

Cosmetic or Cutting? The impact of the modulation of EU direct payments on farm profitability in the Navarra region of Spain

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Abstract

The study analyses the effects of CAP direct payments and their modulation on farm profitability for a sample of 369 farms in the Navarra region of Spain. Cost-revenue ratios are calculated in order to highlight the impact of CAP direct payments, modulation and the valuation of own production factors at opportunity costs on farm-specific profitability. A multinomial logit model is employed for explaining the resulting profitability and relationships to farm characteristics. The results suggest that the rate of modulation, introduced by the 2003 reforms, will have a very minor impact on farm profitability and will exert little pressure on farms to restructure. Farms that can be profitable without any direct payments while valuing unpaid land and labour input at their opportunity costs are significantly more likely to be large, extensive, specialised in cropping and based in a non-mountainous less favoured area. Direct payments account for a smaller share of the gross revenue of profitable farms. Overall, the analysis highlights that the 2003 reforms do little to remedy the poor distributional efficiency and targeting of direct payments.

JEL Classification code(s): Q12, Q18

Keywords: direct payments, CAP reform, farm profitability, multinomial logit model, Spain

1. Introduction

Direct payments, which were introduced as part of the MacSharry reforms and augmented under Agenda 2000, currently account for the majority of Common Agricultural Policy (CAP) expenditure. Expenditure on direct payments amounted to just under €27 billion in 2001, equivalent to approximately 29 per cent of the entire EU budget (EC, 2002). Given the level of financial expenditure, many have questioned whether such payments are tenable and for how long they can be sustained or justified (Swinbank and Tangermann, 2000; Lowe *et al.* 2002), especially in light of the enlargement of the EU (Buckwell and Tangermann, 1999). While in the European Commission's (EC) Mid-Term Review (MTR) direct payments were seen as playing “a central role in ensuring a fair standard of living and stability of income for the agricultural community” (EC, 2002: p.7), it nevertheless proposed reforms to curb expenditure. The MTR formed the basis for CAP reform negotiations that were concluded in June 2003. As a result of these negotiations, direct payments will be modulated and a single farm payment, largely decoupled from production, will replace most existing premia (CEU, 2003). Direct payments may also be reduced if the budgetary ceiling for CAP market support is exceeded (referred to as a financial discipline mechanism).

This paper contributes to the debate over direct payments in two regards. First, it assesses the importance of direct payments to farm-specific profitability. As the reformed CAP will not continue with the same structure of payments, it is important to consider the dependence of farms on direct payments and whether they can cover their costs without such subsidies, especially for those located in marginal areas. Second, a multinomial logit model identifies the characteristics of farms that would be most

susceptible to the further reform of direct payments. The paper draws on data for the Navarra region of Spain. Navarra was chosen as a case study region because it encapsulates a heterogeneous cross-section of farm types ranging from peri-urban cropping to mountainous, extensive livestock systems. The debate on CAP reform also has particular relevance for Spain given its historically low returns to agriculture and the importance of direct payments as a source of income (San Juan and Decimavilla, 1999).

The paper is divided into seven sections. The next section outlines the main features of the debate over EU direct payments, paying particular attention to the Spanish case. A brief overview of the case study region, Navarra, is presented in Section 3 and the methodology detailed in Section 4. The data set is described in detail in Section 5. Sections 6 and 7, respectively, outline the findings of the analysis and relevant conclusions.

2. EU direct payments, agricultural profitability and debates over future reform

Direct payments were introduced as part of the 1992 MacSharry CAP reforms and augmented under Agenda 2000, and are subsidies currently paid per hectare or per animal. They were originally planned to be payments that partially compensated farmers for cuts in intervention prices, initially for grains, oilseeds and beef (EC, 1992). Prior to the implementation of the 2003 reforms, there are over 25 different CAP direct payments with the most important being area payments for cereals, oilseeds and protein crops, and in the beef sector, headage payments. Given that the payments were introduced to compensate for reductions in intervention prices, a debate has emerged regarding the length of time such payments should be available to farmers, how payments should be distributed, the linkage between direct payments and other policy

measures, and the budgetary costs of such support. These issues are outlined in turn followed by a discussion of the debate in Spain.

a) Time-scale and Degressivity

In the MacSharry reforms, direct payments were referred to as compensation payments with the clear implication that they should be decreased over time (degression) and phased out after a reasonable period for farmers to adjust had elapsed. However, in the MTR it was acknowledged that direct payments have “lost their compensatory character over time and have become income payments” (EC, 2002: p.8). This has led to criticisms that direct payments have now become an end in themselves rather than a transitory mechanism (Dwyer, 2002).

In the negotiations, prior to the Agricultural Council's (AC) compromise decision in June 2003, there was little support amongst the Member States for direct payments being phased out completely. The MTR proposals for automatic degressivity were not accepted. These proposals envisaged annual reductions of 3 per cent up to a maximum of 20 per cent, subject to individual farm allowances.¹ The AC Decision replaces proposals for automatic degressivity with a clause stipulating that cuts will be made only if the budgetary ceiling for sub-heading 1a (CAP market support), minus a €300 million safety net, is exceeded. Farmers receiving less than €5,000 in direct payments would be exempt from reductions made under this provision and additional franchises, above €5,000, with partial exemption from the adjustment might also be introduced (CEU, 2003).

¹ The allowances (or franchise) for each farm would have been: €5,000 for the first 2 full-time employees and, optional for member states, €3,000 for each further full-time employee. An upper limit of €300,000 per farm was proposed after allowing for the application of modulation and allowances.

The justification for the franchises is to help smaller farms survive in circumstances when it is feared that they would otherwise disappear or lead to widespread land abandonment (Buckwell and Tangermann, 1999). However, it is questionable whether direct payments are the best mechanism for such objectives and there is little consensus between the Member States on the wider issue of the life span of such payments.

b) The Distribution of Direct Payments and Modulation

The initial MacSharry proposals contained plans for arable area payments to be modulated, i.e. farms exceeding a certain size threshold would have received proportionally less. The proposals for modulation received a hostile response from lobbies representing larger farmers and it was subsequently dropped from the package (Swinbank, 1997). As payments were intended to compensate for price cuts, it was argued that larger and more efficient producers should not be 'disadvantaged' (Falconer and Ward, 2000). This led to some very substantial and visible transfers to certain large holdings. The European Court of Auditors (ECA) noted that in 1997 40 per cent of the total money spent on direct payments was distributed to the largest 4 per cent of producers (ECA, 2000). This led to claims that direct payments failed to take into account need and were in effect transfers to the wealthiest landowners with little benefit to the wider countryside (Blom, 2002).

The Agenda 2000 reforms gave Member States the opportunity to modulate direct payments in order to increase expenditure on the second pillar of the CAP. Member States have been allowed to apply modulation at their discretion using any one, or a combination, of three criteria (labour employed on the farm, standard gross margin and the sum of aid given). However, optional modulation has not been popular and the 2003 Council Decision introduces a Community Modulation Scheme (CMS),

compulsory for all Member States. The CMS will begin in 2005 with a rate of 3 per cent, rising to 4 per cent in 2006 and for the period from 2007 to 2012 it will be maintained at 5 per cent. For the first €5,000 of direct payments any losses as a result of the application of the CMS will be fully compensated.

Modulation aims to improve the balance of expenditure between direct farm aid and rural development. The EC has argued (EC, 2002) that larger farms are more capable of adapting to new technologies and achieving economies of scale and that the franchise system of exempting small farms from modulation will protect payments to the smallest 75 per cent of farms.

c) Linkage with Environmental and Rural Development Objectives

The MacSharry reforms were introduced as market stabilisation measures without strong links to other social and environmental objectives. Such payments also seemed at odds with the advancement of multifunctionality and the promotion of non-market environmental and cultural services (Lowe *et al.*, 2002; Sumpsi and Buckwell, 2002). However, the 1992 reforms were promoted by the EC as having the potential to deliver some environmental benefits in the sense that they would weaken the incentives for intensive production. However, the ECA (2000: p.2) concluded that the reforms had had “little success in converting environmentally damaging intensive agriculture to environmentally sound farming methods” and opponents have argued that direct payments offer too few direct environmental or social benefits beyond the support of existing farm businesses (Dwyer, 2002).

In the Agenda 2000 package, it was agreed that direct payments should be made conditional on farmers observing some basic environmental standards with additional environmental services remunerated through reinforced agri-environmental schemes.

These measures attempted to increase the linkage between direct aids and environmental objectives. However, it was acknowledged in the MTR that the linkage of some direct payments to production (for example, headage payments) encourages many farmers to adopt more intensive production practices than would be the case without support. As a result, the AC agreed in 2003 to switch to a single farm payment, to be introduced from 2005.² Member States can either introduce a fully decoupled single farm payment or elect for partial decoupling (retaining either up to 25 per cent of the current coupled arable area payments or between 50 and 100 per cent of specific livestock premiums). These options are complex and it is difficult to see how some options, such as retaining 100 per cent of the current suckler cow premium, can be considered to be consistent with environmental objectives.

d) Budgetary Impacts

At the 2002 Copenhagen European Council, accession negotiations were concluded with ten states that will become full members of the EU in May 2004. For the new Member States, direct payments will be phased in over the period 2004 to 2013 with opportunities for national 'top ups'. Starting at 25 per cent of the full national envelope for eligible direct payments in the EU-15, payments from the EU budget will rise by 5 per cent per year until 2007 and from then on in 10 per cent increments until reaching full parity in 2013. It is estimated that in 2006 the cost of implementing the first pillar of the CAP in the 10 new Member States will be €2.32 billion with direct payments accounting for €1.42 billion. In the same year, the cost of direct payments for the existing EU-15 is projected to be €28 billion (EC, 2002). While the costs of accommodating the new Member States are less than some initial estimates (Jansen and Frandsen, 2002; Swinnen, 2002), they will rise significantly in the 2007-2013

² Member States may elect to delay implementation of the single farm payment until 2007.

programming period. Looking beyond the 2004 enlargement, the accession of Bulgaria, Romania and Turkey would also further substantially enlarge the agricultural area of the EU. This implies that the 2003 reforms cannot be the last and that further reductions in the direct payments made to farmers in the existing Member States can be expected.

e) Direct Payments and Spanish Agriculture

During its first years of EU membership, the Spanish government, with the support of domestic agricultural unions, pursued a modernisation policy, based on capital intensification aimed at improving efficiency (Moyano, 1995). This was against the backdrop of relatively low profitability and productivity in Spanish agriculture compared against other West European Member States (Sabate, 1992; San Juan and Decimavilla, 1999, 2000). Spanish policy focused on improving the performance of its 'first pillar' with relatively little interest in agri-environmental schemes and wider farm rural development measures (Garrido and Moyano, 1996). As a result of the MacSharry reforms, the profitability of Spanish crop farms increased significantly and the variability of returns fell (Bardají et al., 1995). Under these reforms Spain became a net beneficiary of the first pillar budget.

The Spanish Ministry of Agriculture, Fisheries and Food (Ministerio de Agricultura, Pesca y Alimentación - MAPA) has consistently rejected proposals for radical liberalisation (BER, 1997) and Spain has largely been seen as within the 'protectionist' wing of the existing Member States (Lowe et al., 2002). MAPA has argued that direct payments should be maintained as a tool for compensating farmers for price cuts and preventing land abandonment. Spanish delegations have also resisted attempts to link direct payments to environmental criteria arguing that environmental measures should

be financed separately. In response to the MTR, MAPA stated that, while it saw some form of modulation as desirable, the proposed 20 per cent cut was too severe and it lobbied hard against proposals for automatic degressivity. Various farmers' organisations expressed different views about the reform of direct payments depending on the interests of their membership. There is, thus, little consensus at the national level of what forms future direct payments should take or of the likely effect of the proposed reform. The present paper attempts to shed light on some potential consequences of the reform of direct payments for farm profitability in Spain, exemplified by farms in Navarra.

3. Overview of Navarra's agriculture

Agriculture accounts for 5 per cent of GDP and 9 per cent of employment in Navarra. This is higher than the mean for Spain and is also above the EU average. Although farms in Navarra are larger than the 'mean farm' in Spain and the EU, they are still small, with an average area of 25 hectares (ha) (MAPA, 2001; INE, 1998). The labour input of 0.77 Annual Work Units (AWU) is close to the Spanish average but below the EU mean. During the period 1994-1999, 68 per cent of Navarra's territory and 23 per cent of the population were within designated Objective 5b areas. These areas are characterised by a low population density with more than 25 per cent of the active population being engaged in agriculture.

Navarra is comprised of 7 counties, which have different agri-environmental characteristics. The Nord-West is mountainous with livestock accounting for more than 85 per cent of the value of final agricultural production. The Pirineos is also mountainous and has the lowest population density, 6 inhabitants per square kilometre compared to the regional average of 50. The main agricultural products are livestock

and potatoes. The Basin of Pamplona is an urban county with agriculture having a minor economic role. Tierra Estella can be divided into two parts. In the mountainous North the main activities are livestock and forestry, whilst in the South cereals, vineyards and olive trees prevail. Navarra Media and Ribera Alta are specialised in cereals and horticulture. The Ribera Baja has large, irrigated plains on which horticultural products and maize are cultivated.

4. Methodology

Profitability Ratios

Farm profitability in Navarra is evaluated through ratios of costs to revenues for each farm. A ratio smaller than one indicates a profitable farm and vice versa. Ratios have been preferred in the analysis as they ease the comparison between farms. A similar approach has been used by Gallardo et al. (2003) in a study of farm specific competitiveness and by Davidova et al. (2003) in analysing the viability of different farm types in countries acceding to the EU.

In the most comprehensive version of revenue and costs, the revenue side includes proceeds from the sale of agricultural products, proceeds from other activities and all net current subsidies; costs include labour, land, capital (depreciation and interest), and intermediate consumption. In order to give an insight into the effects of direct payments, their modulation and the valuation of all factors at opportunity costs on profitability of farms with different characteristics, three types of revenue (R) and two types of costs (C) are calculated:

R_{dp} = Total revenue from crops, livestock and other activities including all net direct payments. This is the revenue as recorded in farm accounts.

$R_{0dp} = R_{dp} - \text{CAP area and headage payments}$. This revenue illustrates the case of a removal of the area and headage payments.

$R_{mod} = R_{0dp} + \text{modulated area and headage payments (by 5 per cent)}$, accounting for the franchise of €5,000. This revenue is the closest proxy of the situation after the application of the final rate of modulation as decided by AC in June 2003.

Regarding costs, the first type (C) includes only paid costs. The second form, estimated costs (C_e), utilises shadow prices to account for non-paid (family) labour and own land input. For non-paid land and labour input, shadow prices are estimated using regional averages. Family labour is valued using the average regional farm unit labour costs for the sample.³ Farm labour costs are used as it is assumed that most of the farmers in Navarra have low opportunity costs and their second best alternative is to become farm workers. As far as land is concerned, if a farm has a mixture of rented and owned land, the rent paid is imputed to the owned land, as it is supposed that rented and own land are in close proximity and, thus, are of a compatible quality. If a farm does not rent land, then the average actually paid rent by farms in the sample is applied to the owned land. All value indicators are displayed in euros.

From the above measures, 6 cost revenue ratios are calculated for each farm. First, farm profitability is analysed with reference to a private cost-benefit ratio (P_CB). For the i 'th farm, the P_CB is taken to be:

$$(1) \quad P_CB_i = \frac{(C_i^t + C_i^f)}{R_i}$$

³ The sample mean applied in the paper is €12,312.

where C_i^t is the cost of tradable inputs, C_i^f is the cost of non-tradable factors of production (based on private prices or estimates for non-paid land and labour input) and R_i is the value of output, excluding CAP area and headage payments.

Five other profitability ratios are also calculated in order to give insights into the effects of direct payments and the valuation of factors at opportunity costs. The first, cost-revenue plus direct payments ($C_{R_{dp}}$), exactly matches the entries in Farm Accountancy Data Network (FADN) records and, therefore, C_i^f does not include estimates for non-paid labour and land, and R_i includes direct payments. The second one ($C_{R_{0dp}}$) matches FADN entries in terms of costs in the sense that only paid costs are included, but the revenue side excludes area and headage payments. The third one ($C_{R_{mod}}$), does not contain estimates for non-paid labour and land either, but includes modulated direct payments. The next two, private cost-benefit ratios ($P_{CB_{dp}}$) and ($P_{CB_{mod}}$), incorporate estimates for non-paid labour and land and include full or modulated area and headage payments respectively. As the proposed approach is a static one, little can be said directly about future adjustments to policy changes that might involve a removal or modulation of direct payments. The purpose here is not to use more complex modeling to simulate potential adjustments, but to analyse and stimulate a debate concerning the degree of dependence on direct payments of different farm types.

The Multinomial Logit Model

In order to explain the resulting profitability and to relate it to farm characteristics, multinomial logit model is applied that yields the probability with which a farm k , having a specific set of characteristics x_{ki} , is in one of the categories j . The multinomial logit model can be expressed as:

$$(2) \quad Prob(Y_k = j) = \frac{\exp(\beta_j' x_{ki})}{\sum_{j=0}^2 \exp(\beta_j' x_{ki})}, \quad j = 0, 1, 2.$$

The coefficients can be determined only by an arbitrary normalisation, which leads to $\beta_0 = 0$. Here, the non-profitable farms are chosen for normalisation. Thus, a vector β_j is obtained for each probability except for the normalised situation. In addition, marginal effects are computed for each of the three situations.

The dependent variable is a categorical one with three different values. The farms have been classified into three groups using two versions of the private cost-benefit ratio, P_CB and P_CB_{mod}, as outlined in the profitability analysis. As a result, the dependent variable takes three possible values:

- 0 Non-profitable: the farm has both cost revenue ratios larger than unity. There are 130 farms in this group.
- 1 Profitability dependent on direct payments: the farm is unprofitable according to private cost-benefit ratio without direct payments but becomes profitable when modulated payments are added to its revenue. Sixty-six farms fall into this category.
- 2 Profitable: the farm is profitable according to both ratios. There are 173 farms in this group.

The ratios including estimated costs for family labour and owned land have been chosen for two reasons. First, they reflect the opportunity costs of production. The second reason is pragmatic. As the ratios with paid costs yield a small number of observations in the first and second groups, they are unsuitable for subsequent statistical analysis.

Several continuous variables are used to account for farm characteristics. The variable indicating farm size is total labour, measured in annual work units (TOTALAWU). It has been chosen as it has smaller correlation coefficients with the other variables. The percentage of crop production in the total value of output (PROCRO) is included to take account of farm specialisation. One variable accounts for the use of factor markets. This is the percentage of rented land (PORREUAA). Two measures of the degree of intensification are also included. The first one is the amount of land per annual work unit (LANDAWU) with larger scores indicating lower levels of intensification. The second one is the quantity of depreciation per annual work unit (DEPAWU), in which case higher values are used as proxies that there is more capital per worker employed. The financial situation is reflected by two variables, namely the relationship between total loans and net worth of the farm (LEVERAGE), which is an indicator of gearing, and the ratio of interest and rental costs to gross output (RENGO), which is a measure of financial stress (Franks, 1998). In order to assess the effect of direct payments on the probability of the farm being profitable, the percentage of output coming from direct subsidies is included (SUBOUTP). This variable is calculated as the portion of all CAP direct subsidies in the value of output inclusive of subsidies.

Three dummy variables have also been used to consider some qualitative aspects of the farms. The first one relates to the form of management (DLEGF), a variable that has a value of one for a family farm and zero for a company. The second one (DSTRUC) is a variable that takes into account the farm location in relation to EU support programmes. This variable takes the value of one when the farm is not in a structural funds area and zero when the farm is located in an Objective 5b area. The last variable

(DPARTIM) accounts for the degree of dedication to farm work and it takes the value of one when the farmer works full-time on the farm and zero otherwise.

5. Data employed in the analysis

Data utilised are from FADN, which is implemented in all EU Member-States. FADN is an important source of micro-economic data and is representative for commercial agricultural holdings in each region in the EU.⁴ As the survey does not cover all agricultural holdings, but only those that are of a size that can be considered as commercial, FADN is biased towards larger holdings. This can be seen in Table 1 which presents the sample means for Navarra, first, from the survey of the Structure of Agricultural Holdings and, second, from FADN.

(Table 1)

The analysis was conducted for four years (1996 to 1999) and the size of the sample was roughly constant over this period: 364, 370, 369 and 369 records for each year respectively (Table 2). Two hundred and sixty one farms were the same in the four years. Family farms are the most prevalent type (90 per cent), with the remainder being farming companies.

(Table 2)

The average farm size (using both land and labour measures) was almost constant over the four years but output and assets per farm increased. The distribution of farms as measured by Utilised Agricultural Area (UAA) was stable. Although FADN is biased towards larger farms, nearly half of the farms in the sample are below 30 hectares (ha)

⁴ A commercial holding is defined as a farm that is large enough to provide the main gainful activity of a farmer and a level of income sufficient to support his or her family. In order to be classified as commercial, a farm must exceed a minimum economic size. However, because of the differences in farm structures in the EU, there are separate thresholds for each Member State. For example, in 1997 for Spain the limit was 2 European Size Units (ESU) of the Standard Gross Margin.

in size. Farms operate slightly more on own land and during the most recent years the share of rented land in the total UAA was 44-45 per cent. The sample farms are also small in relation to labour input, around 40 per cent use one or less AWU. Farms employ mainly family labour and the share of paid labour represents only 9-10 per cent of the total labour input. Although the value of the total assets of the sample farms increased over the period analysed, still more than one half of the farms are within the two lower brackets, below €150,000 and between €150,000 and €240,000. The annual value of total output for nearly one half of the sample is below €60,000. The share of crops and livestock in total output was relatively constant over the four years with a slight predominance of crops.

In the FADN sample other details concerning farm location, which may affect farm performance, are reported (Table 3). Seventy-eight per cent of the sample farms receive EAGGF Guidance section aids, as they are located in Objective 5b areas, and 77 per cent of farms in the sample operate in a Less Favoured Area (LFA), either mountainous or non-mountainous, and can qualify for the special aids provided for these areas.⁵

(Table 3)

One important trend in recent years has been the growing number of part-time farms (classified as employing less than one AWU on the farm). In this study, for the distinction between a full-time and part-time farmer/manager, the AWU figures provided by the Regional Department of Agriculture in Navarra are used.

The data for each farm in the sample contains gross output per product and five cost items: total labour costs for hired labour, intermediate consumption, land rent, interest

⁵ Article 3 of Directive 75/268/EEC of April 1975 (OJ L128, 19.05.1975) states that “less-favoured areas shall include mountain areas, in which farming is necessary to protect the countryside, particularly for

and depreciation. In addition, labour and land inputs are given in physical units, hours worked and AWU, and UAA respectively. Labour is sub-divided into hired and family input and land area is given as a total and the amount rented.

6. Analysis

Descriptive Statistics

As the results were similar for the four years, only the results for the most recent year, 1999, are presented and discussed. A comparison of the six profitability ratios shows that, as one would expect, the mean increases when direct payments are removed and non-paid factors are valued at their opportunity costs (Table 4).

(Table 4)

The results indicate that if farmers were to have returns at opportunity costs for their own resources (land and labour) and to work without headage and acreage payments, then less than a half, 47 per cent, would cover their costs. These farms, however, account for more than a half of the total UAA, labour input and assets for the whole sample. If direct payments are added, the share of profitable farms increases to 66 per cent. However, the main differences in profitability are due to the valuation of own land and family labour input rather than the withdrawal or modulation of direct payments. If cost estimates for own resources were not included, even without direct payments 85 per cent of the sample farms would be profitable. Modulation has a negligible effect on the profitability of Navarra's farms. Overall, the sample farms receive small amounts of headage and acreage payments. After the application of the franchise of €5,000, only 201 farms out of the 369 sample farms would be subject to

reasons of protection against erosion or in order to meet leisure needs; they shall also include other areas where the maintenance of a minimum population or the conservation of the countryside are not assured.”

modulation. For these 201 farms, the mean effect of the modulation is a reduction of direct payments by €594. As a result, as shown in Table 4, only 4 farms switch from the profitable to loss making group due to modulation when estimated costs are applied, whilst there are no changes when paid costs are used in the calculations.

The Multinomial Logit Model

The profitability scores can be further analysed by considering their relationship to farm structural characteristics. Several model specification tests were carried out in order to measure the goodness of fit of the multinomial logit model.⁶ Appendix 1 contains a technical presentation of the tests.

First, the likelihood ratio to test if all the slopes in the model are zeros was calculated. The obtained ratio was 248.81, therefore, the joint hypothesis that the coefficients of the included variables are all zero was rejected. As proposed by Windmeijer (1995), more than one indicator could be used to measure the goodness of fit. The first one is the likelihood ratio index, the so-called McFadden (1974) measure. It is an analogue to the R^2 in a conventional regression model. The measure has an intuitive appeal as it is bounded by zero and one. If all the slope coefficients are zero, it equals zero. The likelihood ratio index increases as the fit of the model improves, but values between zero and one have no natural interpretation. In the present estimations, the value of the measure was 0.33. The computed pseudo R^2 proposed by Veall and Zimmermann (1992) was larger than the previous measure, 0.60.

⁶ In order to test whether a binomial logit model with a dependent variable with two categories (non-profitable farms and others), would be better than the proposed multinomial, the test proposed by Cramer and Ridder (1991) was applied. It is a likelihood ratio test distributed as a χ^2 . The test indicated that the resulting LR value (146.17) was bigger than the corresponding χ^2 . Therefore, the assumption that the profitable farms should be treated as a single group was rejected.

Another approach to the goodness of fit is to analyse the classification matrix. In the present case, the percentage of correct predictions of zero (non-profitable) was 66.9 per cent, the percentage of correct predictions of one (profitability dependent on direct payments) was 48.5 per cent and the percentage of correct predictions of two (profitable) was 80.9. Overall, 70.2 per cent of farms were correctly classified. In relation to the classification accuracy, Hair *et al.* (1995) suggest to compare the percentage of farms correctly classified by the model with the percentage that could be classified correctly by chance. When the group sizes are unequal, the determination of the chance classification can be done in two ways, by the maximum chance criterion and the proportional chance criterion. The maximum chance criterion refers to the percentage of the total sample represented by the largest group. In the case of the present model, this percentage was 46.8. The proportional chance criterion, according to which the average probability of classification is calculated considering all group sizes, was 37.6 per cent. All percentages were larger than the proportional and the maximum chance criteria.

No general guidelines have been developed to answer the question of how high should be the classification accuracy in relation to chance. Hair *et al.* (1995) point out that several authors suggest that it should be at least one fourth greater than that achieved by chance. Using this reference, it can be concluded that the model's accuracy is relatively good.

Huberty (1984) (cited in Sharma, 1996) proposed approximate test statistics that can be used to evaluate the statistical significance of the overall classification rate and the classification rate for each group. The values obtained in the present study were $Z_0^*=7.56$, $Z_1^*=6.49$, $Z_2^*=8.97$ and for the whole sample $Z^*=12.93$. In all the cases the

statistic was significant at a level of 0.05, suggesting that the number of correct classifications was significantly greater than the classification due to chance. As a result of these tests, the obtained model was accepted for predicting the probability of the farms to be profitable, non-profitable or dependent on direct payments.

The estimated parameters, presented in the Table 5, are the marginal effects

$$\delta_{ji} = \frac{\partial P_j}{\partial x_i} = P_j \left[\beta_j - \sum_j P_j \beta_j \right].$$

These marginal effects change with the value of the regressors because each P_j depends on the value of the regressors, as discussed in Appendix 2. They indicate the effect of a marginal change in the regressor i on the probability of the farm to be included in the group j (j = non-profitable, dependent on direct payments or profitable). These values are computed at the means of the \underline{X} s. A negative sign of the coefficient implies that an increase in the variable x_i decreases the probability of the farm belonging to the correspondent category j and a positive sign indicates that an increase in the variable x_i increases the probability of the farm belonging to category j .⁷

(Table 5)

The size of the farm, measured by the total annual work units (TOTALAWU), has a positive and significant effect on the probability of being profitable and a negative and significant effect on the probability of being unprofitable. A similar finding is apparent for the percentage of rented land (PORREUAA) - an increase in the percentage of rented land is associated with a decrease in the probability of a farm being in the non-

⁷ For example, as can be seen in Table 5, the marginal effect the variable TOTALAWU and category 2 (profitable) takes the value 0.195 and is statistically significant at the 5 per cent level. This implies that an increase of one unit in TOTALAWU increases the probability of belonging to the profitable group by 19.5 per cent.

profitable group and an increase in the probability of belonging to the profitable group. Both of the above relationships indicate the importance of size for farm profitability, as rented land increases the farm area beyond that which the family owns. Therefore, the larger the farm, the higher the probability of the farm being profitable even when all the factors are measured at opportunity costs and the CAP direct payments are discounted. In relation to land per annual work unit (LANDAWU), the results are similar, but the coefficients are statistically significant in all three cases. When farms have more land per unit of labour, they have a higher probability of belonging to either the profitable or profitability dependent on direct payments groups (the marginal effect is larger in the former case), and a lower probability of being in the non-profitable group.

In the case of the amount of depreciation per unit of labour (DEPAWU), two marginal effects are statistically significant. An increase in the quantity of capital per unit of labour increases the probability of a farm belonging to the non-profitable group and decreases the probability of profitability depending on the provision of direct payments. This suggests that an increase in the amount of capital per unit of labour is associated with rises in costs that are not fully compensated by increases in production. The estimated parameters for the marginal effects of the percentage of output accounted for by crops (PROCRO) indicate that when the farm is more specialised in crop production the probability of being profitable is higher, whilst the probability of being dependent on direct payments in order to achieve profitability or being unprofitable under all conditions is lower. In all three cases the variable is statistically significant.

The LEVERAGE ratio has a positive and significant effect on the farm's probability of belonging to the groups of farms that depend on direct payments to be profitable. In other words, when a farm has more liabilities in relation to its net worth, there is a

higher probability of the farm being dependent on direct payments to be profitable. However, the more a farm has to pay in rents and interest in relation to its total output (RENGO), the more likely the farm is to belong to the non-profitable group. A rise in financial stress is therefore associated with an increased probability of a farm being non-profitable.

The quantity of subsidies per unit of output (SUBOUTP) has a negative impact on the farm's probability of being profitable. The higher this ratio, the higher the probability of the farm being either non-profitable or to rely on direct payments for profitability. This provides an important insight into the relationship between subsidies and farm performance.

While the marginal effects for the dummy variables computed at the sample means for all the variables are reported in Table 5, it is more appropriate to consider the difference in the estimated probabilities of a farm belonging to each group, with the dummy variable equal to one and zero, and the other variables at their sample means (see Appendix 2). Based on the latter, family farms (DLEGF=1) have a smaller probability of being dependent on modulated direct payments for profitability and a higher probability of belonging to the profitable group. Farms that are not located in an Objective 5b area are more likely to be in the non-profitable group and have a smaller probability of being in the profitable cohort. The farms where the farmer works full time (DPARTIM=1) have a higher probability of being reliant on modulated direct payments for profitability and a lower probability of being profitable without CAP direct aids.

7. Conclusions

The majority of farms in the Navarra region are relatively small and a high proportion is located in LFA or Objective 5b areas. Despite this, there is a core of farms that are profitable even without CAP direct payments and with the valuation of their own land and labour input at their opportunity costs. Although these farms comprise less than a half of the FADN sample, they incorporate more than 50 per cent of the sample's UAA, labour input and assets, as they are, overall, larger than the sample mean.

The analysis indicates that compulsory modulation, at the rates provided for by the Council's decision in 2003 (accounting for the franchise of €5,000), hardly affects farm profitability. Only 4 farms switch from being profitable with existing, full direct payments to becoming unprofitable with modulated payments, and only when estimated costs are applied. Therefore, modulation, as agreed to date, will exert little pressure on farms to cut costs and modernise. However, although the rate of modulation is modest and not progressive in this phase of CAP reform, the introduction of such a compulsory Community Modulation Scheme paves the way for its more effectual future use.

Returning to the debate on whether modulation and eventual capping of direct payments disadvantages larger and more efficient producers in Europe, the analysis indicates that larger farms are more likely to be profitable without CAP direct payments. From this point of view there is no justification for maintaining the present distribution of direct payments that benefit larger farms disproportionately. Unfortunately, the 2003 CAP reform will not significantly improve the distribution of payments nor will it contribute substantially to funding rural development programmes through modulation.

In Navarra, the main beneficiaries of the current system of direct payments are larger arable farms that are based in non-mountainous LFAs. While receiving the financial benefits of being situated in an LFA, they do not have the handicap of a mountainous location. The best performers do not rely on direct payments and have a high probability of being profitable even without such payments. While specialised crop farms are more likely to be profitable, there are large variations between arable farms and without direct payments many would struggle to be profitable. Specialisation in cropping increases profitability in the short-term but it also increases dependence on modulated payments.

Profitable farms receive, on average, less CAP direct subsidies. A high ratio of direct payments to gross output is associated with farms that are more likely to be either loss making or dependent on modulated payments for their profitability. This suggests that those farms, which are currently more sheltered by direct payments, will have a more difficult adjustment process if future reforms are more substantial.

Overall, it appears that the CAP direct payments, even in view of the 2003 reform, will tend to maintain inequalities in agricultural incomes and are poorly targeted. The lack of appropriate targeting is apparent with regard to both their distribution and relationship with profitability.

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TABLES

Table 1: A comparison between the Survey on the Structures of Agricultural Holdings and FADN in 1997

	Structure of Agricultural Holdings	FADN
No. Farms	230,900	3,866
Total Utilised Agricultural Area (UAA) (ha)	5,792,422	194,377
UAA per farm (ha/farm)	25.18	49.34
Total Annual Work Units (AWU)	178,677	5,864
AWU per farm	0.77	1.50

Source: Structure of Agricultural Holdings Survey, 1997. I.N.E. (*Instituto Nacional de Estadística*)

Table 2: Main characteristics of farms in the FADN sample

	1996	1997	1998	1999
No. Farms	364	370	369	369
Land (UAA ha)				
Total land	18,617	18,091	18,553	18,535
Land per farm	51	49	50	50
Average share of rented land (%)	38.86	43.14	44.3	44.85
Labour (AWU)				
Total labour	537.99	549.89	535.37	550.88
Labour per farm	1.48	1.49	1.45	1.49
Average share of hired labour (%)	8.47	9.12	8.62	9.89
Share of farms with a full-time employment of farmer/manager (%)	95.20	94.30	92.10	90.80
Output (thousand Euro, current prices) ¹				
Total output	32,752	31,233	31,214	35,789
Output per farm	90	84	85	97
Average share of crop production (%)	51	51	51	49
Average share of livestock production (%)	46	46	46	47
Total asset (thousand Euro, current prices)				
Total assets	96,888	94,933	97,448	107,690
Assets per farm	266	257	264	292

¹ Total output includes net direct payments.

Table 3: Distribution of FADN sample according to farm location

	1996		1997		1998		1999	
Structural funds	Frequency	%	Frequency	%	Frequency	%	Frequency	%
1. In Objective 5b area	282	77.5	286	77.3	288	78.0	288	78.0
2. Outside structural funds area	82	22.5	84	22.7	81	22.0	81	22.0
Less favoured area (LFA)								
1. In LFA mountainous area	161	44.2	162	43.8	167	45.3	166	45.0
2. In LFA non-mountainous areas	88	24.2	97	26.2	92	24.9	118	32.0
3. Outside LFA	115	31.6	111	30.0	110	29.8	85	23.0

Table 4: Profitability ratios for farms in Navarra, 1999

	P_CB	P_CB _{mod}	P_CB _{dp}	C_R _{0dp}	C_R _{mod}	C_R _{dp}
Max	4.50	2.91	2.90	2.50	1.58	1.56
Min	0.22	0.22	0.22	0.10	0.10	0.10
Mean	1.10	0.92	0.92	0.71	0.61	0.60
Standard deviation	0.54	0.37	0.37	0.34	0.26	0.26
No. of profitable farms	173	239	243	313	342	342
No. of loss making farms	196	130	126	56	27	27
% of profitable farms	47	65	66	85	93	93
% of UAA in profitable farms	51	76	77	88	97	97
% of AWU in profitable farms	52	70	71	86	94	94
% of assets in profitable farms	54	73	74	87	94	94

Table 5: Multinomial logit model (369 farms)

Variable	Coefficient	t-ratio	Significance
<i>Y=0: Non-profitable (N=130)</i>			
Constant	0.285	1.784	*
TOTALAWU	-0.216	-3.314	***
PROCRO	-0.252	-2.787	***
LEVERAGE	-0.239	-1.312	
PORRESAU	-0.003	-3.177	***
RENGO	4.796	4.265	***
SUBOUTP	1.744	4.054	***
LANDAWU	-0.008	-4.360	***
DEPAWU	0.0000001	2.858	***
DLEGF	-0.009	-0.084	
DSTRUC	0.229	3.123	***
DPARTIM	-0.011	-0.118	
<i>Y=1: Profitability Dependent on Direct Payments (N=66)</i>			
Constant	-0.397	-5.780	
TOTALAWU	0.021	0.990	***
PROCRO	-0.202	-5.258	
LEVERAGE	0.161	2.483	**
PORRESAU	-0.0003	-0.710	
RENGO	0.281	0.806	
SUBOUTP	1.227	6.496	***
LANDAWU	0.002	3.072	***
DEPAWU	-0.00000005	-3.199	***
DLEGF	-0.091	-2.269	**
DSTRUC	-0.033	-1.356	
DPARTIM	0.246	5.787	***
<i>Y=2: Profitable (N=173)</i>			
Constant	0.112	0.515	
TOTALAWU	0.195	2.463	**
PROCRO	0.454	3.432	***
LEVERAGE	0.078	0.323	
PORRESAU	0.004	2.766	***
RENGO	-5.077	-3.591	***
SUBOUTP	-2.971	-3.838	***
LANDAWU	0.006	2.970	***
DEPAWU	-0.00000007	-1.362	
DLEGF	0.100	0.688	
DSTRUC	-0.196	-2.089	**
DTIM	-0.234	-1.753	*

*** Statistically significant at 1% level. ** Statistically significant at 5% level. * Statistically significant at 10% level.

Appendix 1: Model Specification Tests

1. Likelihood Ratio Test

The likelihood ratio was computed as:

$$LR = -2 \left[\ln \hat{L}_r - \ln \hat{L} \right]$$

where \hat{L}_r and \hat{L} are the log-likelihood functions evaluated at the restricted and unrestricted estimates, respectively.

2. McFadden's (1974) measure

$$R_{MF}^2 = LRI = 1 - \ln \hat{L} / \ln \hat{L}_r$$

3. Pseudo R^2 proposed by Veall and Zimmermann (1992)

$$R_{VZ}^2 = \frac{2 \left[\ln \hat{L} - \ln \hat{L}_r \right]}{2 \left[\ln \hat{L} - \ln \hat{L}_r \right] + n} * \frac{2 \ln \hat{L}_r - n}{2 \ln \hat{L}_r}.$$

4. The proportional chance criterion (PCC)

$$PCC = \sum_{i=1}^n p_i^2$$

where p_i is the proportion of individuals in the group i .

5. Huberty (1984) (cited in Sharma, 1996) test statistics

$$Z_g^* = \frac{(o_g - e_g) \sqrt{n_g}}{\sqrt{e_g (n_g - e_g)}}$$

$$Z^* = \frac{(o - e) \sqrt{n}}{\sqrt{e(n - e)}}$$

where $e_g = \frac{n_g^2}{n}$, $e = \frac{1}{n} \sum_{g=1}^G n_g^2$, o_g is the number of correct classification for group g ; e_g is the expected number of correct classification due to chance for group g ; n_g is the number of observations in group g ; o is the total number of correct classifications; e is the expected number of correct classification due to chance for the total sample; n is the total number of observations. The test statistics Z_g^* and Z^* follow an approximately normal probability distribution with one degree of freedom.

Appendix 2: Analysis of Dummy Variables

For the dummy variables the probability of belonging to each group is estimated assuming the dummy takes a value of one and zero:

$$P_0 = Prob(Y_k = 0) = \frac{1}{1 + \exp(\beta_1 x_{ki}) + \exp(\beta_2 x_{ki})}$$

$$P_1 = Prob(Y_k = 1) = \frac{\exp(\beta_1 x_{ki})}{1 + \exp(\beta_1 x_{ki}) + \exp(\beta_2 x_{ki})}$$

$$P_2 = Prob(Y_k = 2) = \frac{\exp(\beta_2 x_{ki})}{1 + \exp(\beta_1 x_{ki}) + \exp(\beta_2 x_{ki})}$$

Where P_0 is the probability of belonging to the non-profitable group, P_1 is the probability of belonging to the group dependent on direct payments for subsidies and P_2 is the probability of belonging to the profitable group. In other words, P_0 is estimated using the sample means for all the variables twice, once with DLEG=1 (family farm) and the other with DLEG=0 (not family farm). After the calculation of the two probabilities, the difference between the two is assessed. Similar computations are made for P_1 and for P_2 and for the other two dummies where DSTRUCT = 1 represents farms that are not in an Objective 5b area and DPARTIM = 1 accounts for full-time farmers.

The table below presents the differences between the probability (P_j) of belonging to the group j when the variable takes the value one and zero ($P_j[x_i = 1] - P_j[x_i = 0]$).

	P_0	P_1	P_2
DLEG	0.005	-0.111	0.106
DSTRUC	0.235	-0.038	-0.197
DPARTIM	0.044	0.140	-0.184