DELIVERABLE 7.4
"A comparative analysis of rural labour markets"

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Dissemination level (see DoW p. 27-30)		
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Executive summary

Deliverable 7.4 provides an econometrical analysis of the driving forces of labour adjustment out of EU agriculture based on the conceptual framework that was developed in Deliverable 7.1.

The decision to leave the agricultural sector depends in the first place on income differences. Higher income in other sectors will stimulate individuals to leave the agricultural sector for other sectors and vice versa. Therefore one would expect that the large Common Agriculture Policy (CAP) payments, that were introduced - among other reasons - to ensuring a fair living standard for farmers, would have a positive effect on agricultural employment. However, subsidies induce also second order effects which have an adverse effect on agricultural employment. The literature on the impact of subsidies on agricultural employment mentions three important effects. First, subsidies are – at least - partially capitalized in agricultural input prices (e.g. prices of fertilizer and land). If subsidies are unequally divided over the farm population, farmers that receive relatively less subsidies might even experience a relative decline in agricultural income and leave the agricultural sector for other employment alternatives. Second, subsidies make it easier for some farms to take over other farms and finally subsidies also accelerate the capital/ labour substitution.

In the EU15, agricultural employment has rapidly declined in the past two decades, indicating that the CAP is not efficient in increasing farmers' income in such a way that it is profitable to stay in the agricultural sector. This indicates that the second order effects that are induced by the CAP payments could have a more important effect on agricultural employment than the direct effect on income.

Second, also non-income factors influence the decision to leave agriculture. Individual characteristics such as age, education and marital status have been found to be significantly related to the extent of off-farm work. Younger and better educated individuals are more mobile and flexible to move to other employment alternatives. Younger individuals can benefit over a longer period from the benefits that are associated with moving to another sector. Better educated individuals have more non agricultural skills and generally they have better access to information trough non agricultural social networks, which makes it easier for them to find alternative employment.

Third, there exists some empirical evidence that supports earlier findings on positive non-pecuniary benefits from farming. Earlier studies find that due to independence, pride associated with farming and tradition, self employed farmers are more likely to stay in agriculture than employees in an agricultural company.

Finally, individuals take in account the costs of switching jobs and the probability of finding another job. This will depend on the personal characteristics, such as age and education level, of the individual, but it will also depend on some regional variables, such as the degree of urbanisation and economic development of the region.

By combining individual and regional data of the European Labour Force Survey (EULFS), the EU New Cronos Database and the Farm Accountancy Data Network (FADN) this deliverable analyzes the effects of these different factors that affected the decision to leave the agricultural sector in the EU25 in 2005-2006[ii]. In a first approach, we analyze the determinants affecting the exit decision of individuals employed in the agricultural sector by using a simple logit model. However, little attention has been given to the driving forces behind the intersectoral labour flows. Therefore we also analyze the determinants of intersectoral labour flows in a multinominal logit model.

The results of this analysis show that in regions where the average subsidy per worker is higher farmers are more likely to leave the agricultural sector. On the first sight, these results are counterintuitive as subsidies are generally expected to increase farmers' income which stimulates them to stay in agriculture. However, when taking in account the possible second order effects of subsidies these results become much more logic. I present three possible explanation, but the nature of the data (there are only regional data available on subsidies) do not allow us to draw conclusive results. First, subsidies are capitalized in farm input prices, such as land and fertilizer prices. If subsidies are unequally divided over the farm population, the capitalization of subsidies in input prices can make that farmers who receive less subsidies can be confronted with a decline in their net income compared to a situation were there are no subsidies. Second, subsidies make it easier for farmers that stay in agriculture to take over the farms of the ones that leave the sector. Finally, subsidies are also found to accelerate labour/ capital substitution. The effects of subsidies on labour adjustments is very relevant for policy makers and recently it became even more important because as with the accession of ten New Member States to the EU in which agriculture is still an important sector (in terms of GDP and employment) the criticism on the CAP budget and its effectiveness even increased.

Second, human capital variables, such as age and education are found to have an important impact on the likelihood of flowing to a certain sector. Younger persons employed in agriculture are more likely to leave the sector as they can benefit from higher income or non income benefits in other sectors over a longer time period. Also better educated individuals are more likely to switch employment in the agricultural sector for other employment alternatives. The elderly and less educated individuals stay in the agricultural sector, which leads to an impoverishment in terms of human capital in the agricultural sector compared to other economic sectors. Therefore the promotion of education and life long learning will be crucial for policy makers to increase the flexibility of individuals to leave the agricultural sector for other more profitable employment alternatives.

[ii] The author is well aware that the short studied period and the combination of individual data and regional data are important limitations of the study presented here. However, given the limited amount of data on the agricultural sector available, this approach appeared to us the most appropriate to analyse the factors that have an impact on structural change in the agricultural sector.

Third, besides subsidies and human capital variables, employment alternatives are found to have a large impact on the decision to leave the agricultural sector, which indicates the importance of creating alternative employment in remote areas in order to facilitate structural change. In addition, to alternative employment options, it is important that the government also establish a well-functioning social security program. In some members states older households now need to continue to work their land to complement their pensions with extra income from agriculture or need to work longer than households employed in other sectors because of low pensions. In combination with high food prices, low social payments make that there are few incentives for these households to rent out their land to more productive farms, which slow down structural change.

Finally, the most important factor affecting the decision to leave the agricultural sector were the non pecuniary benefits related to working in the agricultural as a self employed or as a family worker. Being self employed reduces the probability of leaving the agricultural sector by 125%, whereas being a family worker reduces this probability by 65%. An individual that is self employed in agriculture is 90% less likely to leave the agricultural sector for industry or services and 93% less likely to leave the work force permanently. Similar, although smaller, results can be found in the case of a family worker. These findings suggests that attributes associated with individual farming—such as autonomy over farm management decisions, independence, sense of responsibility, and pride associated with business ownership — are valuable to farmers and decrease the probability that they leave the agricultural sector.

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CAP	Common Agricultural Policy
EU	European Union
EULFS	European Union Labour Force Survey
FADN	Farm Accountancy Data Network
NMS	New Member States
OECD	Organisation of Economic Co-operation and Development
GDP	Gross Domestic Product

1   INTRODUCTION

In 2008, the European Union (EU) spent more than 50 billion € to the Common Agricultural Policy (CAP). The CAP was established in 1958, among others, to ensure a fair living standard for farmers by protecting EU farmers' income and employment from foreign competition. However despite the large expenses on agricultural subsidies to support the agricultural income, agricultural employment is steadily decreasing in all West European countries during the past 50 years. Between 1986 and 2007 agricultural employment in the EU15 declined by more than 40%. The accession of the new member states (NMS) in 2004 and 2007 almost doubled the number of persons employed in agriculture and the subsequent pressure on the expenses for agricultural policy measures raises important questions on the sustainability and effectiveness of the CAP[1].

With the increasing CAP budget and the ongoing trade negotiations in which the agricultural negotiations play a crucial role, economists and policy makers are interested in the effect of subsidies on agricultural employment and structural change. In addition to the effect of subsidies as a whole, researchers are also interested in the effect of different types of subsidies (coupled vs. decoupled[2]). On the first sight, subsidies increase farmers' income, which motivates them to stay in agriculture. However when considering also the second order effects of subsidies, the effect of subsidies on farmers' net income and labour allocation becomes less straightforward, which makes that the empirical evidence on the impact of subsidies on labour adjustments is mixed (Barley 1990; Goetz and Debertin 1996, 2001; Glauben et al. 2006; Breustedt and Glauben 2007; Benjamin 1994; Mishra and Goodwin 1997; Dewbre and Mishra 2002; El-Osta et al. 2004; Ahearn et al. 2006; Hennessey and Rehman 2008).

In this paper, we examine the driving forces of labour adjustment out of EU agriculture in the period 2005-2006. by combining individual and regional data of the European Labour Force Survey (EULFS), the EU New Cronos Database and the Farm Accountancy Data Network (FADN)[3]. In a first approach, we analyze the determinants affecting the exit decision of individuals employed in the agricultural sector. There are several studies on the determinants of labour adjustments in agriculture in the EU15 (Weiss 1999; Pietola et al. 2003; Glauben et al. 2006; Breustedt and Glauben 2007; Gullstrand and Tezic 2008) and the NMS (OECD 2001; Swinnen et al. 2005). However, little attention has been given to the driving forces behind the intersectoral labour flows. Bojnec and Dries (2005) and Ingham and Ingham (2005) studied intersectoral labour flows in Slovenia and Poland, respectively, in the transition period. Therefore we also analyze the determinants of intersectoral

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[1] Recently, also in other countries such as the US, farm payments have received more criticism under pressure of increased public attention (Williams-Derry and Cook 2000; Key and Roberts 2006).

[2] In 2003 the most recent fundamental reform of the CAP, the "Mid Term Review", took place and EU farm ministers decided to (partly) decouple subsidies from the production. Eligibility for subsidies became subject to requirements to food safety, animal welfare standards and the requirement to keep the land in good agricultural and environmental conditions. The extent to which CAP direct payments are really decoupled from the production has been a topic of debate (Adams et al. 2001; Roe et al. 2003; Burfisher and Hopkins 2003; Goodwin and Mishra 2005, Ciaian and Swinnen 2006, 2009).

[3] The author is well aware that due to data limitations the studied period is very short and that is an important limitation of the study.

labour flows. The nature of the data allows us to control for both individual characteristics and regional effects, such as the average subsidy per agricultural worker.

The paper is structured as follows. First, we give an overview of the literature on the determinants of intersectoral labour adjustments. In section 3, we present some descriptive statistics based on our dataset. In section 4, we discuss a simple exit model on which we base our econometrical specification (section 5). Also in section 5, we discuss our regression results and finally section 6 concludes.

2   LITERATURE ON DETERMINANTS OF INTERSECTORAL LABOUR FLOWS

Typically individuals base their labour allocation decisions not only on income differences but also on non income benefits, such as personal and employment characteristics (Todaro 1969; Todaro and Harris 1970; Sadoulet and de Janvry 1995). This allows us to determine several factors that will influence the decision to leave agriculture.

First, higher income in other sectors will stimulate individuals to leave the agricultural sector for other sectors. In this context, one could expect that coupled subsidies, which increase agricultural output prices and consequently agricultural gross income, stimulate farmers to stay in agriculture. Decoupled subsidies are expected to have a different impact on the labour allocation as decoupled payments reduce the return to farm labour and increase the unearned income of farmers. Therefore it is expected that farmers receiving decoupled payments to allocate more time to off-farm work or leisure[4] and less to on-farm work compared to farmers receiving the same amount of coupled payments (Hennessey and Rehman 2008).

However, when also taking in account second order effects of subsidies, empirical evidence shows that in practice the results are less straightforward as the theory predicts. Barkley (1990) and Glauben et al. (2006) find no significant coefficient on the effect of coupled government payments on agricultural employment. Barkley (1990) indicates the possibility of two opposite effects of subsidies on structural change. On the one hand, coupled subsidies are expected to slow down the rate of migration out of agriculture trough their effect on income. However, set aside obligation accompanying enrolment in coupled support schemes reduces the need for inputs complementary to land, resulting in an increase in migration of labour out of agriculture. Barkley (1990) arguments that these two effects perhaps levelled out each other. Other studies find that subsidies have a significant effect on agricultural employment, but there is still uncertainty on whether subsidies reduce agricultural labour outflow or increase it. Based on county-level data, Goetz and Debertin (2001) find that higher farm payments reduce the odds that there is a loss of agricultural employment in a county, but when they consider the subset of net losing counties they find that higher payments accelerate the rate at which farmers exit. These findings could indicate that subsidies make it easier for the farms that stay in the agricultural sector to buy the farms of the one that leave the agricultural sector. In a previous study (Goetz and Debertin 1996) they find similar results that indicate that in the 1980s government payments increased the population migration in rural counties as subsidies are found to increase the substitution of labour by capital. Key and Roberts (2007) mention the role of second order effects on the exit decision of farmers. Subsidies are expected to be capitalized in input prices, such as land prices and fertilizer prices. This can increase the outflow of farmers, especially when the access to subsidies is unequally divided over the rural population (Key and Roberts 2007). Breustedt and Glauben

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[4] Decoupling shifts the relative return of labour in agriculture such that the probability of participating in off farm employment increases. However decoupled subsidies also increase the wealth of a farm household which reduces the need for off-farm income. Hence, we can expect two potential effects of decoupling; on the one hand there is the substitution effect, which makes that individuals increase their off farm labour participation and on the other hand, there is the wealth effect, which decreases off farm labour participation in favour of more leisure time.

(2007) on the other hand find statistically significant evidence that an increase in government payments reduces the decline in the number of farms. However the economic impact is rather small.

Second, also non-income factors influence the decision to leave agriculture. Individual characteristics such as age, education and maritial status have been found to be significantly related to the extent of off-farm work (see, for example, Sumner 1982; Huffman 1980; Rizov and Mathijs 2003; Rizov and Swinnen 2005; Bojnec and Dries 2005). This strand of the literature predicts that younger and better educated individuals are more mobile and flexible to move to other employment alternatives. Younger individuals can benefit over a longer period from the benefits that are associated with moving to another sector. Better educated individuals have more non agricultural skills and generally they have better access to information trough non agricultural social networks, which makes it easier for them to find alternative employment.

Third, there exits some empirical support for positive non-pecuniary benefits from farming (Gillespie et al. 2004; Hoppe and Banker 2006; Key and Roberts 2007). It is found that due to independence, pride associated with farming and tradition, self employed farmers prefer to stay in agriculture whereas employees in an agricultural company will be more likely to stop working in the agricultural sector. Also in other sectors, studies mention the greater satisfaction associated with self employment (Vandenheuvel and Wooden 1997).

Finally, individuals take in account the costs of switching jobs and the probability of finding another job. This will depend on the personal characteristics, such as age and education level, of the individual, but it will also depend on some regional variables, such as the degree of urbanisation and economic development of the region.

3   DESCRIPTIVE STATISTICS

3.1. Impact of subsidies on exits from the agricultural sector

Despite high subsidies, the importance of agricultural employment in total employment continued to gradually decline during the past two decades in the EU15 (Figure 1). This indicates that subsidies have not been effective in increasing the agricultural income of farmers. In fact, when we consider the change in agricultural employment and the change in agricultural support in different OECD regions, we find a negative correlation between the change in agricultural support and a change in agricultural employment in the period 1987-2007 (Figure 2). This is fully inconsistent with the notion that agricultural support has a significant positive impact on agricultural employment in the long run and also in the short run we don't find positive impact of subsidies on the exit rate from agriculture in different regions in the EU (Figure 3).
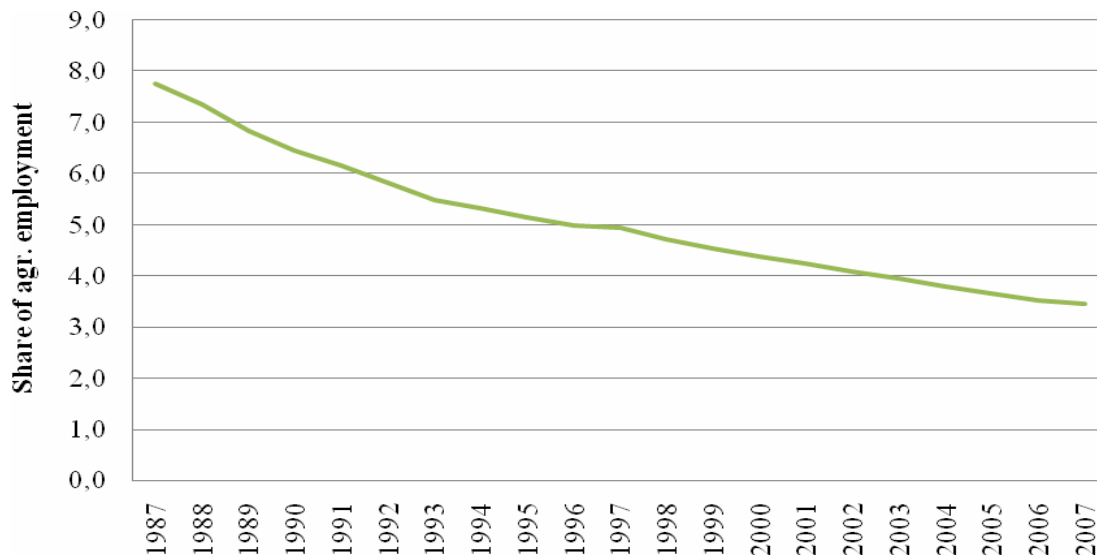
Figure 1 Change in agricultural employment in the EU15
Source: ILO, Eurostat, national statistics
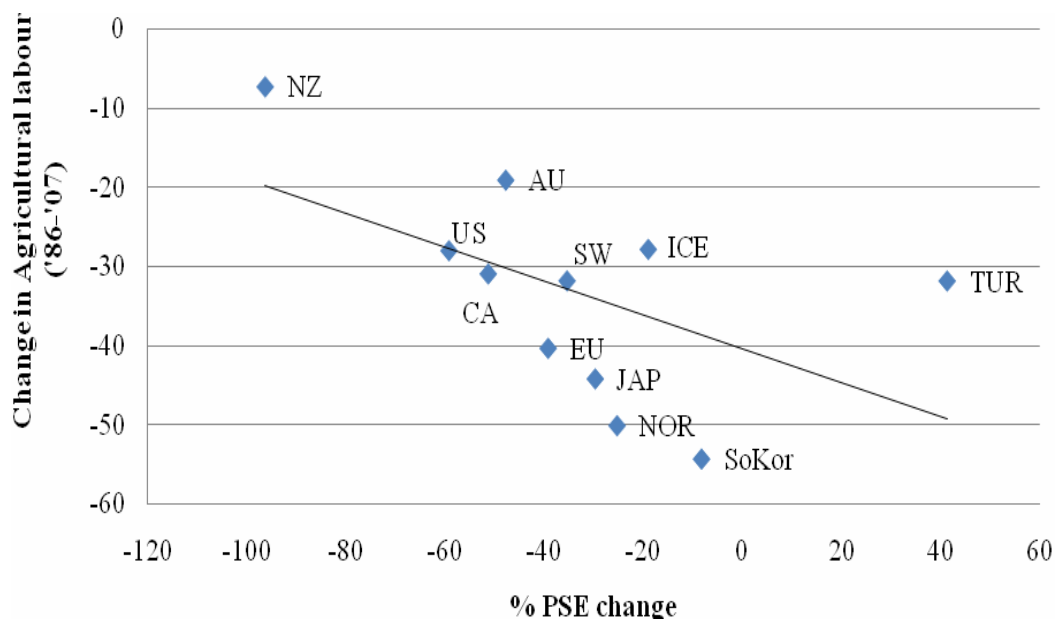
Figure 2 Change in agricultural labour and Change in % PSE ('87-'07)
Source: OECD, ILO, Eurostat and national statistics
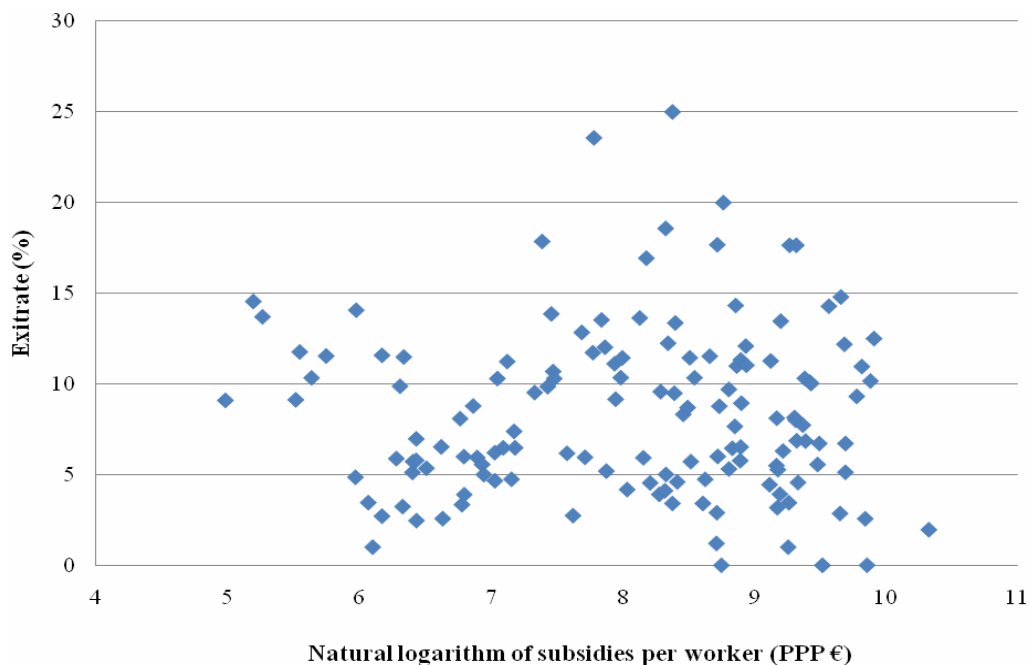
Figure 3 Relation between exit rate and agricultural subsidies in 2005-2006
Source: Own calculations based on EULFS and FADN

3.2. Impact of non income factors on exits from the agricultural sector

Non income factors, such as age, education, gender and marital status may affect the decision of the farmer to leave the agricultural sector. Figure 4 allows us to compare the age distribution of the individuals that stayed in agriculture, individuals that left agriculture for industry or services, individuals that left agriculture for unemployment and individuals that left agriculture and are currently out the labour force. Individuals that went to industry or services and unemployment are younger than the ones that stay in agriculture, whereas individuals that went out of the labour force are much older as in most cases they retired. In general, the European agricultural labour force is characterized by a high proportion of workers in the higher age groups: in 2006 45% of the work force was older than 50 years old, whereas only 10% was younger than 30 years old. However, these figures differ between countries. For example, in southern European countries, such as Greece, Italy and Portugal, the average age of the individuals employed in agriculture is higher than in the other member states. On the other hand, in the some of the NMS, such as Hungary, Lithuania and Poland, the average age is lower than in the other member states (Table 1).
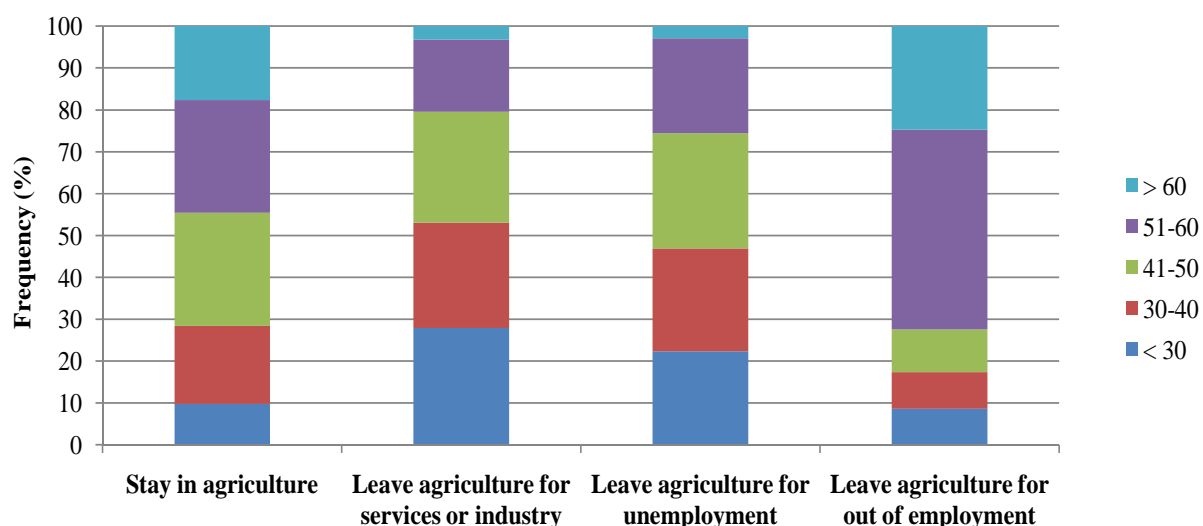
Figure 4 Age distrubution in the different groups in 2006
Source: Own calculations based on EULFS

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Table 1 Descriptive statistics on country level

Country	Age Mean (Std. Dev.)	Percentage individuals with only primary education	Percentage employees
Austria	44.54 (10.8685)	31.77	18.90
Belgium	44.86 (12.2876)	43.68	23.33
Czech Republic	46.00 (10.9559)	12.19	81.89
Denmark	44.64 (14.4959)	30.12	52.35
Estonia	45.94 (11.8143)	20.41	69.45
Finland	47.15 (12.0549)	29.03	33.25
France	44.44 (11.3362)	35.02	32.55
Greece	49.01 (13.4580)	83.88	6.51
Hungary	44.11 (10.8125)	31.70	65.62
Italy	45.64 (12.3951)	72.90	43.97
Latvia	45.75 (12.8546)	32.67	48.02
Lithuania	43.94 (11.5357)	23.80	29.61
The Netherlands	44.33 (12.1036)	37.88	44.36
Poland	44.27 (12.5207)	30.74	9.22
Portugal	57.24 (15.3334)	96.92	19.00
Slovakia	44.75 (9.9960)	15.31	85.93
Spain	45.22 (12.9626)	78.10	43.97
United Kingdom	46.39 (13.9372)	36.20	46.78

Source: Own Calculations based on EULFS

Figure 5 shows the distribution of the highest level of education for the ones that stayed in agriculture and the different groups that left the agricultural sector. In general, the ones that leave agriculture for industry or services and – although less – the ones that left agriculture for unemployment are better educated. However, this could relate to the differences in age structure. In general, the level of education attained by those working in the agricultural sector is very unfavourable. Only 43% of the agricultural workers have more than primary education. However, there are wide differences in the minimal education level across the different member states. In the Southern European countries, the percentage of individuals employed in agriculture which received only primary education, is very high (Table 1). For example, more than 97% of the Portuguese agricultural work force has only received primary education and also in Spain, Greece and Italy the percentage of the agricultural work force with only primary education reaches more than 70%. In the NMS, the situation is totally different. In all NMS, except Slovenia, less than 35% of the individuals working in agricultural had only received primary education. In Czech Republic even less than 12% received only primary education.
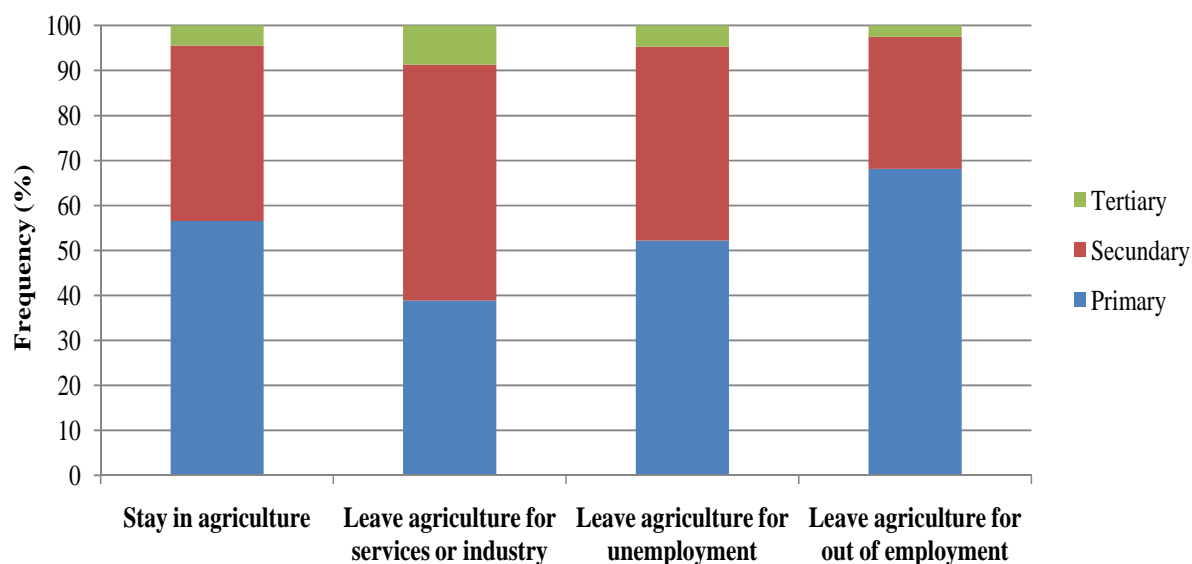
Figure 5 Education distribution in the different groups in 2006
Source: Own calculations based on EULFS

3.3. Impact of non-pecuniary benefits from farming on exits from the agricultural sector

Agricultural workers do not only take decisions based on income factors or individual characteristics, they also take in account some non pecuniary benefits from being employed in the agricultural sector and more specifically from being self employed or working in a family farm. Figure 6 gives the distribution of the employment status of the agricultural workers in 2005. The majority of the ones that left agriculture for industry or services and unemployment in 2006 were employees. In general, the majority of the individuals employed in the agricultural sector are self employed, however there are important differences between countries (Table 1). In the some of the NMS, such as Czech Republic, Hungary or Slovakia, agriculture is mainly concentrated in large corporate farms and consequently the share of employees is much higher in these countries. In Czech Republic 81% of the individuals working in agriculture was an employee and in Slovakia, this number increased even to 85%.
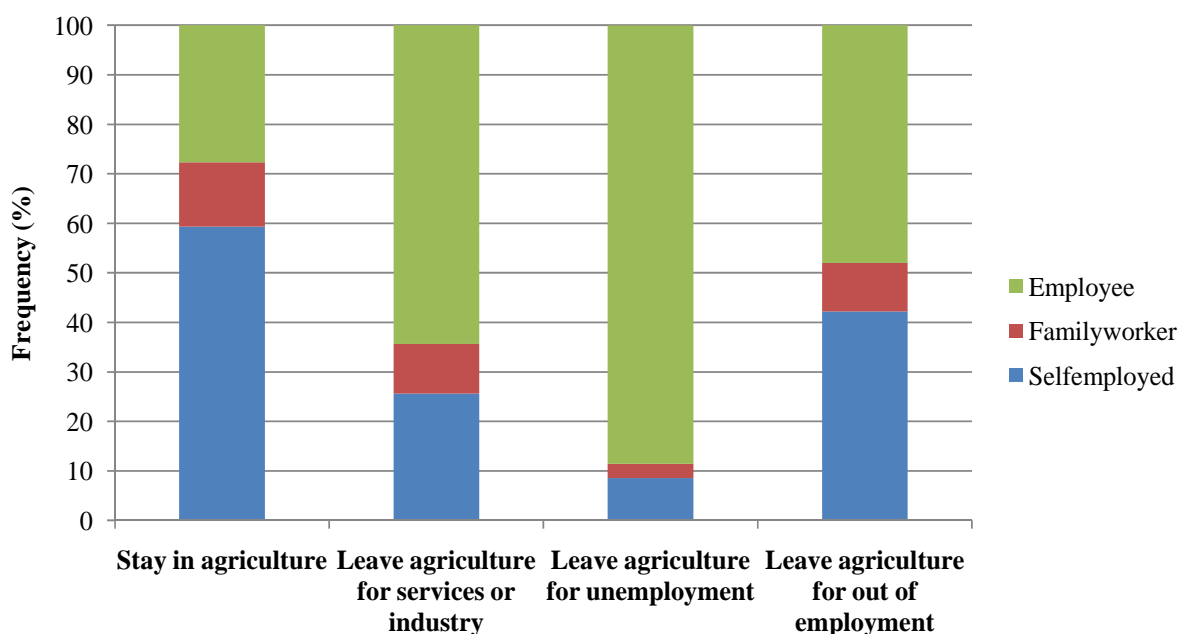
Figure 6: Distribution of the employment status in the different groups in 2005

Source: Own Calculations

4 THEORY: A SIMPLE EXIT MODEL

Traditionally, intersectoral labour flows in the agricultural sector are seen as the flow from agricultural to the urban sector. The decision to leave the agricultural sector can be analysed in a framework closely related to the simple exit model of Todaro (1969) and Harris and Todaro (1970). This model which was originally designed for analysing the migration of labour from one region to another based on income differences, can also be used to analyse the migration from one sector to another in the economy.

In a first approach, we assume an economy with two sector: the agricultural and the non agricultural sector. However the non agricultural sector is heterogeneous as it includes individuals that are employed in a different economic sector, individuals that became unemployed and individuals that retired. Therefore, we also consider a second approach to labour adjustments in the agricultural sector, which we discuss in detail in the remaining part of this section.

In the second approach, we assume that there are four sectors in the economy: the agricultural sector, industry and services, unemployment and out of employment (retired or disabled). The agricultural sector is represented by subscript A and the three other sectors are represented by subscript i with i=1,....3.

According to Todaro (1969) and Harris and Todaro (1970), the discounted utility of an individual working in agriculture (non agriculture) can be defined in **Equation 1**:

$$U_A = \int U\big(Y_{A,t}, h_{A,t}, Z_{A,t}\big)\ e^{-rt}dt$$

$$U_i = \int U\big(Y_{i,t}, h_{i,t}, Z_{i,t}\big)\ e^{-rt}dt\ \ with\ i = 1,....3$$

Equation 1: Utility of an individual working in agricultural (non agricultural) sector

where $Y_{A,t}$ ($Y_{i,t}$) is the income of employment in the agricultural sector (non agricultural sector) in the time period t, $h_{A,t}$ ($h_{i,t}$) is the number of hours worked in the agricultural (non agricultural sector) in the time period t, $Z_{A,t}$ ($Z_{i,t}$) is the vector of exogenous utility shifters, such as personal characteristics and employment characteristics, in time period t and r denotes the discount rate.

The agricultural (non agricultural) income in time period t can be represented by **Equation 2**:

$$Y_{A,t} = \Phi_{A,t} W_{A,t} h_{A,t}$$

$$Y_{i,t} = \Phi_{i,t} W_{i,t} h_{i,t}$$

Equation 2: Agricultural (non agricultural) income

Income depends on earnings in agricultural (non agricultural) sector, which depends on the wage rate, $W_{A,t}$ ($W_{i,t}$) and the hours worked, $h_{A,t}$ ($h_{i,t}$), in the agricultural (non agricultural) sector, accounting for the probability, $\Phi_{A,t}$ ($\Phi_{i,t}$), of finding employment in the agricultural (non agricultural) sector in time period t. This probability is related to economic conditions, such as local employment conditions, and non economic conditions, such as human capital variables.

An individual will make a decision that is partly based on the utility differential, represented by **Equation 3**:

$$\Delta U_{A,i} = U_i - U_A$$

Equation 3: Utility differential between working in the non agricultural sector and the agricultural sector

However he will also take in account the cost associated with switching from the agricultural sector to the non agricultural sector. The cost of switching from agriculture to non agriculture is presented by Equation 4:

$$CT_{A,i} = \int CT_{A,i,t} e^{-rt} dt$$

Equation 4: Cost of switching from the agricultural sector to non agriculture

The inter-sectoral relocation costs, $CT_{A,i}$ will include search costs of finding another employment and the costs of the loss of the agricultural skills in another sector. When a worker leaves the agricultural sector, his farming skills are of little use in other sectors. Hence, when he switches between sectors, he will have to accumulate new skills. In order to capture the skill effect, we use personal characteristics of the worker, such as age and education (Rizov and Swinnen 2004, Bojnec and Dries 2005; Goetz and Debertin 2001).

A worker will base his decision to leave the agricultural sector by taking in account the utility differential, $\Delta U_{A,i}$, and the transaction costs, $CT_{A,i}$. His decision will be based on, $V_{A,i}$:

$$V_{A,i} = \max_{i=1,\dots3}\{\Delta U_{A,i} - CT_{A,i}\}$$

Equation 5: Decision to leave the agricultural sector or to stay in agriculture

If $V_{A,i} > 0$, the worker will decide to leave the agricultural sector for the non agricultural sector i. If $V_{A,i} < 0$, the worker will stay in the agricultural sector.

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5 ECONOMETRICAL SPECIFICATION AND EMPIRICAL RESULTS

5.1. Model specification

Following the theoretical specification of the model, we estimate 2 model specifications. First, we estimate a logit model that estimates the probability of leaving the agricultural sector. However, it is possible that the effect of some variables depend on the destination of the individual leaving the sector, e.g. the effect of age can expected to be different between individuals that leave agriculture for the industry/ services sector and individuals that leave employment. Therefore, in order to increase the identification, we estimate a multinominal logit model that estimates the probability of labour flowing from agriculture into the industrial or services sector, into unemployment and out of labour force.

We assume that Y_{ijk} is the discrete choice of an individual i living in a region j from K+1 alternatives (remain in the same occupation (0) or move to one of the K alternatives) and U_{ijk} is the utility of an individual i living in region j of the choice of alternative K. We will consider U_{ijk} as an independent random variable with a systematic component u_{ijk} and a random component e_{ijk}, such that

$$U_{ijk} = u_{ijk} + e_{ijk}$$

Equation 6: Utility of the alternative k for an individual i, living in a region j

In the multinomial logit model, the expected utilities u_{ijk} are modelled in terms of the characteristics of the individuals (x_{ij})[5], so that

$$u_{ijk} = \beta_k^{'} x_{ij}$$

Equation 7: Expected utilities in the multinomial logit model

The multinomial logit model allows us to estimate a β_k corresponding to each outcome category:

$$P\left(Y_{ij} = k\right) = \frac{e^{\beta_k^{'} x_{ij}}}{\sum_{m=0}^{K} e^{\beta_m^{'} x_{ij}}}$$

Equation 8: Multinomial logit model

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[5] Note that x_{ij} can contain a variety of factors. Obviously it can contain variables that are determined at the individual level variables, but also variables that are determined at a regional level.

The estimated equations provide a set of probabilities for the K+1 choices. The model, however, is unidentified in the sense that there is more than one solution for the β_k, that leads to the same probabilities for Y = k. A convenient normalisation that solves the problem is to assume that $\beta_0 = 0$. The remaining coefficients β_k measure the change relative to the Y = 0 group. This means that we compare each outcome with the base group, which are conveniently the individuals that did not exit the agricultural sector. The probabilities are now given by:

$$P\left(Y_{ij} = k\right) = \frac{e^{\beta_k^{'} x_{ij}}}{1 + \sum\limits_{m=0}^{K} e^{\beta_m^{'} x_{ij}}} \quad for \ k = 1,...K$$

$$P\left(Y_{ij} = 0\right) = \frac{1}{1 + \sum\limits_{m=0}^{K} e^{\beta_m^{'} x_{ij}}}$$

Equation 9: Normalisation of the multinomial logit model

5.2. Description of the variables

The independent variables used in the econometrical analysis are derived from a subsample of the EULFS, whereas the dependent variables are derived from the EULFS, the EU New Cronos database and FADN.

The independent variables in the logit and multinomial logit model capture labour adjustments in the period 2005-2006. All individuals in the subsample of the EULFS that we use in the econometric analysis were working in the agricultural sector in 2005. Based on the sector in which they were working in 2006, we are able to identify whether an individual was still working in agriculture and if not, in which sector he was working in 2006. In the logit model, the dependent variable is a dummy variable, EXIT, which takes a value of 1 if the individual left the agricultural sector in 2006 and 0 otherwise. In the multinomial logit model, the dependent variable, DESTIN, is a categorical variable that takes the value of 0 if the individual stayed working in agriculture in 2006, a value of 1 if the individual left the agricultural sector for the industrial or service sector in 2006, a value of 2 if the individual left agriculture and became unemployed in 2006 and a value of 3 if the individual left the workforce permanently in 2006, because he/ she retired or became permanently disabled.

The independent variables are both individual and regional variables. Based on the EULFS, we are able to identify the NUTS2 regions[6] in which the individual was living, which allows us to use in addition to individual characteristics provided by the EULFS, also regional

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[6] NUTS2 regions have between 800.000 and 3 million inhabitants. Examples are Denmark, Estonia, the regions in France and the provinces in Belgium.

variables from the EU New Cronos database and FADN. Table 2 gives an overview of the regions and countries that are included in the sample. In total, 144 regions are included in the analysis. Table 3 gives an overview of the explanatory variables used in the econometrical analysis.

Table 2 Regions included in the analysis

Country	Number of regions
Austria	3
Belgium	10
Czech Republic	8
Denmark	1
Estonia	1
Finland	5
France	16
Greece	13
Hungary	7
Italy	21
Latvia	1
Lithuania	1
The Netherlands	1 (NUTS1)
Poland	16
Portugal	7
Slovakia	4
Spain	17
United Kingdom	12

Table 3 Descriptive statistics

	Description	Mean (Std. Dev)
Income characteristics		
SUBS	Natural logarithm of subsidies per worker in PPP € in 2005	7.60 (1.12)
COUPLED	Natural logarithm of coupled subsidies per worker in PPP € in 2005	7.17 (1.17)
DECOUPLED	Natural logarithm of decoupled subsidies per worker in PPP € in 2005	5.62 (1.75)
INCDIFF	Ratio of the average wage and the agricultural income per worker in 2005	1.81 (0.78)
Farm characteristics		
SMALL	Percentage of small farmers (<2 ha) in the region in 2005	66.01 (20.89)
OWNED	Percentage of owned land in the region in 2005	64.57 (22.08)
LIVESTOCK	Percentage of livestock farmers in the region in 2005	58.55 (21.11)
CEREALS	Percentage of cereals farmers in the region in 2005	45.08 (21.80)
Personal characteristics		
AGE	Age of the individual in years	47.34 (13.14)
HIGHEDU	Dummy that takes a value of 1 if the individual received tertiary education and 0 otherwise	0.05 (0.21)
MEDEDU	Dummy that takes a value of 1 if the individual received secondary education and 0 otherwise	0.39 (0.49)
AGEDU	Dummy that takes a value of 1 if the individual received agricultural education and 0 otherwise	0.14 (0.35)
MARRIED	Dummy that takes a value of 1 if the individual is married and 0 otherwise	0.74 (0.44)
GENDER	Dummy that takes a value of 1 if the individual is male and 0 otherwise	0.62 (0.49)
Job characteristics		
SELFEMPL	Dummy that takes a value of 1 if the individual was self employed and 0 otherwise in 2005	0.57 (0.49)
FAMILYWORK	Dummy that takes a value of 1 if the individual was a family worker and 0 otherwise in 2005	0.13 (0.33)
Regional characteristics		
DENSE	Dummy that takes a value of 1 if the individual is living in a densely populated area and 0 otherwise	0.07 (0.25)
INTERDENSE	Dummy that takes a value of 1 if the individual is living in an intermediate densely populated area and 0 otherwise	0.23 (0.42)
NMS	Dummy that takes a value of 1 if the individual in a NMS and 0 otherwise	0.27 (0.45)

A first set of explanatory variables relate to the effect of regional income variables on intersectoral labour flows. These include variables that relate to the average level of agricultural subsidies in a region and a variable that measures the average return to labour in the agricultural sector compared to other industries in the region. These variables all relate to income in 2005.

The average subsidy per worker is measured by the variables, SUBS, COUPLED and DECOUPLED. All three variables are subtracted from the FADN regional database and controlled for differences in PPP across countries. SUBS is specified as the natural logarithm of the regional average amount of subsidies (both coupled and decoupled) per agricultural worker. COUPLED is the natural logarithm of the regional average subsidies coupled to production per agricultural worker, whereas DECOUPLED is the natural logarithm of the regional average subsidies decoupled from production per agricultural worker.

To measure the returns to labour in the agricultural sector, we use a variable similar to the one used by Barkley (1990). INCDIFF is the ratio of the weighted average wage in the region and the agricultural income in the region. The average nominal wage comes from the EUROSTAT AMECO database and is weighted by the NUTS2 regional GDP from the EU New CRONOS Database. The agricultural income comes from the FADN regional database and is the net income that the agricultural worker receives from agricultural activities minus agricultural subsidies.

A second set of explanatory variables represent variables that related to regional farm characteristics. SMALL, OWNED, LIVESTOCK and CEREALS are regional variables that come from the EU New CRONOS database for the year 2005.

The effect of the farm structure on the labour adjustments is measured by the variables SMALL and OWNED. SMALL is the percentage of all farms in the region that have a farm size smaller than 2 ha, whereas OWNED is the percentage of owned land in the region. To account for differences in the production patterns, we include the variables LIVESTOCK and CEREALS, which measure respectively the percentage of livestock farms in a region and the percentage of farmers with cereal production in the region. These shares might reflect different production conditions as well as different commodity-specific market conditions.

A third set of explanatory variables are individual variables that relate to personal characteristics, such as age, education, gender and marital status. These data are subtracted from the European Labour Force Survey.

The effect of age is measured by the variable AGE, which is the age of the individual expressed in years. In other specifications of the model, the author also included the squared value of the age of the individual. However, this variable turned out to be insignificant and did not change the results for the other variables. The effect of education is measured by 3 variables, HIGHEDU, MEDEDU and AGEDU. HIGHEDU is a dummy variable that takes a value of 1 if the individual received a high education (higher than secondary education) and a value of 0 otherwise. MEDEDU is a dummy variable that takes a value of 1 if the highest education level of the individual is secondary education and a value of 0 otherwise. AGEDU is a dummy variable that takes a value of 1 if the individual received any agricultural education and a value of 0 otherwise. The effect of gender is measured by a dummy variable, GENDER, that takes a value of 1 if the individual is male and 0 otherwise. Finally, MARRIED is a dummy variable that takes a value of 1 if the individual is married and 0 otherwise.

A fourth set of explanatory variables is related to the job characteristics that could give non-pecuniary benefits of working in agriculture. These data are also subtracted from the European Labour Force Survey. SELFEMPL is a dummy that takes a value of 1 if the individual was self-employed in 2005 and a value of 0 otherwise. FAMILYWORK is a dummy that takes a value of 1 if the individual was working as family worker in 2005 and 0 otherwise.

Finally, the last set of explanatory variables are variables that relate to the region in which the individual is living. These variables are a measure for other employment alternatives in the region. The variables, DENSE and INTERDENSE, are subtracted from the European Labour Force Survey. DENSE is a dummy variable that takes a value of 1 if the individual is living in a densely populated area. This means that the individual is living in a contiguous set of local areas, each with a population density of more than 500 inhabitants/ m^2 and the total population of the set is at least 50.000 inhabitants. INTERDENSE is a dummy variable that takes a value of 1 if the individual is living in an intermediate densely populated area. This means that the individual is living in a contiguous set of local areas, not belonging to a densely populated area and in each of the local areas the population density is a at least 100 inhabitants/ m^2. The set should have a total population of at least 50.000 inhabitants or be adjacent to a densely-populated area. In addition to these variables we also add a dummy variable NMS, that takes a value of 1 if the country accessed the EU in 2004 and 0 otherwise. There are 2 reasons for adding this variable. First, the NMS that are included in our analysis are all former communist countries and although transition towards a market-orientated economy took place already more than 20 years ago, studies have shown that the impact of transition remained important also in the years after transition (Swinnen et al. 2005). Second, the accession to the EU was accompanied with significant social and economic reforms, which are expected to have significantly changed employment alternatives.

5.3. Regression results

In this section we discuss the results of the logit and the multinomial logit model, that we use to analyze labour adjustments in the agricultural sector. Table 4 show the estimation results of a logit model with EXIT as a dependent variable, in which we include total agricultural subsidies (SUBS) as an explanatory variable, while table 5 shows the estimation results of a logit model, in which we measure the impact of coupled and decoupled subsidies separately (COUPLED and DECOUPLED). However, it is possible that there could be different effects depending on the destination that the agricultural worker is going to after leaving the agricultural sector. Therefore, we also estimate a multinomial logit model with DESTIN as a dependent variable, in which we include SUBS as an explanatory variable (Table 6), and a multinomial logit model, in which we include COUPLED and DECOUPLED as explanatory variables (Table 7). In all model specifications, estimations are based on Huber corrected standard errors[7]. According to the likelihood

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[7] Observations within one region are likely to have characteristics that are more similar than observations drawn from different clusters. This difference between intra-cluster and inter-cluster correlations will most likely result in heteroscedasticity. In order to have consistent estimates for these models we need to correct the standard errors following Huber (1967) by allowing correlation within the observations in one region.

ratio (LR) chi square statistic, all four models are significant at a 1% level and estimation results for most variables are consistent across different model specifications.

Table 4 Logit regression results including the variable SUBS

| | Exit from agriculture (prob= 7.3%) | | |
	Coefficient	z-value	Marginal effect
Income characteristics			
SUBS	0.197	3.97****	0.0106
COUPLED	-	-	-
DECOUPLED	-	-	-
INCDIFF	0.056	0.94	0.0030
Farm characteristics			
SMALL	-0.001	-1.02	-0.0001
OWNED	-0.002	-1.21	-0.0001
LIVESTOCK	-0.010	-5.54***	-0.0005
CEREALS	0.005	2.76***	0.0003
Personal characteristics			
AGE	0.015	3.59***	0.0008
HIGHEDU	0.071	0.56	0.0039
MEDEDU	0.010	0.16	0.0005
AGEDU	-0.456	-6.51***	-0.0214
GENDER	-0.344	-7.08***	-0.0193
MARIED	-0.399	-8.72***	-0.0236
Job characteristics			
SELFEMPL	-1.459	-21.62***	-0.0914
FAMILYWORK	-1.281	-12.19***	-0.0473
Regional characteristics			
DENSE	0.458	5.69***	0.0296
INTERDENSE	0.110	2.22**	0.0061
NMS	0.554	3.88***	0.0337
Intercept	-3.156	-5.76***	
Number of observations	87105		
Likelihood ratio	1245.36***		

Note. The standard errors are robust clustered standard error. Levels of significance: ***1%; **5%; *10%

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Table 5 Logit regression results including the variables COUPLED and DECOUPLED

	Exit from agriculture (prob= 7.3%)		
	Coefficient	z-value	Marginal effect
Income characteristics			
SUBS	-	-	-
COUPLED	0.135	3.40***	0.0073
DECOUPLED	0.052	2.42**	0.0028
INCDIFF	0.044	0.82	0.0024
Farm characteristics			
SMALL	-0.002	-1.56	-0.0001
OWNED	-0.002	-1.16	-0.0001
LIVESTOCK	-0.011	-5.99***	-0.0016
CEREALS	0.004	2.53**	0.0002
Personal characteristics			
AGE	0.015	3.52***	0.0008
HIGHEDU	0.063	0.51	0.0035
MEDEDU	-0.003	-0.05	-0.0001
AGEDU	-0.459	-6.60***	-0.0215
GENDER	-0.342	-6.97***	-0.0192
MARIED	-0.396	-8.71***	-0.0234
Job characteristics			
SELFEMPL	-1.456	-19.28***	-0.0912
FAMILYWORK	-1.280	-11.64***	-0.0472
Regional characteristics			
DENSE	0.462	5.69***	0.0299
INTERDENSE	0.115	2.35**	0.0064
NMS	0.501	3.65***	0.0301
Intercept	-2.757	-6.01***	
Number of observations	87105		
Likelihood ratio	1257.08***		

Note. The standard errors are robust clustered standard error. Levels of significance: ***1%; **5%; *10%

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Table 6: Multinomial Logit regression results including the variable SUBS

	Industry and services (prob.= 2.7 %)			Unemployment (prob. = 1.0%)			Out of employment (prob. = 3.6%)		
	Coefficient	z value	Marginal effect	Coefficient	z value	Marginal effect	Coefficient	z value	Marginal effect
Income characteristics									
SUBS	0.147	1.67*	0.0022	0.074	0.67	0.0002	0.321	3.22***	0.0073
COUPLED	-	-	-	-	-	-	-	-	-
DECOUPLED	-	-	-	-	-	-	-	-	-
INCDIFF	0.177	1.95*	0.0028	0.014	0.14	-0.0000	-0.034	-0.40	-0.0009
Farm characteristics									
SMALL	-0.000	-0.08	-0.0000	-0.003	-0.09	-0.0000	-0.003	-1.18	-0.0001
OWNED	-0.001	-0.22	-0.0000	-0.002	-0.70	-0.0000	-0.004	-1.69*	-0.0001
LIVESTOCK	-0.010	-3.09***	-0.0002	-0.001	-0.37	-0.0000	-0.014	-4.41***	-0.0003
CEREALS	0.007	2.10**	0.0001	0.006	1.26	0.0000	0.002	0.72	0.0000
Personal characteristics									
AGE	-0.035	-8.48***	-0.0006	-0.020	-4.80***	-0.0001	0.062	11.11***	0.0014
HIGHEDU	0.986	6.82***	0.0255	-0.345	-1.38	-0.0011	-0.780	-3.77***	-0.0135
MEDEDU	0.575	6.07***	0.0100	-0.254	-2.00**	-0.0015	-0.329	-3.98***	-0.0075
AGEDU	-0.957	-8.86***	-0.0113	-0.505	-3.32***	-0.0015	0.067	0.66	0.0019
GENDER	0.074	0.89	0.0015	-0.355	-3.43***	-0.0013	-0.703	-11.02***	-0.0177
MARIED	-0.208	-3.30***	-0.0034	-0.456	-3.96***	-0.0018	-0.195	-3.11	-0.0045
Job characteristics									
SELFEMPL	-1.373	-11..33***	-0.0243	-2.952	-16.19***	-0.0172	-1.1322	-15.61***	-0.0335
FAMILYWORK	-1.063	-7.74***	-0.0118	-2.836	-9.41***	-0.0048	-1.391	-8.19***	-0.0206
Regional characteristics									
DENSE	0.707	5.03***	0.0152	0.381	2.33**	0.0015	0.247	2.06**	0.0058
INTERDENSE	0.256	3.60***	0.0044	-0.037	-0.25	-0.0001	0.024	0.32	0.0005
NMS	0.312	1.21	0.0047	0.256	0.93*	0.0008	1.013	3.51***	0.0296
Intercept	-2.864	-3.28***		-2.582	-2.15		-6.455	-7.51***	
Number of observations	87105								
Likelihood ratio	4262.02***								

Note. The standard errors are robust clustered standard error. Levels of significance: ***1%; **5%; *10%

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Table 7 Multinomial Logit regression results including the variables COUPLED and DECOUPLED

Note. The standard errors are robust clustered standard error. Levels of significance: ***1%; **5%; *10%

	Industry and services (prob.= 2.7%)			Unemployment (prob. = 1.0%)			Out of employment (prob. = 3.6%)		
	Coefficient	z value	Marginal effect	Coefficient	z value	Marginal effect	Coefficient	z value	Marginal effect
Income characteristics									
SUBS	-	-	-	-	-	-	-	-	-
COUPLED	0.039	0.50	0.0005	0.074	1.00	0.0002	0.238	2.62***	0.0054
DECOUPLED	0.118	2.92***	0.0018	0.040	0.72	0.0001	0.027	0.79	-0.0006
INCDIFF	0.200	2.46**	0.0032	0.027	0.28	-0.0001	-0.081	-0.86	-0.0019
Farm characteristics									
SMALL	-0.002	-0.83	-0.0000	-0.001	-0.20	-0.0000	-0.003	-1.13	-0.0001
OWNED	-0.001	-0.18	0.000	-0.002	-0.79	-0.0000	-0.004	-1.54	-0.0001
LIVESTOCK	-0.008	-2.64**	-0.0001	-0.001	-0.37	-0.0000	-0.017	-4.58***	-0.0004
CEREALS	0.005	1.52	0.0001	0.005	1.00	0.0000	0.003	0.90	0.0001
Personal characteristics									
AGE	-0.036	-8.63***	-0.0006	-0.020	-4.87***	-0.0001	0.062	10.87***	0.0014
HIGHEDU	0.965	6.76***	0.0245	-0.359	-1.43	-0.0011	-0.791	-3.74***	-0.0134
MEDEDU	0.539	5.89***	0.0092	-0.267	-2.13**	-0.0009	-0.321	-3.94***	-0.0073
AGEDU	-0.972	-9.03***	-0.0113	-0.503	-3.32***	-0.0015	0.065	0.64	0.0019
GENDER	0.079	0.93	0.0015	-0.353	-3.44***	-0.0012	-0.702	-10.93***	-0.0177
MARIED	-0.205	-3.25***	-0.0033	-0.451	-3.90***	-0.0017	-0.195	-3.13***	-0.0045
Job characteristics									
SELFEMPL	-1.300	-11.00***	-0.0224	-2.935	-15.86***	-0.0170	-1.380	-13.69***	-0.0355
FAMILYWORK	-0.964	-7.57***	-0.0108	-2.816	-9.04***	-0.0048	-1.465	-7.98***	-0.0213
Regional characteristics									
DENSE	0.746	5.42***	0.0161	0.399	2.53**	0.0016	0.226	1.86**	0.0052
INTERDENSE	0.249	3.56***	0.0042	-00020	-0.14	0.0001	0.038	0.52	0.0007
NMS	0.254	1.12	0.0037	0.318	1.32	0.0011	0.886	3.24***	0.0251
Intercept	-2.606	-3.54***		-2.739	-2.94***		-5.570	-6.71***	
Number of observations	87105								
Likelihood ratio	4141.26***								

Farmers that live in regions with higher subsidies per worker are more likely to exit agriculture. An increase of 1% in the average subsidy per worker increases the probability of leaving the agricultural sector by 15% (or 1 ‰). In addition, subsidies are found to increase the probability of exit of the two most important groups of individuals that leave the agricultural sector, namely the ones that leave agricultural for the industry or services and individuals that leave employment permanently. Looking at the marginal effects evaluated at the mean, we see that a 1% increase in subsidies increases the probability of flowing into the industrial or service industry by 8% (or 0.2 ‰). Similar, an increase of 1% in subsidies increases the likelihood of flowing out of employment by 20% (or 0.7‰). When considering the effect of coupled and decoupled subsidies separately, we find that both an increase in the average coupled and decoupled subsidy per worker has a significant and positive effect on the probability to leave the agricultural sector. An increase of 1% in the average coupled and decoupled subsidy, increases the probability to leave the agricultural sector by respectively 10% and 4%. An increase in coupled subsidies by 1%, increases the likelihood of leaving the workforce permanently by 15%. Decoupled subsidies are found to have an effect on the decision to leave the workforce for a job in industry/ services. If decoupled subsidies in a region increase by 1%, persons living in that region are more likely to switch to industry/services (7% more likely).

On the first sight, this result looks rather counter intuitively as subsidies increases farmers' gross income. However, when we consider the also the second order effects of subsidies and their impact on farmers' net income, the results become more clear. Subsidies are expected to be capitalized in farm input prices, such as land prices and fertilizer prices (Floyd 1965; Ciaian and Swinnen 2006, 2009). If subsidies are unequally divided over the farm population and the capitalization in farm input prices is high, it is possible that the net income of a farmer that receives less than the average subsidy even decreases compared to a situation where there are no subsidies (Key and Roberts 2006). Additionally, subsidies make it easier for the farmers that stay in agriculture to buy out those farmers that are seeking to exit the sector, accelerating the rate of exits (Goetz and Debertin 2001). Finally, subsidies are also found to accelerate the substitution of labour by capital (Goetz and Debertin 1996).

The other variable that is related to income, INCDIFF, is no found to have an impact on the decision to leave the agricultural sector. Although, it is possible that INCDIFF affects the different groups that leave the agricultural sector in a different way. The income generated in the agricultural sector is considerably lower than in the other economic sectors, this will stimulate farmers willing to work in another sector to do so. However, the lower income in the agricultural sector will motivate a farmer that wants to stay in the agricultural sector to work longer before retiring because two reasons. First, during his lifetime the farmer received a lower income and he needs to compensate for the lower income by working longer. Second, in general pension payments for farmers are lower. We find that INCDIFF has a negative and significant impact on the probability to go to industry or services. This implies that when the difference between the regional average wage and the agricultural income is larger, farmers are more likely to leave the agricultural sector for a job in the better paid sector (10% more likely). We find no significant impact of INCDIFF on the probability of leaving the workforce permanently.

Farm characteristics (SMALL and OWNED) are not found to have a significant impact on the decision to leave the agricultural sector. The literature mentions two opposite effect of farm size on the probability to leave the agricultural sector. On the one hand, farm size is expected to increase the survival rate of the farm as larger farms are expected to provide the farm of a sustainable income. On the other hand, a larger farm size means a higher valuation of the farm assets in the case of take-over of the farm.

Most previous studies (Kimhi and Bollman 1999; Glauben et al. 2006; Breustedt and Glauben 2007) find that farm size contributes positively to farm survival. However, it is possible that in our analysis the two effects level out each other. OWNED is not found to have a significant impact on the decision to leave the agricultural sector. When considering the impact of OWNED in the multinomial logit model, we find a significant and negative impact on the decision to leave the agricultural sector permanently, but the impact is found to be very small. The literature mentions two opposite effects of a larger share of owned land. Studies by Goetz and Debertin (2001) and Breustedt and Glauben (2007) find that in regions with a higher share of owned land, farm exits are lower. A large share of owned land can indicate a relatively close emotional tie between the family and the farming industry, which reduces the chance to leave the agricultural sector. Additionally, it can indicate a better credit capacity and financial stability of the enterprise. However, a study by Glauben et al. 2006 finds that in regions with more owned land farm exits are higher. They argument that a higher proportion of owned land increases the value of the farm, which provides farmers of an additional income as by selling or leasing out their land (Glauben et al. 2006). As in the case of the farm size it is possible that these two effects level each other out.

Differences in the agricultural production structures and the degree of specialization affects labour adjustments. In regions with a higher percentage of livestock farms, the probability to leave the agricultural sector is lower, whereas in regions with a higher share of cereal farmers the probability is higher. These results are consistent with the findings by Breustedt and Glauben (2007) who find that farmers living in regions with more livestock farming are less likely to leave the agricultural sector and the opposite for farmers living in regions with more cereal production. This can indicate that farmers who have more livestock production face higher sunk costs when leaving the agricultural sector compared to farmers with only cereal production.

With regard to the socio-economic characteristics of the individual, we find similar results as Bojnec and Dries (2005). Age is found to have a significant impact on the decision to leave the agricultural sector. Older farmers are more likely to leave the agricultural sector. However, when considering the effect of AGE on the different groups that left the agricultural sector, we find a different effect of age on the different groups. Young farmers are more likely to leave for industry or services or become unemployed because being older reduces the probability to find alternative employment and younger individuals can benefit from the gains of switching sectors, such as a better income or better working conditions, over a longer period in time. Being one year older decreases the probability of leaving for employment in industry or services by 2% and the probability to become unemployed by 1%. On the other hand, older individuals are more likely to leave the work force as being an additional year older increase the likelihood of leaving the labour force permanently by 4% (or 0.1‰). This is because in most cases these farmers retire.

The level of education is not found to have a significant impact on the decision to leave the agricultural sector. However, when considering the impact of education in the multinomial logit model, we find a positive and significant coefficient of HIGHEDU and MEDEDU for labour flows out of agricultural employment into industry or services, meaning that individuals with secondary or tertiary education are more likely to leave agriculture for a job in industry or services. If a person received a degree of tertiary education or secondary education, this person is respectively 94% and 37% more likely to flow to the industrial or service sector compared to individuals with only primary education. On contrary, individuals that have obtained a higher degree are less likely to end up in unemployment. Individuals with a secondary degree are 15% less likely to become unemployed.

In addition, to the highest degree of education obtained, also the type of education (AGEDU) influences the probability of leaving the agricultural sector. If farmers received agricultural education, they are less likely to leave the agricultural sector as leaving the agricultural sector would mean a loss of the skills that they have accumulated during their education. We find a positive effect of agricultural education on the likelihood of leaving the agricultural sector. Farmers that received agricultural education are 29% less likely to leave the agricultural sector. The probability to leave the agricultural sector for industry or services is 42% lower than average for individuals that received some agricultural education, whereas the probability of individuals that received agricultural education to become unemployed is reduced by 15%. There is no significant effect of agricultural education on the probability to leave the work force.

Different studies have analysed the effect of gender on the decision to leave the agricultural studies, but found different results. On the one hand, men are traditionally expected to be more likely to flow to a different employment status than women because men are expected to be more likely to flow to a different employment status than women because men are often observed to play a more active role in labour market participation (Bojnec and Dries 2005). However, some studies indicate the role of the spouse in earning an additional off farm income (Huffman and Lange 1989; Benjamin and Kimhi 2006). In our analysis, we find that men are less likely to leave agriculture. Additionally, we find that men are less likely to become unemployed or leave the work force permanently, respectively 13% and 49% less likely than average. Also being married is expected to reduce the likelihood that an individual leaves the agricultural sector. Married individuals are expected to change less likely between employment options as they are expected to have more responsibilities, such as child care, which makes them less mobile (Bojnec and Dries 2005). Our results confirm these expectations and MARRIED is found to reduce the likelihood to leave the agricultural sector.

Non pecuniary benefits (SELFEMPL and FAMILYWORK) are the most important variables influencing the decision to leave the agricultural sector. Being self employed reduces the probability of leaving the agricultural sector by 125%, whereas being a family worker reduces this probability by 65%. Being self employed decrease the likelihood of leaving the agricultural sector for all different groups. An individual that is self employed in agriculture is 90% less likely to leave the agricultural sector for industry or services and 93% less likely to leave the work force permanently. Self employed farmers are also less likely to become unemployed (172% lower than average). Similar, although smaller, results can be found in the case of a family worker.

There is a positive relation between population density (DENSE and INTERDENSE) and probability of leaving the agricultural sector. Individuals living in a densely are 41% more likely to leave the agricultural sector, whereas individuals living in an intermediate densely populated area are 8% more likely to leave the agricultural sector.

Finally, also NMS has a positive and significant effect on the probability to leave the agricultural sector. Individuals that live in a NMS are 46% more likely to leave the agricultural sector.

6   CONCLUSION

At the time of its establishment, one of the main objectives of the CAP was to ensuring a fair living standard for farmers and currently, this is still one of the objectives. However, despite large CAP payments, agricultural employment in the EU15 has rapidly declined in the past two decades, indicating that the CAP is not efficient in increasing farmers' income in such a way that it is profitable to stay in the agricultural sector. Recently, criticism on the CAP budget increased due to the accession of ten NMS to the EU in which the agricultural sector represents a substantial share in GDP and employment, and the ongoing trade negations in which the agricultural negotiations seem the key to an agreement. Therefore researchers and policy makers are interested in the role of subsidies on the labour adjustments in the agricultural sector.

Using individual level data derived from the EULFS and regional data derived from FADN and the New Cronos database, which have been linked, we analyze the role of subsidies on intersectoral labour flows out of the agricultural sector in the period 2005-2006. In addition to the role of subsidies we also investigate the other determinants of intersectoral labour adjustments, such as regional employment alternatives, farm characteristics, personal characteristics and non pecuniary benefits associated with being employed in the agricultural sector. On the base of the empirical results in the study, at least four important findings need to be highlighted.

First, in regions were the average subsidy per worker is higher farmers are more likely to leave the agricultural sector. On the first sight, these results are counterintuitive as subsidies are generally expected to increase farmers income which stimulates them to stay in agriculture. However, when taking in account the second order effects of subsidies these results become much more logic. In general, subsidies are capitalized in farm input prices, such as land and fertilizer prices. If subsidies are unequally divided over the farm population, the capitalization of subsidies in input prices can make that farmers who receive less subsidies can be confronted with a decline in their net income compared to a situation were there are no subsidies. This is expected to increase exits from the agricultural sector. Additionally, subsidies make it easier for the farmers that stay in agriculture to take over the farms of the ones that leave the agricultural sector. Finally, subsidies are also found to accelerate labour/ capital substitution. These findings place serious question marks next to the efficiency in which the CAP fills in one of the most important objectives of the CAP, namely ensuring a fair standard of living for farmers.

Second, human capital variables, such as age and education are found to have an important impact on the likelihood of flowing to a certain sector. Younger persons employed in agriculture are more likely to leave the sector as the can benefit from higher income or non income benefits in other sectors over a longer time period. Also better educated individuals are more likely to switch employment in the agricultural sector for other employment alternatives. The elderly and less educated individuals stay in the agricultural sector, which leads to an impoverishment in terms of human capital in the agricultural sector compared to other economic sectors. Therefore the promotion of education and life long learning will be crucial for policy makers to increase the flexibility of individuals to leave the agricultural sector for other more profitable employment alternatives.

Third, besides subsidies and human capital variables, employment alternatives are found to have a large impact on the decision to leave the agricultural sector, which indicates the importance of creating alternative employment in remote areas in order to facilitate structural change.

Finally, the most important factor affecting the decision to leave the agricultural sector were the non pecuniary benefits related to working in the agricultural as a self employed or as a family worker. This suggests that attributes associated with farming—such as autonomy over farm management decisions, independence, sense of responsibility, and pride associated with business ownership — are valuable to farmers and decrease the probability that they leave the agricultural sector.

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