196	-0.065	8
Greece	0.108	-0.147	-0.039	9
Spain	0.172	-0.144	0.027	16
Italy	0.132	-0.203	-0.071	18
Ireland	0.054	-0.066	-0.012	21
Luxemburg	0.060	-0.086	-0.026	52
France	0.073	-0.090	-0.017	58
Germany	0.080	-0.101	-0.021	59
Belgium	0.047	-0.068	-0.021	72
Denmark	0.056	-0.082	-0.026	72
UK	0.067	-0.110	-0.043	83
The Netherlands	0.058	-0.079	-0.021	111

* average ESU per farm

Source: Own calculations based on FADN data

3.4. Cell-based regression model and results

Following Dunne et al. (1989), Davis (1998) and Davis and Haltiwanger (1999) we have grouped observations on individual farms based on the year of observation in the FADN sample, country, and categories of farm size and sector.[9] The average annual job creation and job destruction rate is calculated – based on expressions (4) and (5) – for each cell using the observations on all the farms in the cell. Furthermore, for each cell

[9] Years include the FSS periods 1990-1993; 1993-1995; 1995-1997; 1997-2000; 2000-2003; 2003-2005. Countries include the 12 EU member states that span the whole period 1990-2005: Belgium; Denmark; Germany; Greece; Spain; France; Ireland; Italy; Luxemburg; the Netherlands; Portugal; UK. Size categories include size1 (< 6 ESU); size2 (6-12 ESU); size3 (12-40 ESU); size4 (>40 ESU). Sectors include Cereals (cereals, oilseed and protein crops); Field crops; Permanent crops (horticulture; vineyards; fruit and citrus fruit; olives); Milk; Grazing livestock (cattle rearing and fattening; cattle dairying, rearing and fattening combined); Sheep and goats; Pigs and poultry; Mixed farms (various crops and livestock combined).

we calculated summary statistics that typify the characteristics of the farms per cell at the start of the observation period. These cell characteristics include measures of output (average output per ha); input use (average labor use per ha); degree of subsidization (average subsidies per ha); assets (average assets per ha); family labor use (average ratio of family to total labor); indebtedness (average liabilities over assets ratio). Next, a regression model is calculated to examine across-cell patterns of job creation and destruction. Furthermore, the cell characteristics will be used as structural variables in the regression model to identify the role of farm characteristics in explaining job creation and destruction rates. The model is specified as follows:

$$Y_{ijkl} = \sum_{i}^{6} \alpha 1_i year + \sum_{j}^{12} \alpha 2_j country + \sum_{k}^{4} \alpha 3_k size + \sum_{l}^{8} \alpha 4_l sector + \sum_{m}^{6} \beta_m X_{ijkl} \quad + \varepsilon_{ijkl}$$

where year, country, size and sector are dummy variables that represent each of the time periods, EU member states, size categories and sectors respectively, while x_{ijkl} represents a vector that includes the structural variables related to average farm characteristics in each cell.

This methodology groups farms into data cells and uses all observations within each cell to consistently estimate parameters of the distributions of realized net job creation and destruction rates for all farms within the cell. A regression model is then used to summarize the across-cell variation in these estimates. The basic assumption is that all farms within a cell are homogeneous up to a random disturbance with a zero mean and constant, cell-specific variance. The grouped data technique that we utilize has a number of advantages. Distributional assumptions are avoided. Therefore, a great degree of nonlinearity is allowed in the mean and variance of the observed values. As a result, we can avoid the difficulty of separating sample selection, heteroskedasticity, and the nonlinear effects of the explanatory variables on the conditional mean of the latent variable distribution (Dunne et al., 1989).

Table 6 reports the results of the regression model. Some interesting conclusions can be drawn with respect to the determinants of job creation and destruction in EU agriculture. First, the structural – farm-related – variables do not contribute to the explanation of job creation rates. Job creation seems to be much higher in Spain than in the other EU member states. Job creation also increased in the middle of the 1990s (i.e. after the McSharry reforms) and again after 2003. Finally, job creation is more pronounced in mixed farms than in specialized crop and dairy farms.

On the other hand, structural variables do play a role in explaining job destruction rates in agriculture. More input intensive farms display higher job destruction rates, while more indebted farms have lower rates of job destruction. Farm size also plays a role, with smaller farms having higher rates of job destruction than larger farms. This is in line with general findings in the literature. Job destruction rates in EU agriculture are higher in recent years than in the beginning of the 1990s. There are distinct differences between EU member states. Finally, there is little econometric support for the link between job destruction and capital intensity, to the extent that different agricultural sub-sectors do not display significant differences in job destruction.

Table 6. Cell-regression results

	Job Creation Rate			Job Destruction Rate		
	Coefficient	Std. error		Coefficient	Std. error	
Output/ha	0.000	0.000		0.000	0.000	
Input/ha	0.003	0.005		-0.014	0.006	*
Subs/ha	0.000	0.000		0.000	0.000	
Asset/ha	0.000	0.000		0.000	0.000	
FamL/totL	0.032	0.025		0.036	0.031	
Liab./asset	0.006	0.021		0.053	0.026	*
1993	0.055	0.008	*	-0.046	0.010	*
1995	0.042	0.008	*	-0.026	0.010	*
1997	0.006	0.008		0.000	0.010	
2000	-0.006	0.008		-0.023	0.010	*
2003	0.053	0.008	*	-0.040	0.010	*
Belgium	-0.138	0.016	*	0.012	0.019	
Denmark	-0.132	0.016	*	-0.039	0.019	*
Germany	-0.086	0.012	*	-0.008	0.015	
Greece	-0.059	0.010	*	0.041	0.013	*
France	-0.108	0.013	*	-0.020	0.016	
Ireland	-0.090	0.011	*	0.061	0.013	*
Italy	-0.033	0.010	*	-0.028	0.012	*
Luxemburg	-0.117	0.014	*	-0.020	0.017	
Netherlands	-0.101	0.015	*	-0.037	0.018	*
Portugal	-0.027	0.010	*	0.016	0.013	
United Kingdom	-0.091	0.011	*	-0.001	0.014	
< 6 ESU	-0.012	0.008		-0.121	0.010	*
6-12 ESU	0.013	0.007		-0.036	0.008	*
> 40 ESU	-0.002	0.007		0.024	0.009	*
Cereals	-0.021	0.009	*	0.009	0.012	
Field crops	-0.021	0.009	*	0.004	0.012	
Permanent crops	-0.003	0.011		0.023	0.013	
Milk	-0.038	0.009	*	0.019	0.011	
Grazing livestock	-0.014	0.009		0.029	0.011	*
Sheep & goats	-0.024	0.009	*	0.011	0.012	
Pigs & poultry	0.016	0.010		-0.015	0.013	
_cons	0.138	0.025		-0.155	0.031	

* significant at 0.05
Omitted category: 1990; Spain; 12-40 ESU; mixed farms

4. CONCLUSIONS

This paper provides the first attempt to apply the job creation and job destruction approach to agricultural labour adjustments in the EU. This approach allows disaggregating the overall employment patterns and net job flows into detailed intra-sectoral labour adjustment dynamics. Despite that there are numerous studies that apply the job creation and job destruction methodology to the manufacturing and services sector, a study analysing job creation and job destruction in the EU agriculture is still lacking. This is surprising, given the significant farm labour adjustments that have been observed in EU agriculture in recent decades. As a result, the identification of the types of farms that create jobs and that lay off labour, the role of farm exit and farm specialisation, differences between family and hired labour adjustments, and their dynamics are not yet fully explored and understood.

Employing a unique EU-wide firm-level panel data set, we find a number of interesting results. First, job creation and destruction in agriculture seems to be similar to the average job creation and destruction rates found in studies on the manufacturing sector and the overall economy implying that structural characteristics of agriculture do not create a different behaviour pattern of farm labour allocation. Particularly, our findings indicate that the higher occurrence of idiosyncratic shocks in agriculture; the importance of seasonal labour; and the relatively small size of agricultural enterprises may increase the labour flow rates but capital intensity and aging of farmers may offset these effects.

Both the family and the hired labour flow rates which we calculate are similar to the aggregate labour flow rates. Our results also suggest that the JCR appears to be consistently higher for hired labour than for family labour, indicating the ongoing substitution of family labour for hired labour.

Furthermore, job creation and destruction rates differ strongly between member states. This observation can be linked to structural differences of the farm sector in different member states. More specifically, we find strong support for the hypothesis that member states that have a smaller average farm size, have much higher job creation and destruction rates. While this is in line with findings in other studies, there are additional explanations specific to the situation in agriculture. These explanations include: stronger vulnerability of small farms to idiosyncratic shocks; a continuous trend towards larger farm sizes over time; and more flexible labour contracts in small farms vis-à-vis large farms.

These findings show that the disaggregation of agricultural labour adjustment patterns, using the job creation and destruction methodology, can be a strong tool in the exploration and quantification of the dynamics in the EU agricultural labour market.

The insights obtained by disaggregating the gross employment patterns and net job flows into detailed intra-sectoral labour adjustment dynamics are important for agricultural policies. Based on these results, agricultural policies can be better targeted and hence designed more efficiently, as different policy instruments are required for addressing job creation versus job destruction, the employment of family labour versus hired labour, farm exit/entry versus farm scale of operation, etc.

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