An Examination of the contribution of off-farm income to the viability and sustainability of farm households and the productivity of farm businesses

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NATIONAL DEVELOPMENT PLAN

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CHAPTER 1
INTRODUCTION

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The number of farm households in Ireland participating in the off-farm labour market has increased significantly in the last decade. According to the National Farm Survey (NFS), the number of farm households where the spouse and/or operator is working off-farm has increased from 37 per cent in 1995 to 58 per cent in 2007. The important contribution of non-farm income to viability of farm households is highlighted in the results of the Agri-Vision 2015 report, which concluded that the number of economically viable farm businesses is in decline and that a significant proportion of farm households are sustainable only because of the presence of off-farm income. Research conducted by Hennessy (2004) demonstrated that approximately 40 percent of farm households have an off-farm income and that almost 30 percent of the farming population are only sustainable because of off-farm income. Clearly, the future viability and sustainability of a large number of farm households depends on the ability of farmers and their spouses' to secure and retain gainful off-farm employment. The Department of Agriculture, Fisheries and Food (DAFF) have recognised the importance of off-farm income to the sector and they have recommended that future policies focus on farm household viability in all its dimensions, including farm and off-farm income sources (2000).

The strong growth in the macro-economy in the 1990s and early 2000s led to a significant contraction in the number of unemployed and an enlargement of the labour market. Against the backdrop of this strong economic growth, farmers found it relatively easy to secure employment off the farm, most commonly in the construction and traditional manufacturing sectors. While unemployment still remains low in Ireland, government policy in recent years has tended to support the knowledge based economy concept and as a result the majority of job creation has tended to be at the higher skilled end of the employment spectrum. Such policy and economic developments may threaten the ability of farmers to secure and retain employment in the traditional sectors. It was in this context in 2006 that the

Department of Agriculture, Fisheries and Food provided funding through the research stimulus fund for a project examining the contribution of off-farm income to the viability and sustainability of farm households and the productivity of farm businesses.

This principal aim of the project was provide quality scientific based policy advice and recommendations on issues pertaining to farm viability, off-farm employment and the implications for the productivity of the farming sector. The main objectives of the project were to examine the contribution of off-farm income to farming, to project future numbers of part-time farmers and to explore the productivity effects of an increase in part-time farming. To deliver on these objectives, a number of tasks were carried out. These tasks are outlined in the following chapters;

1. Examining the contribution of off-farm income to the viability of farming
2. Investigating whether off-farm income is driving on-farm investment
3. Understanding the effects of off-farm employment on technical efficiency levels in Ireland
4. Examining the effect of decoupling on farmers labour allocation decision.
5. Examining the role of off-farm income in insulating vulnerable farm households from poverty
6. Assessing the availability of off-farm employment and farmers training needs

What follows is the final report of this project, summarising the main findings of the research. The report is structured in a number of chapters relating to each project task. Chapter 2 presents a review of the number and types of farmers and farmers' spouses with off-farm income. The chapter outlines the recent trends in the labour market in Ireland and in particular focuses on the types of off-farm employment taken up by farmers and their spouses. The chapter also presents a number of estimates of total farm income using a number of data sources. These estimates highlight the importance of off farm income to farm households.

The objective of Chapter 3 is to explore the contribution of off-farm income to the viability of the farm business; specifically the focus of the analysis is the link between off-farm income and farm investment. The hypothesis tested is; does off-farm income drive on-farm investment? Economic models are developed to estimate the effect of off-farm income on the probability and level of farm investment.

Chapter 4 provides an insight into the effects of off-farm employment on technical efficiency levels in Ireland. An increase in the number of farmers working off the farm may have implications for the productivity of the farming sector. To date, relatively little research has been conducted in Ireland about the productivity of farms that are operated on a part-time basis. Internationally, the issue has been studied by Chavas and Aliber (1993) using stochastic frontier analysis. The recent Agri-Vision 2015 report recommended 'that research be carried out on the socio-economic determinants of the productivity performance of Irish agricultural production so to inform our understanding of the sector's competitive potential'. This chapter describes economic models that have been developed to measure the rate of technical change and efficiency on farms. In particular, the emphasis is on the efficiency of part-time farms relative to full-time farms.

Chapter 5 will contribute to a deeper understanding of the factors affecting the decisions to work off-farm and how those factors may change as a result of decoupling. In particular this chapter focuses on the impact of the recent decoupling policy reform on the incidence of part-time farming. Economic models are developed to estimate the impact of decoupling direct payments from production on the probability of a farmer working off farm.

Chapter 6 examines the role of off-farm income in insulating vulnerable farm households from poverty. Keeney (2005) has found a significantly higher risk of consistent poverty (relative income poverty plus a consideration of non-monetary deprivation) for rural households relying solely on the returns from farming. The objective of chapter 7 is to update this research and to explore whether low incomes in farm households are chronic or involuntary. The research reported in chapter 7 applies models of variance decomposition to ascertain the strategies that farm households can take to sustainably withstand the greater poverty risk of relying on farming.

Chapter 7 involves an assessment of the availability of off-farm employment and farmer training needs. The employability of farmers and their spouses is critical to the future viability of farming. Concerns have been expressed about the employability of farmers, who typically tend to participate in vulnerable sectors and in low skilled positions. This chapter examines the education and skill profiles of farmers. These profiles are compared to labour market projections to assess the likelihood of farmers securing and retaining employment in a changing labour market. Where gaps are identified training recommendations are made.

The concluding chapter of the report summarises the main research findings and makes some policy recommendations.

CHAPTER 2

THE CONTRIBUTION OF OFF-FARM INCOME TO THE VIABILITY OF FARMING IN IRELAND.

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2.1 Introduction:

The reliance of farm households on non-farm income is a growing phenomenon in Irish farming. The Agri-Vision 2015 report (Dept of Agriculture and Food, 2004) concludes that the number of economically viable farm businesses is in decline and that a large number of farm households are sustainable only because of the presence of off-farm income. The results show that approximately 40 percent of farm households have an off-farm income and that almost 30 percent of the farming population are only sustainable because of off-farm income (Hennessy (2004)). This suggests that the future viability and sustainability of a large number of farm households is dependent on farmers and their spouses' ability to secure employment off the farm.

The objective of this chapter is to review the contribution of off-farm income to the viability of farming. Issues addressed include:

1. Macroeconomic developments in Ireland over the last twenty years
2. The number of farmers employed off farm
3. The number of spouses employed off farm
4. Types of off farm employment
5. Measures of off-farm income
6. The contribution of off-farm income to the sustainability of Irish farm households

The chapter begins by reviewing changes in the Irish economy over the last ten years, identifying potential reasons for the increased proportion of farm operators and spouses participating in the off-farm labour market. We will then focus on the evolving agricultural sector, examining the farm, socio-economic and governmental characteristics which may have influenced the increasing participation of farm households in the off-farm labour market and the contribution that this additional income makes ensuring the sustainability of the farm business. Finally, we provide an estimate of the total farm household income for the farms included in the 2004 National Farm Survey.

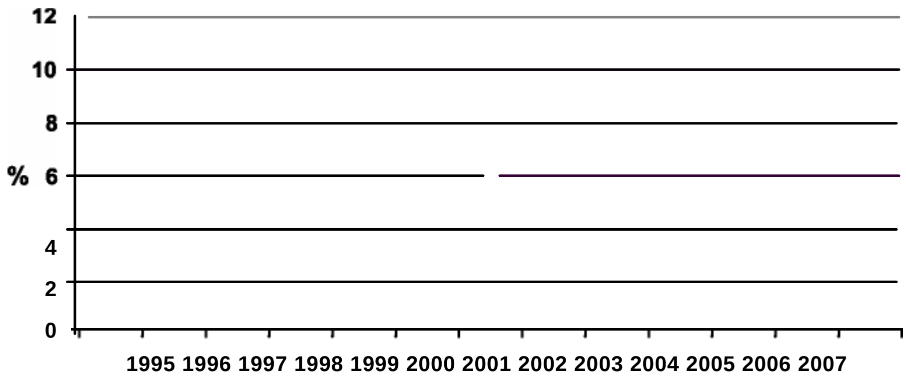
2.2 Review of Recent Trends

This section of the chapter presents an overview of the major developments affecting Irish labour markets for the last twenty years or so. This information helps to provide context to the changes in farm labour and especially the increasing participation of farmers in the non-farm labour market.

2.2.1 The Irish Economy

The Irish economy was transformed during the 1990s and a period of exceptional growth was experienced (Figure 2.1). During the 1990s the Irish economy experienced a series of favourable demand-side shocks, emanating from exchange rate and interest rate developments, the global economic boom, and increased mobility of foreign direct investment and its increased sensitivity to tax differentials. The dramatic response to these developments was facilitated by a set of favourable supply side developments: an elastic labour supply underpinned by a strong demographic situation; the growing stock of human capital due to rising levels of educational attainment in the inflow to the labour force; wage moderation induced by centralised wage bargaining and declining union power; a reduction in the tax wedge on earnings; a fall in the unemployment replacement ratio; and a stricter approach to unemployment benefit claimants (Walsh, 2004). The juxtaposition of so many favourable demand and supply side developments created what was known as the 'Celtic Tiger'.

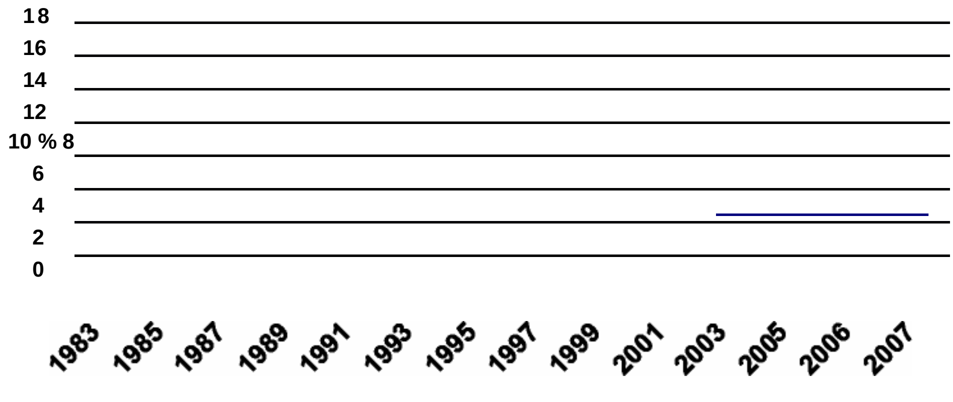
Figure 2.1: GDP Volume change as % (1995-2007)



Source: *CSO*

A key feature of this exceptional growth was the unprecedented employment boom. This reduced the unemployment rate, raised the participation rate, and reversed the outflow of population from the country. The resultant increase in the employment rate played a large part in Ireland's belated, but very rapid, catch-up in living standards with the leading economies.

Figure 2.2: Unemployment Rate (1983 to 2007)



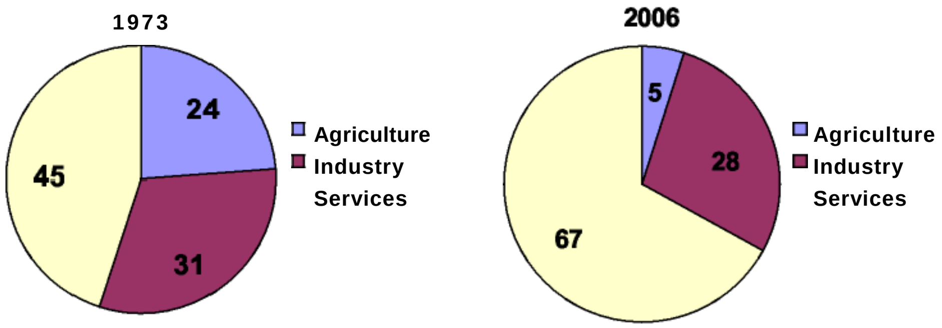
Source: *CSO (Labour Force Survey and QNHS)*

The impressive rate of employment growth led to a reduction in the unemployment rate from 16% to 4% between 1988 and 2007 (Figure 2.2). Between 1986 and 2003 total employment grew by 60 per cent, with non-agricultural employment, and in particular private sector employment, growing at a faster rate of 80 per cent. Over the same period, labour force participation rates rose markedly and emigration was replaced by a rising net inflow of population. The improvements in labour market outcomes were widely spread across regions, age groups, and educational levels. Employment in agriculture and the traditional industrial sectors continued to decline but rapid employment growth occurred in newer manufacturing sectors such as electronics, pharmaceuticals and medical instrumentation, construction, tourism and internationally traded financial sectors.

2.2.2 Sectors of Employment

It is evident from Figure 2.3 that the agricultural sector has declined in terms of its contribution to total employment in Ireland. In the 1960s, even before accession to the EU, there was significant restructuring in the Irish economy away from agriculture towards industry and services. Between 1960 and 1973 the share of agriculture in GDP fell from 25 to 19 percent. This decline continued in subsequent years, so that by 1998 agriculture accounted for only 6 per cent of total value added, in comparison to the 53 percent share by services (Kennedy, 2001). In 1973 agriculture (farming sector) accounted for 24 percent of total employment compared to approximately 5 percent in 2006. Simultaneously, the numbers working in the services sector has grown from under half a million in 1973 to almost 1.2 million in 2003, a total increase of over 700,000 persons. In 2006, approximately two thirds of the working population were employed in the Services sector.

Figure 2.3: Comparisons of Employment by Sector (1973 & 2006)



Source: *National Income and Expenditure, various issues; ESRI Quarterly Economic Commentary, December2000; data compiled for the ESRI Medium-Term Review 1999-2005*

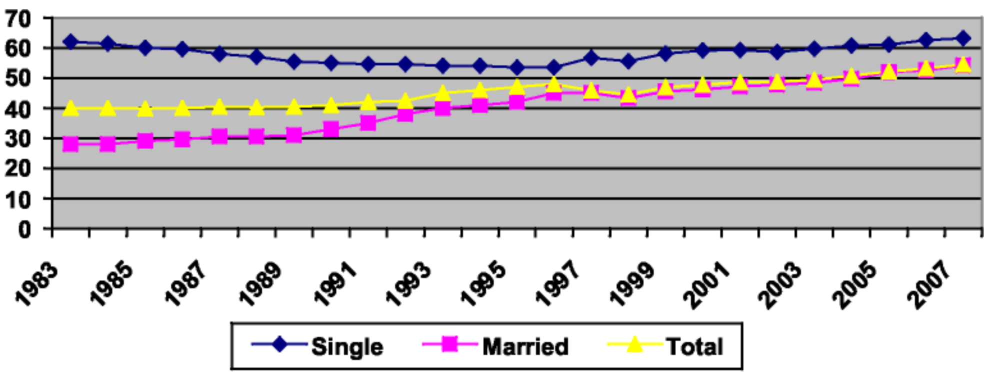
Most of the employment growth experienced in Ireland occurred in newer sectors such as electronics, pharmaceuticals, and medical instrumentation where foreign-owned firms account for over 90 per cent of output. However, these sectors were badly affected by the slowdown after 2001, leading to an overall decline in manufacturing jobs. According to the 2006 census, manufacturing as a whole accounted for 12 per cent of total employment, compared with almost 20 per cent in the mid-1980s. Employment in construction has more than doubled since the early 1990s, increasing at the fastest rate of any sector. In 2007, it accounted for 13 per cent of all employment (CSO; QNHS Quarter 4), compared with 8 per cent in 1997. Employment in the publicly financed health and educational services has also increased quite rapidly, especially in recent years, but the numbers in core public administration have been contained.

2.2.3 Women in the Workplace

Against the backdrop of strong growth, the economy also benefited by the increasing level of female participation in the labour market. In 1983, only one-third of Irish women were in employment. The share has increased from 34 per cent in 1991 to 37 per cent in 1996 and then to approximately 55 per cent in 2007.

Empirical Research in Europe has found that re-entry to the workforce and length of leave is strongly related to women's human capital in the form of education and accumulated work experience (Macran et al., 1996; Jonsson and Mills, 2001a; Blossfeld and Drobnic, 2001) and family–cycle characteristics, such as age, number of children and age of mother at birth (Blossfeld and Drobnic, 2001).

Figure 2.4: Female Participation Rates in Ireland (1983-2007)

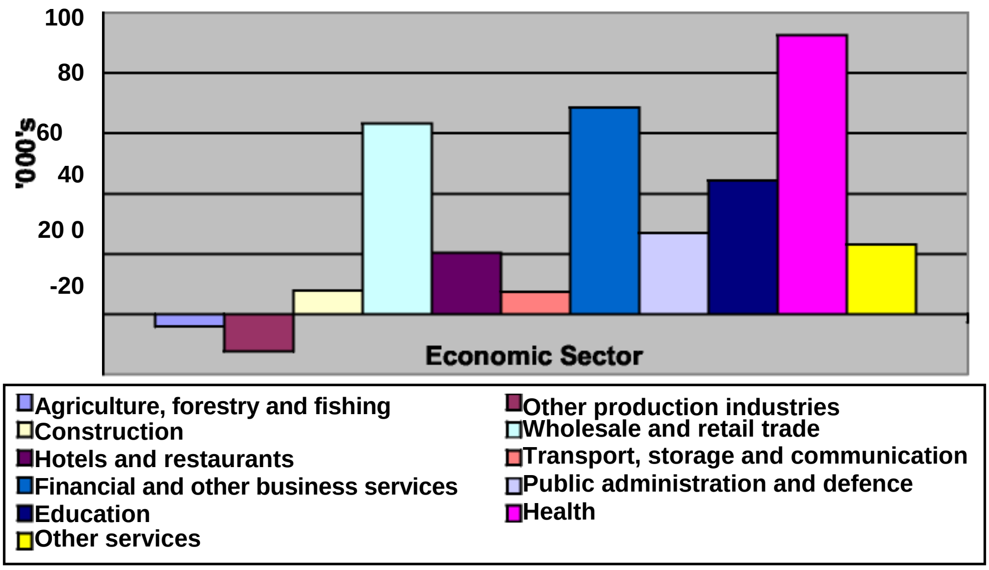


Source: *CSO*

In 1990, 55 per cent of women aged between 20 and 40 were in the paid labour force, whereas by 2000 it was just under 70 per cent. In addition, in 1990 4 per cent of women in that age group were students compared to 10 per cent in 2000. In the five years 1995-2000, the single biggest factor underlying the rise in labour supply was increased female participation - contributing 1.5 percentage points a year to the growth in the potential output of the economy.

The increasing labour force participation of women is partly due to equality legislation, but mainly due to improving economic conditions and flexible working patterns. In 1973, there were 287,800 females in employment, representing 27 percent of total employment. In the thirty years since 1973, female employment grew by 464,000 while male employment grew by less than 262,000. According to Quarterly National Household Survey, in 2007 females accounted for over 43% of the numbers at work. As shown in figure 2.4 most of the increase in female participation comes from more married women in the workplace, which is due to a reverse of the traditional trend of women leaving the labour force on marriage.

Figure 2.5: Female labour force changes (1997-2007)



Source: *´analysis done by Teagasc/FÁS using the CSO; QNHS´*

The most notable change of interest in this study is that the number of women employed in the agriculture, forestry and fishing sector has declined by 25% between 1997 and 2007 while there has been significant increases in female participation rates in the education, wholesale and retail trade, financial and other business services and health sectors (Figure 2.5).

The decline in female participation in farm employment is substantiated by the increasing numbers of farmers' spouses participating in the off-farm labour market. In 1995, 15 per cent of farmer's spouses had off-farm employment, this trend has continued to grow and by 2006, 35 per cent of farmer's spouses were participating in the off-farm labour market.

This decrease in female participation in the farm labour market may be a result of the pull factors of higher salaries and better working conditions in the non-agricultural sector or the push factor of the poor economic outlook for farming.

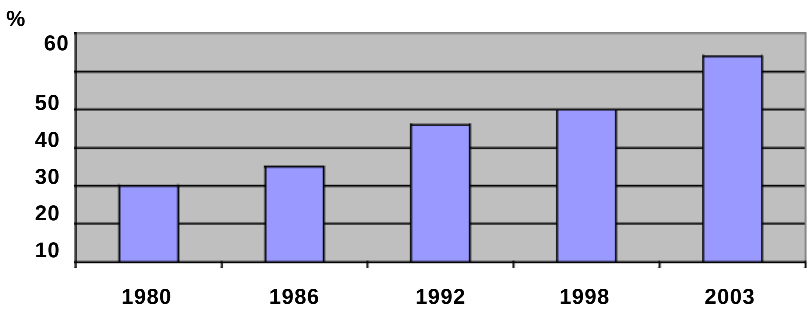
2.2.4 Education

The factors pertaining to the strong economic growth experienced by Ireland in the 1990's have been outlined in the previous section. The economy transformed from being characterised as a labour surplus economy as evidenced by high unemployment rates to a situation of excess demand for labour which heralded increased participation rates by females. The growing stock of human capital due to rising levels of educational attainment in the inflow to the labour force may also have had a profound influence on the demand for labour in that it proved an attraction to foreign enterprise, which in its absence might have chosen another location (Kennedy, 2001).

The move towards a more knowledge based economy has been facilitated by the increasing level of third level educational attainment and the increasing levels of female participation in the Irish labour market. Ireland has experienced substantial increases in participation in higher education since the 1960s. It has been argued that the expansion in educational participation, at both second and third level, has been one of the main factors underlying Ireland's rapid economic growth during the 1990s (Fitzgerald, 2000).

The national rate of admission to higher education was 54 per cent in 2003 (Figure 2.6), which means that 54 percent of school leavers continued in fulltime education. This is an increase of 10 points on the 1998 admission rate of 44 per cent. Indeed, admission rates have increased to such an extent that the rate of admission in 2003 was more than twice the 1980 rate.

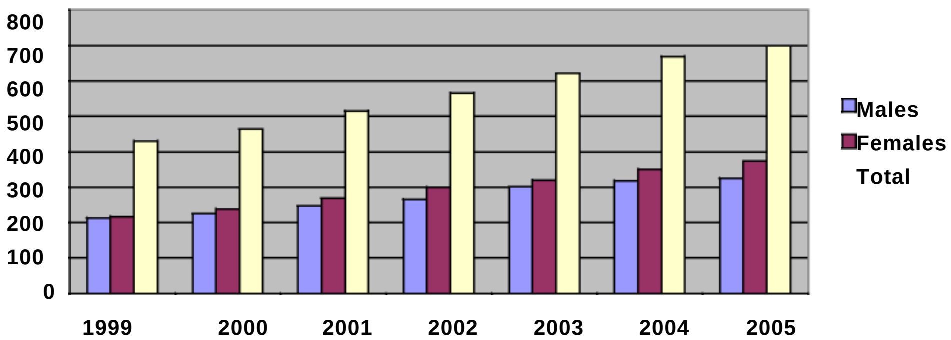
Figure 2.6: Trend in Admission Rates to Higher Education, (1980-2003)



Source: *HEA; WHO WENT TO COLLEGE IN 2004? A NATIONAL SURVEYOF NEW ENTRANTS TO HIGHER EDUCATION.*

The data presented in Figure 2.7 confirms the trend of increasing numbers of people pursuing further education with the numbers with a third level qualification almost doubling between 1999 and 2005.

Figure 2.7: Persons aged 15 to 64 years with a third level qualification ('000s)

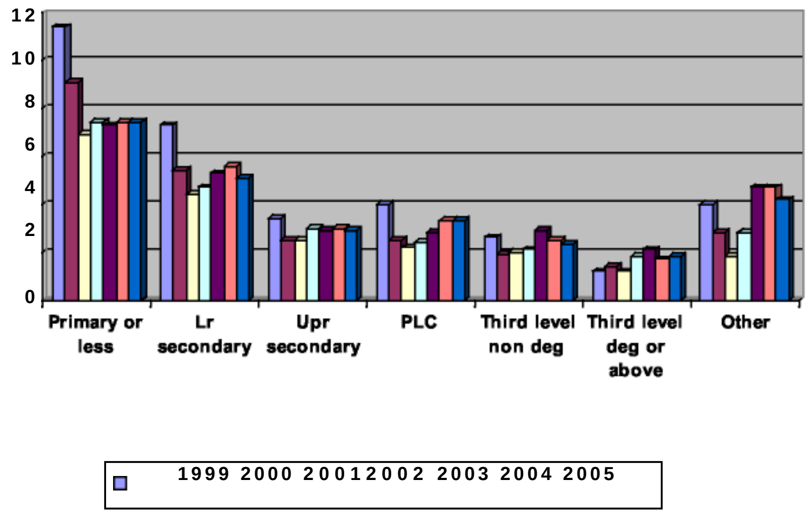


Source: *'analysis done by Teagasc/FÁS using the CSO; QNHS Module on Educational Attainment, 2002-2005'*

It has been argued that the rapid development of Irish society over the past four decades entailed a process of occupational upgrading to meet the skill needs of a rapidly modernising economy. As a consequence, educational credentials have come to assume major importance in determining the economic prospects of individuals

(O'Connell, 2000). The importance attached to the attainment of a third level educational qualification is evident from Figure 2.8. The unemployment rate for those aged 25-64 with a degree or above is just 1.8 percent compared with 7.4 percent for persons whose highest educational attainment level was primary or below.

Figure 2.8: Unemployment rate of persons aged 25 to 64, classified by the highest level of education attained, 1999 to 2005



Source: *'analysis done by Teagasc/FÁS using CSO; QNHS, Module on Educational Attainment, 1999-2003, 2002-2005'*

2.2.5 Conclusion

The economic growth experienced in the 1990s resulted in Ireland's transformation from being traditionally characterised as a labour surplus economy where the unemployment rate was held in check only by emigration, low labour force participation rates, and a continued reliance on subsistence farming to one of excess demand for labour, as witnessed by the significant decrease in unemployment rates in the 1990s. As stated by Kennedy (2001), the growth in human capital stock, as evidenced by increasing levels of educational attainment, had a significant influence on the demand for labour by attracting foreign enterprises. The excess demand for labour resulted in increased labour force participation rates by females and led to a restructuring of the labour market.

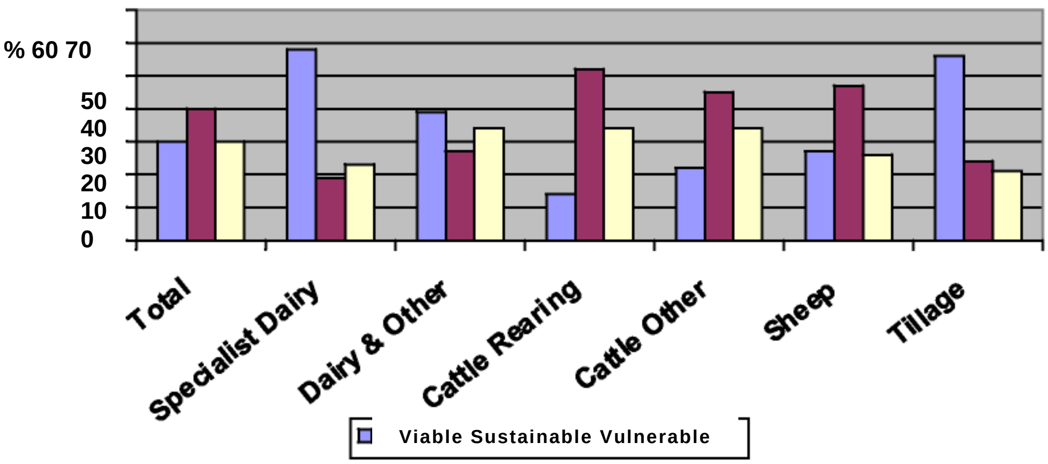
Section 2.3 analyses how economic growth has affected the agricultural sector, identifying the numbers employed in the agricultural sector and analyses the economic status of the farming population represented in the 2004 National Farm Survey (NFS).

2.3 The Farm Economy

The total number of farms in Ireland has been decreasing by approximately 2 percent per year for the last decade or so. The most recent statistics show that there were approximately 130,000 farms in Ireland in 2002 (CSO 2002). The farming population of 130,000 farms is comprised of both full and part-time farms.

Here we classify the farming population according to their economic status. Farms are classified as being economically viable businesses. An economically viable farm is defined as one having (a) the capacity to remunerate family labour at the average agricultural wage, and (b) the capacity to provide an additional 5 per cent return on non-land assets, (Frawley and Commins 1996). Farms that are not economically viable but where the farmer and/or spouse participate in off-farm employment are classified as sustainable. Although these farms are not economically viable as businesses, the farm household may be sustainable in the longer term due to the presence of an off-farm income. Non-viable farms where neither farmer nor spouse is involved in off-farm employment are considered economically vulnerable. Due to the poor economic return on these farms and the lack of any other gainful activity, the farm business is unlikely to be sustainable in the longer term. The economic status of the 2006 farming population is presented in Figure 2.10.

Figure 2.10: Viability of Farming in 2006



Source: *NFS, 2006*

The National Farm Survey in 2006 comprised of 1,159 farms representing 113,100 farms nationally. In relation to these farms, 30 per cent were classified as economically viable, 40 per cent were sustainable and 30 per cent were vulnerable. These figures indicate that without the contribution of off-farm employment to the farm household income, 40 per cent of the farming population would be in a vulnerable position, in addition to the 30 per cent already in this category. However, the variation in the economic status of farms is more apparent when analysed with respect to the systems of farming.

The specialist dairy system has the highest percentage of economically viable farms with 58 per cent. The cattle farming systems have the fewest viable farms. While there is a significant difference across farming systems the importance of off-farm income to the sustainability of farm households in general is evident.

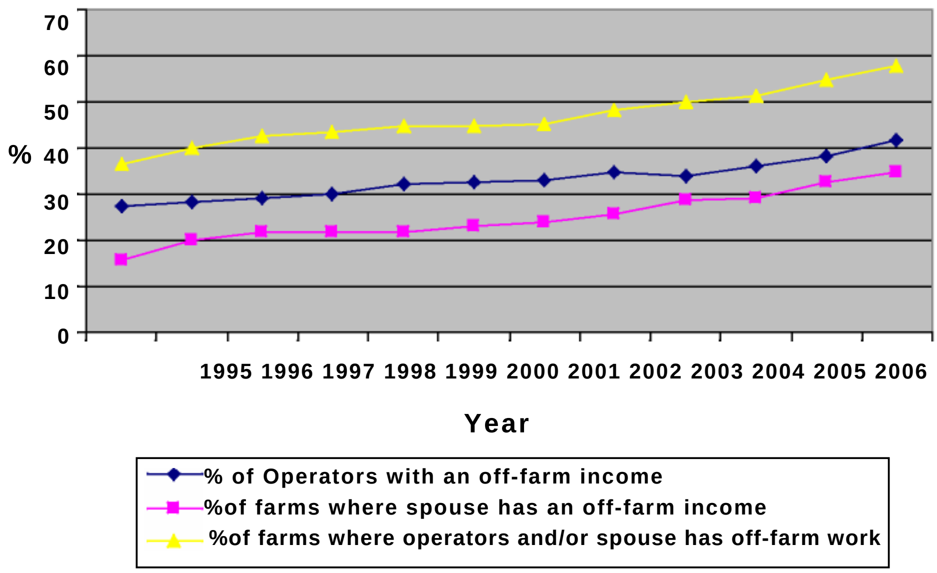
The analysis of the total farming population shows that 70 percent of farm households would be in an economically vulnerable position if it were not for the presence of off-farm income. Clearly, off–farm income has assumed an integral role in ensuring the sustainability of farm households.

2.3.1 Off-Farm Employment

This section will address the increasing trend of farm households' participation in the off-farm labour market. Increasing non-farm wages and restricted farm incomes have affected the relative earnings from activities on and off the farm and thus have resulted in increasing numbers of farmers working off-farm (Keeney and Matthews, 2000). In 1995, Teagasc's National Farm Survey (NFS) recorded that on 36.5 percent of the farms sampled (1,201) the farmer and/or spouse had an off-farm job. By 2006, this figure had increased to over 58 percent.

From figure 2.11, we can see that in 1995, 26 percent of farm operators were engaged in off-farm employment and this figure has risen to a little over 40 percent by 2006. For the spouse, growth in off-farm employment has been even more dramatic growing from 15 percent of spouses in 1995 to 35 percent in 2006. These trends mirror the general macroeconomic trend in relation to female participation. The percentage of households with at least one off-farm income source i.e. either the farmer or the spouse or both are employed off the farm, has risen from 36 percent in 1995 to 58 percent in 2006 across all farm systems.

Figure 2.11: Off-farm employment status (1995-2006)



Source: *Derived from Teagasc, NFS 1995-2006*

The sectors associated with providing off-farm employment opportunities for farm households are recorded by the NFS. Statistics show that operators who work off the farm tend to be employed in the more "traditional" sectors of the economy such as, agriculture (20%), construction (20%) and manufacturing (10%). The positions most commonly held by farmers include building tradesmen, labourers, drivers or machine operators.

With regards to the off-farm occupations of farmers' spouses, the data shows that a significant share of them are employed in a professional, associate professional and clerical capacity. Results from the National Farm Survey of 2006 show that 25 per cent of the spouses participating in the off-farm labour market are employed in clerical duties. More than 29 per cent of spouses are nurses or teachers; this is an increase of approximately 5 percentage points on 2002 figures. There are also a significant number (8%) of spouses employed in the domestic services industry. Over 3 per cent of spouses work in hotel and catering related activities, either as proprietors of lodging and catering establishments or as workers, a decrease of 4 per cent on 2002 figures, while in excess of 5 percent are employed in the retail sector.

As outlined previously, there have been increasing participation levels in the off-farm labour market by farm households. The off-farm income earned has assumed an important role in the sustainability of farm households. Given the buoyancy of the macro economy in recent years, off-farm employment opportunities have been readily available for operator and spouse alike. However, it is important to consider the longer-term prospects for off-farm employment, which will be discussed in Chapter 7.

2.4 Theoretical Drivers of Off-Farm Employment:

This section of the chapter examines the increasing phenomenon of part-time farming from a theoretical viewpoint by reviewing literature and identifying the factors that may be driving this trend.

An extensive literature has evolved that investigates the determinants of farm household involvement in nonfarm labour markets. A number of studies have considered various demographic factors relevant to participation in off-farm labour markets, including age, household size, experience, and the presence of small children in the household (Goodwin and Holt; Huffman and Lange; Lass and Gempesaw; and Sumner). In addition, a number of farm characteristics have been shown to be relevant to the degree of participation in off-farm labour markets. One of the principal theories used to describe farmers' labour allocation decisions is the theory of time allocation.

2.4.1 Theories of Time Alocation

In his seminal paper, Becker (1965) assumed that households behave to maximise the household's utility function defined over consumption commodities and that their time is allocated between work and leisure so as to maximise that utility function. The allocation of farm labour can be modelled using an agricultural household model that integrates agricultural production, consumption and labour supply decisions into a single framework and operates to maximise Becker's utility function. The agricultural household model developed by Singh, Squire and Strauss (1986) has been frequently applied to the study of labour allocation (for example, Huffman and Lange, 1989; Gould and Saupe 1989; and Weersink et al 1998).

If we consider the labour allocation decision from a farm operator's perspective only, then we assume that the farm operator maximises his utility function, *U,* which, drawing from Becker (1965), is derived from purchased goods, G, and leisure, L, and is affected by environmental factors, E, such as age, which are assumed to be exogenous to current consumption decisions.

$$U=U(G,L;E) \qquad (2.1)$$

Utility is maximised subject to constraints on time, income and farm productivity. The farmer has a fixed amount of time, T, which can be allocated to either leisure or work, which consists of time spent on the farm, T_F, plus the hours spent on off-farm work, T_O. It is normally assumed that time allocated to leisure and farm work is positive but for some individuals the time allocated to non-farm work may be zero, hence the inequality in equation 2. Thus the time constraint can be expressed as:

$$T=T_L+T_O+T_F \qquad T_O\sim 0 \qquad (2.2)$$

The consumption of market goods at the price P_G is limited by the amount of available income earned from farm profits, off-farm wages, and other exogenous household income, V. Farm profit is equal to the price of farm output, P, multiplied by output, Q, less variable costs of production, RX, where R is the input price vector and X is the quantity of inputs used. Off-farm income is the product of the wage rate, W, and the hours worked off-farm, T_O. The budget constraint is therefore:

$$P.Q- R.X+ W.T_O + V=P_G.G \qquad (2.3)$$

The technology available to produce farm output represents the final constraint to the household:

$$Q=f(F,X;Z_F, H) \qquad (2.4)$$

where $f(\cdot)$ is a strictly concave production function and Z_F is a vector of exogenous farm specific characteristics. Human characteristics are included in the production function to account for the increased efficiency assumed to be related to factors such as age and formal education. These same human capital variables will also influence the off-farm earning potential of the farmer along with other market conditions, Z, which implies that the wage rate should be expressed as:

$$W=W(H,Z) \qquad (2.5)$$

Drawing from the neo-classical labour theory, the framework assumes that an individual maximises utility by choosing hours of farm labour, off-farm labour and leisure so that at the optimum, the marginal utilities of these hours are equal. The decision to participate in off-farm employment is binary. Rational individuals are expected to participate when the off-farm wage offered exceeds their reservation wage. This can be expressed as follows,

$$E[I_i^{\prime}X]=P(O_i=1)=P(w_r<w_i)=\beta^{\prime}X \qquad (2.6)$$

where $P(O_i = 1)$ is the probability of $O_i = 1$, that is participating in off-farm employment, which occurs if $W^r<W^i$, that is the reservation wage rate is less than the wage offered off-farm. The probability of participating in off-farm work is estimated using a vector of exogenous variables X that are hypothesised to influence the latent reservation wage and off-farm wage rates and therefore the participation decision. Variables that increase the off-farm wage rate relative to the reservation wage increase the probability of off-farm work and the opposite is true for variables that decrease the off-farm wage rate (Huffman, 1988).

The agricultural household model outlined the factors that theoretically influence the off-farm employment decision. In the following section of the paper some of these factors are outlined in more detail.

2.4.2 The Effect of Farm Household Characteristics

Theoretically, farm household characteristics such as the presence of children and other family members, the size of the family and other sources of income have been incorporated into the agricultural household model through their effect on the budget constraint.

In theory, if the household is comprised of a significant number of young children, this increases the demand for consumption and subsequently increases the pressure on the budget constraint. Therefore, this increases the necessity to allocate more time to off-farm employment activities so as to generate more income. If the farm household is composed of older children, then this may increase the farm labour supply and reduce the demand on the farmer's labour time. Empirically, the presence of children and other household members has been shown to significantly affect both the off-farm participation decision and off-farm hours supplied by the farm operator and spouse (Sumner, 1982, Lass et al, 1989). Mishra and Goodwin (1998) state that the presence of children under the age of thirteen years in the household significantly reduces the supply of off-farm labour. Lass, Findeis and Hallberg (1991) state that this effect is typically confirmed for the spouse but in relation to the operator, on the one hand, childcare may require a husband's time, but on the other, the presence of more children may generate higher pressure for obtaining additional income to meet the consumption needs of a larger family.

Family size generally has a significant impact on the off-farm participation of operators and spouses. According to Woldehanna, et al. (2000), households with a larger family size have a relatively higher marginal utility of income and a stronger desire to participate in off-farm work. Therefore, the increasing number farmers' spouses participating in the off-farm labour market (increased by 17 per cent between 1995 and 2007) may be due to pressure on the budget constraint caused by the size of the family household.

2.4.3 The Effect of Household Wealth

An increase in the farm household income from sources other than labour income is hypothesised to relax the budget constraint and reduce the probability of farm households participating in the off-farm labour market. Wealthier farm households may be less likely to seek off-farm jobs for two main reasons. First, wealthier households may be less risk averse relative to poorer ones, which may reduce their incentives to seek a more stable source of income other than farm earnings. In this context wealth represents a form of self insurance. Second, wealth may be a source of non-labour income (e.g., interests, dividends, rents, etc.), which may further reduce incentives to work off the farm.

The effect of sources of exogenous wealth such as non-labour income, social transfers and other income on the farm households' decision to participate in the off-farm labour market, have been tested empirically by Huffman and EL Osta (1998). These alternative incomes increase the net farm income, inflating the marginal value of farm labour, which determines the reservation wage that must be exceeded before an off-farm job is considered, thereby reducing the probability of off-farm participation (Serra et al, 2003).

2.4.4 Policy

The implementation of agricultural policies may also affect the income of farm households and may determine whether members of the farm household participate in the off-farm labour market. The Luxembourg Agreement on reform of the Common Agricultural Policy (CAP) has allowed for the decoupling of all direct payments from production from 2005 onwards. Decoupling payments are fixed income transfers that do not subsidize production activities, inputs, or practices. To date, in Ireland, most direct payments have been coupled to production, and therefore farmers were required to grow crops or stock animals to qualify for support. Decoupled payments can be considered as a source of non-labour income or exogenous household wealth, represented by V in equation 2.3 in the earlier discussion of the household model. As they are not linked to labour activity, it follows then that replacing coupled payments with decoupled payments is likely to affect the relative return to farm work and is likely to result in two conflicting effects. Burfisher and Hopkins (2003) suggest that if an individual receives an increase in non-labour income, i.e. wealth, the household budget constraint is relaxed and the individual can work less and enjoy more leisure while maintaining consumption that is a move to a higher indifference curve. On the other hand however, decoupled payments are likely to change the relative returns to farm and off-farm labour. If the returns to farm labour decrease relative to non-farm labour, the household model suggests, that the individual will increase the number of hours allocated to off-farm labour. This is referred to as a substitution effect. Therefore, decoupling is likely to result in both a wealth and substitution effect, whichever effect is greater will determine the impact of decoupling on labour allocation. The effect of decoupling on the labour allocation decision of Irish farm operators will be investigated in chapter 6 of this report.

2.4.5 The Effect of Human Capital

The most common human capital variables used in previous empirical studies on off-farm labour participation have been age and education. In the context of the agricultural household model, age can influence the time allocation decision as it affects the returns to both farm and non-farm labour through human capital effects.

Many models have supported the hypothesis of a life cycle effect (Huffman 1980 and Sumner 1982), which contends that individuals will increase their work effort in earlier years in order to accumulate assets to draw on later in life. Previous research has found that older farm operators are less likely to work off the farm, which may reflect differences in attitudes regarding work that are correlated with age (Mishra and Goodwin 1998).

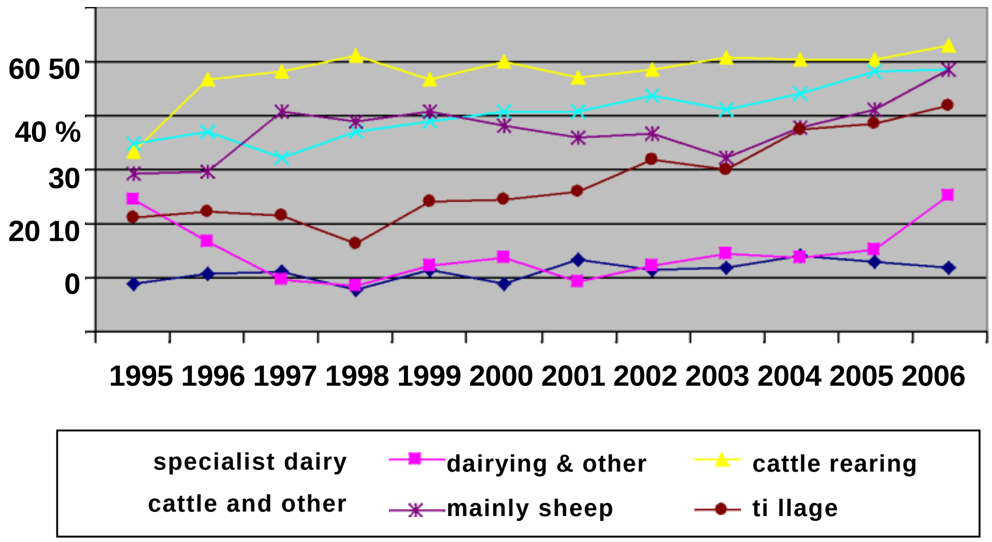
Although education would be expected to enhance farm and off-farm productivity, one might expect that increased education raises individuals' human capital stock, which has a positive impact on potential market earnings, thereby raising the relative wages off-farm compared to on farm (Goodwin & Holt, 2002). Orazem and Mattila (1991) have shown that schooling produces occupational specific human capital and that the returns to schooling are higher for non-agricultural occupations. Hence, higher levels of schooling, in particular non-agricultural related schooling, would be expected to influence the probability of entering full-time farming negatively, but may influence the decision on part-time farming or the choice of a non-farming occupation positively. With regards to Ireland, there has been a significant increase in the third level education participation rates, the rates of admission have doubled since the 1980s with 54 per cent of school leavers continuing in full time education. O' Connell et al (2006) have shown increased that third level participation rates of farm operators children have increased significantly between 1998 and 2004. In 2004, 12.4 per cent of new entrants to higher education were from the socio economic group of farming. Therefore, the increased levels of educational attainment raises human capital stock and raises the relative off-farm wages compared to the farm income and decreases the likelihood of entering full time farming.

2.4.6 The Effect of Farm Characteristics

Another important element of the farm household model is that farming provides an income source: the higher the farm income the lower the need for off-farm income to satisfy the budget constraint. Previous studies note the impact of different farming systems on the decision to work off the farm (Sumner 1982; Lass et al 1989, Gould and Saupe 1989). The reason for such a specification is that farming systems that are labour intensive will be less likely to have operators involved in off-farm employment. The profitability of farming systems also assumes an important role in the decision to participate in the off-farm labour market. For example, in Ireland specialist dairy farms tend to have the lowest probability of farmer participation in off-farm employment.

Figure 2.12 shows the stark contrast between systems in terms of the percentage of operators involved in off-farm activities. The figure shows that there has been an increase in the levels of off-farm participation across all farming systems, with the exception of the dairying and other system since 1995. It is evident from the diagram that the cattle rearing system has a larger proportion of farms with off-farm employment than any other system. The systems with the lowest percentage of farms with off-farm employment were the specialist dairying (14.1 per cent) and the dairying and other system (13.8 per cent), these are the most labour intensive systems requiring a larger allocation of time and subsequently resulting in less hours allocated to off-farm employment.

Figure 2.12: Off-Farm Employment by System of Farming

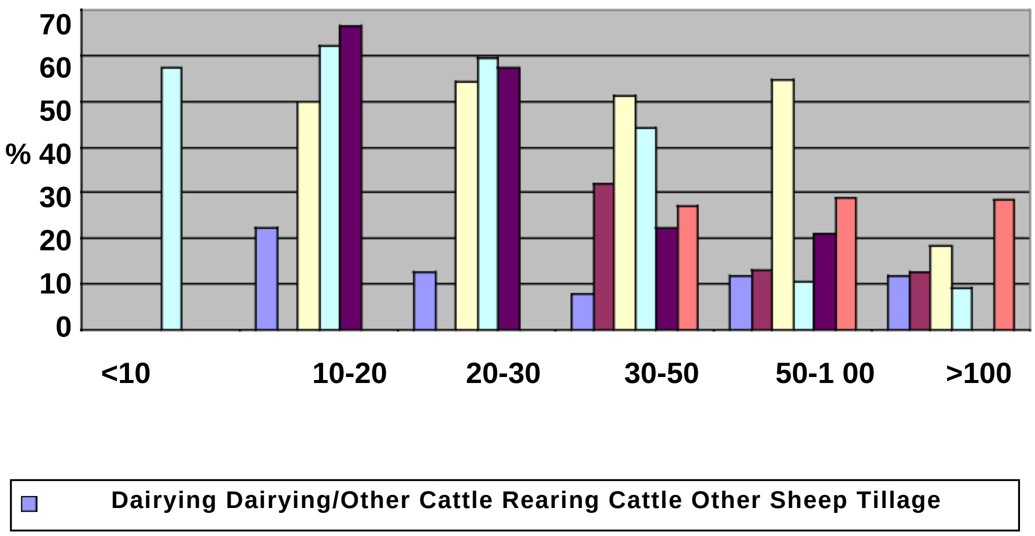


Source: *Derived from Teagasc, NFS 1995-2006*

Many authors contend that the larger the farm, the lower the probability that a farmer works off-farm. Mishra and Goodwin (1997) found a negative correlation between off-farm jobs and farm acreage. However, Mishra et al (2002) found that dual careers are often pursued even in households operating very large farms.

In relation to the sample of farms which participated in the 2006 NFS, it is evident from Figure 2.13 that as the farm size increases, the number of farmers with off-farm employment decreases. This is apparent, in particular, in the dairying and dairying and other farming systems, where the percentage engaged in off-farm employment decreases from a high of 22% (dairying) with a farm size of 10-20 U.A.A. to 12% with a farm size in excess of 100 U.A.A. The system of farming most consistent with off-farm employment over all farm sizes is cattle rearing, where there are high numbers engaged in off-farm employment irrespective of the size of the farm.

Figure 2.13: Off-farm employment by size and system of farming:



Source: *NFS 2006*

2.4.7 The Effects of Local Labour Markets

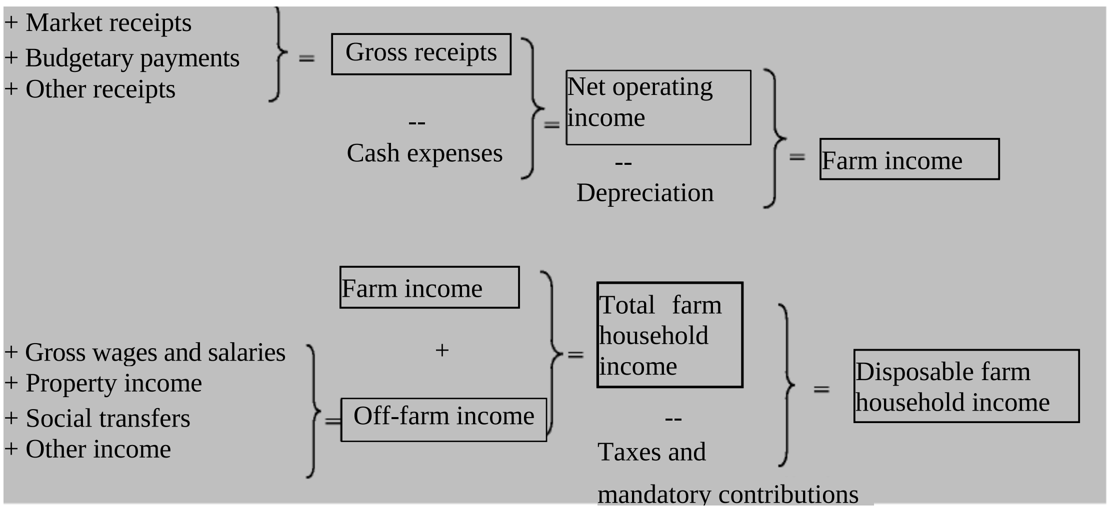
Local labour market characteristics theoretically affect the off-farm income earnings in the agricultural household model. If the local unemployment rate is high, the relative off-farm wages decrease compared to the farm wage, which results in less hours worked off the farm. Tokle and Huffman (1991) state that the labour force participation decisions of households are also affected by changes in anticipated local economic conditions. For farm households, the probability of wage work increases when expected farm output prices decline and decreases when local labour demand grows.

2.5 Measures of Non-Farm Income

It is evident that there has been an increasing trend of farm households participating in the off-farm labour market. Off-farm income now plays a vital role in ensuring the sustainability of farm households. To assess how reliant farm households are on off-farm income, we need to gauge the contribution of this source of income to the total farm household income. In order to address this issue, we need to estimate the off-farm income for the operator and/or spouse participating in the off-farm labour market.

Household income is defined by the CSO "to include all money receipts of a recurring nature which accrue to the household regularly at annual or more frequent intervals, together with the value of any free goods and services regularly received by household members and the retail value of own farm or garden produce consumed by the household." (CSO, 2002; 63) Taking this definition we define gross household income as the gross income of all household members from all sources, including the farm income, other earned and non-earned income, together with state transfers.

Figure 2.14: Components of farm household income



Source: *OECD, 2003*

Farm households derive a significant share of their income from sources other than farming. In 2007, approximately 58 percent of farm households had an operator and/or spouse with off-farm employment and 40 percent of farms were only sustainable due to the presence of an off-farm income source. However, in order to reflect the income situation of farm households, all sources of income should be taken into account. According to the OECD (Figure 2.14), total farm household income consists of farm and off-farm income. Off-farm income comprises of gross wages and salaries, property income, social transfers and other income, while farm income is defined as gross output less total net expenses. In this section we will use three data sources to estimate total farm household income. Initially, the data sources will be outlined before discussing the advantages and disadvantages of each in relation to the estimation of total farm household income. Finally, an estimate will be provided incorporating the differing data sources.

1) **EU-SILC:** The Survey on Income and Living Conditions (SILC) is an annual survey conducted by the Central Statistics Office (CSO) to obtain information on the income and living conditions of different types of households. The survey also collects information on poverty and social exclusion. A representative random sample of households throughout the country is approached to provide the required information. The survey is voluntary from a respondent's perspective. The 2006 sample comprised of 14,634 individuals and 5,836 households.

2) **Household Budget Survey (HBS):** In the HBS, data is collected in both cross-sectional (pertaining to a given time in a certain time period) and longitudinal (pertaining to individual-level changes over time) dimensions. Therefore, certain households will be surveyed on an annual basis. In 1999-2000, 7,644 households participated in the HBS. This represented a response rate of 55% which was somewhat below the rate achieved in the 1994-95 HBS. The main purpose of the HBS is to determine in detail the current pattern of household expenditure in order to update the weighting basis of the Consumer Price Index. The maintenance of a detailed diary of household expenditure over a two-week period by the surveyed households is thus the main distinguishing feature of the HBS. Detailed information is also collected on all sources of household income and on a range of household facilities.

3) **National Farm Survey (NFS):** The objectives of the

   National Farm Survey (NFS) are to

1. Determine the financial situation on Irish farms by measuring the level of gross output, costs, income, investment and indebtedness across the spectrum of farming systems and sizes,
2. Provide data on Irish farm incomes to the EU Commission in Brussels (FADN),
3. Measure the current levels of, and variation in, farm performance for use as standards for farm management purposes, and
4. Provide a database for economic and rural development research and policy analysis.

To achieve these objectives, a farm accounts book is recorded for each year on a random sample of farms, selected by the CSO, throughout the country.

The National Farm Survey is designed to collect and analyse information relating to farming activities as its primary objective. Information and data relating to other activities by the household are considered secondary and as such where this information is presented it should be interpreted with caution. For 2007, there are 1,151 farms included in the analysis, representing 111,913 farms nationally.

2.5.1 Advantages and Disadvantages of Each Data Source:

The EU-SILC provides detailed information with regard to the off-farming activities of farm operators, which makes it easier to provide an estimation of off-farm income. However, unlike the NFS, it does not provide detailed information regarding the farming activities of farm households. The farm household income is calculated using the broad definition of a farm household, which is defined as farm households (including those in urban areas) that have an income from farming. It also provides information pertaining to non labour income, social transfers and other direct income. A potential problem with the EU-SILC is that the questionnaire is completed on a voluntary basis and only 520 questionnaires were collected in 2004. Therefore, there are question marks over the integrity of the farm household income estimates.

The National Farm Survey (NFS) produced annually by Teagasc provides estimates of family farm income for different categories of farms. While the NFS collects valuable data in relation to the farm, socioeconomic and demographic characteristics pertaining to the farm operator employed on the farm, it provides limited information regarding off-farm occupations of farm operators/spouses. The off-farm income earned by operators are allocated to income ranges, however, there is no information relating to off-farm income earnings by spouses. Therefore, it is difficult to provide a precise approximation of off-farm income. The NFS also does not collect information pertaining to non labour income, social transfer payments or any other direct income, thus an estimate of total farm household income is unattainable.

The Household Budget Survey (HBS) provides estimates of the total income of farm households. Primarily designed as an expenditure survey, there are issues relating to the reliability of the income data; however it can still be useful for comparison purposes if the degree of income under-reporting is assumed the same for farm and non-farm households. The advantage of the HBS over the NFS is that it provides information on both the farming and off farm activities of the farm household, incorporating socioeconomic variables such as education levels of operator/spouse which are not collected by the NFS. The farms included in the data are the same farms as the NFS and farm data is provided by Teagasc, the main disadvantage of the HBS is that it is only undertaken every four years.

In analysing the data one of the issues of concern is the classification of farm households. This is a concern, as many farm households only derive a small proportion of their income from farming. Following on from these concerns the CSO have provided two sets of analysis, one based on a broad definition of farm households, which is outlined in the previous section, and another based on a narrow definition. The CSO's Household Budget Survey used a narrower approach to define farm households. It defines a farm household as a household in which the head of the household is a farmer or the head of the household is a retired farmer and there is at least one other farmer in the household. This definition would exclude part-time farmers who have another major occupation and who are not living with a retired farmer. This makes it difficult to estimate off-farm income.

2.5.2 Estimating off-farm income

In the absence of a data source that comprehensively records total farm household income every year, an alternative is to use the information collected by the NFS on non-farm activities to estimate the non-farm income arising from those activities. The NFS survey provides a list of 37 off-farm employment occupational categories. It also provides information on the number of hours worked off the farm for both the operator and spouse and the various ranges of off-farm income earned by the operator. However, the difficulty with providing an estimate of the farm households off-farm income using the NFS sample is that there is no information with regards to the ranges of off-farm income earned by spouses. Therefore, we have provided an estimate of the off-farm income for the farm households participating in the off-farm labour market by multiplying the earnings per hour for the various off-farm occupations by the number of hours worked off the farm provided by the NFS. The earnings per hour estimates for the different off-farm occupations have been extracted from various data sources which can be found in Appendix 2A of the Appendix section[1].

Table 2.1 provides a comparison of the estimated off-farm income of farm households using the EU-SILC and NFS data. The EU-SILC estimates have been ascertained from the annual review 2005/2006 published by the Department of Agriculture and Food and are contrasted against the estimate we have provided encompassing the NFS 2004 data.

Table 2.1: Estimates of Farmhousehold income

	EU-SILC	HBS	NFS
Farm Income	€14,382	€18,320	€25,019
Non-farm employment	€21,692	€14,369	€13,629
Other Direct In come	€806	€930	n/a
State Transfers	€6,825	€6,228	n/a
Gross Income	**€43,704**	**€39,847**	**€38,648**

Source: *Annual Review 2005/2006, Dept of Agri & Food, NFS 2004*

The off-farm income estimates provided by the Annual Review are calculated based on the broad and narrow definition of a farm household, the latter which is used by the HBS and which has been described in the previous section. From the table it is evident that there is a considerable difference between the family farm incomes generated using the two datasets. The difference could be contributed to the size of

[1] The problem with using different sources is that there may be issues concerning the consistency with which these estimates are collected and this may compromise the accuracy of the off-farm income estimate for farm households

the samples included in the two datasets. The EU-SILC consisted of 520 completed farm questionnaires in contrast to the NFS which encompassed 1,194 farms.

The EU-SILC estimate of farm income is calculated by taking the average income for farm size and system while the family farm income collected by the NFS represents the financial reward to all members of the family, who work on the farm, for their labour, management and investment.

In relation to the off-farm income, the estimate generated using the NFS is close to the approximation provided by the HBS data. However, there is a considerable difference between the off-farm income estimate provided by the broad definition of a farm household of the EU-SILC and the NFS estimate. Unfortunately, the NFS does not provide information on state transfers or other direct income for the farms included in their sample; therefore, no estimate can be provided.

Table 2.2: Farm household Income (€'s) by Economic Category for the Farms in the NFS 2004 Sample

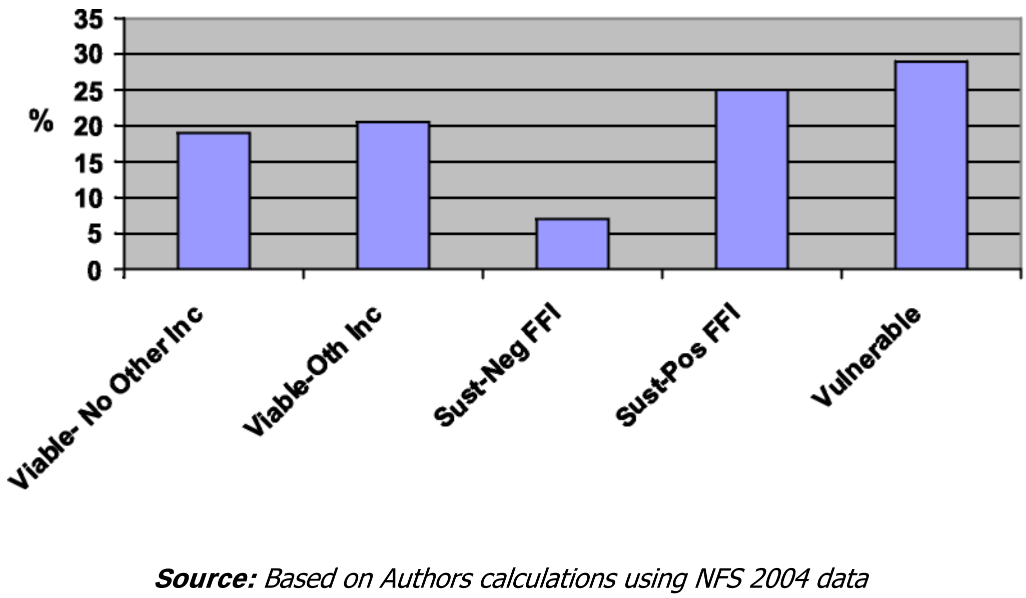
Economic Categories	**All Farms**		**Vulnerable**	**Sustainable**		**Viable**	
	Famhslds With ofjob	Farmhslds w/o ofjob		Negative FFI	Positive FFI	Farmhslds With ofjob	Farmhslds w/o ofjob
No. of farms	536	554	296	41	250	245	258
Average FFI	18,510	22,911	9,393	(3,478)	10,193	36,842	44,547
Average Off-farm Income	30,080			34,590	28,403	28,353	
Average Total Farmhousehld Income	48,591	22,911	9,393	31,112	38,596	65,195	44,547

Source: *Based on Authors calculations using NFS 2004 data. Note: Estimates are rounded off to one decimal place.*

The estimate of off-farm income we have provided allows us to assign the farm households included in the NFS to different economic categories. The economic status of the farm households encompassed in the NFS sample are outlined in Table 2.2. The table outlines the estimated total farm household income for the farms included in the 2004 NFS. These farms are then assigned according to their participation in the off-farm labour market.

In relation to the 2004 NFS, the farms with and without off-farm employment are evenly distributed. However, there is a significant difference between the total farm household income estimates for the two groups. In relation to family farm income, as anticipated, those farms not participating in the off-farm labour market have a higher estimate. While those farms with off-farm employment have a significantly higher total farm household income, the average income earned by those farms was €30,080.

Figure 2.15: Farm Household Income by Economic Category for the Farms in the NFS 2004 Sample



Source: *Based on Authors calculations using NFS 2004 data*

The economic status of the farms included in the NFS can be dissected even further. As illustrated in figure 2.15, the viable category includes farms with and without off-farm employment, while the sustainable category can be divided on the basis of family farm income. Off-farm employment assumes an integral role in protecting farm households from a vulnerable economic position. Particularly when family farm income is insufficient to cover family labour and returns on assets, the off-farm income ensures the sustainability of farm households. The contrasting fortunes of farms is highlighted by the fact that 7 per cent of all farms are sustainable but have a negative family farm income, as shown in figure 2.15. For these farms, off-farm income assumes an even greater importance, as the off-farm income sustains both the household and the loss making business. Results also show that off-farm income accounts for between 60 to 100 per cent of the total farm household income for 63 per cent of the farms located in the sustainable with a positive family farm income category (see Appendix 2).

The most surprising result is the number of viable businesses with farmers or spouses participating in the off-farm labour market. Our results show that almost half of all viable farms also have an off-farm income and typically off-farm income accounts for between 20-50 per cent of total farm household income in these households. This represents a significant proportion of total income and it would be interesting to investigate what function this income has in ensuring the viability of these farm households.

2.6 Conclusions

The macroeconomic changes brought about by strong economic growth have led to the restructuring of sectoral employment in Ireland. The contribution of traditional industries, such as agriculture, to both GDP and total employment decreased and emphasis was placed on a move towards a more knowledge based economy. Ireland transformed from a labour surplus economy to one of excess demand for labour and resulted in increased labour market participation rates by females. The increase in human capital stock attributable to increased educational attainment levels was one of the factors in attracting the foreign direct investment necessary to facilitate the strong economic growth.

This era heralded a change in the agricultural sector. Over the last decade the number of farm households participating in the off-farm labour market has increased significantly and reached a high of almost 58 per cent of the farms in the 2007 NFS. Off-farm income now assumes an important role in ensuring the sustainability of farm households, as evidenced in the NFS 2006 where 40 per cent of farms were sustainable. The NFS has shown that the majority of farm operators with off-farm employment have occupations residing in traditional manufacturing, construction or agriculture sectors, while the farmers’ spouses participating in the off-farm labour market were typically associated with employment in teaching, nursing or clerical occupations.

The importance attached to off-farm income was emphasised when we provided an estimate of the total farm household incomes and examined the economic status of the farms included in the 2004 NFS. It was shown that approximately 7 per cent of the farms required off-farm income to sustain not only the farm household but also the farm which was operating at a loss. It also showed that a significant proportion of viable farms (20 per cent) were participating in the off-farm labour market.

CHAPTER 3
IS OFF-FARM INCOME DRIVING ON-FARM INVESTMENT?

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3.1 Introduction

The previous chapters of this report have outlined the growing reliance by farm households on non-farm incomes. Chapter 2 has highlighted the large number of farm households that are sustainable only because of the presence of off-farm income. The objective of this chapter is to explore the contribution of off-farm income to the viability of the farm business; specifically the focus of the analysis is the link between off-farm income and farm investment. The hypothesis tested is; does off-farm income drive on-farm investment?

Despite the ever growing divergence between farm and non-farm incomes, farmers continue to invest in agriculture. Data for Ireland shows that in the ten year period from 1995 to 2005 average farm incomes declined by almost 17 percent in real terms while net new investment increased by almost 30 percent over the same period (Connolly et al. 2005). Moreover, anecdotal evidence drawn from advertisements in the farming print media suggests that the market for agricultural farm machinery remains buoyant. Given that agriculture is a sector in relative decline, with farm numbers in decline and farm and non-farm incomes continuing to diverge, it is surprising then that new investment in farming has remained so positive, especially when one considers the alternative investment opportunities available in a buoyant economy like Ireland. It is, therefore, somewhat counter-intuitive that given the apparent disincentives to invest in farming that agricultural investment levels remain positive.

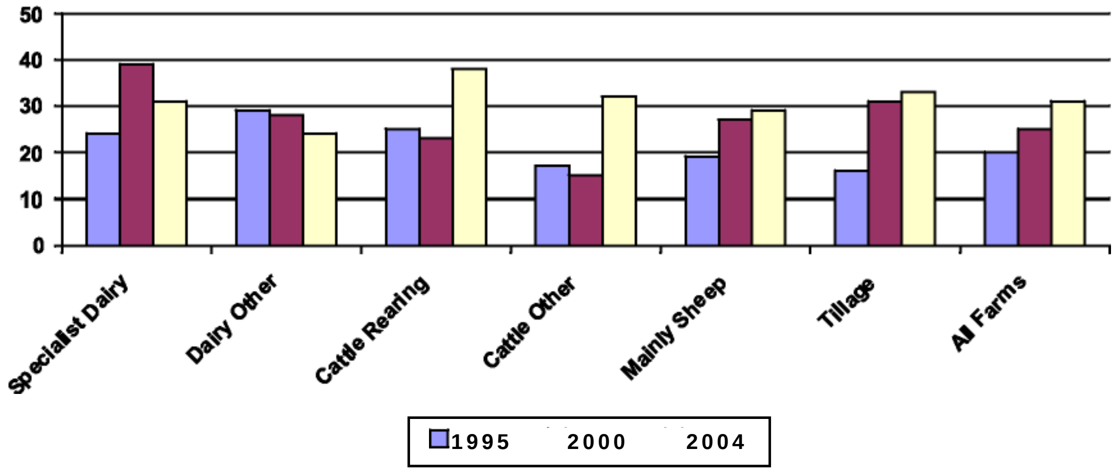
The chapter begins by exploring the factors affecting farm investment decisions with a view to identifying why farm investment has increased despite the apparent poor returns to farming. The chapter begins by providing a clear definition of farm investment and some background information on farm investment trends in Ireland. Following this a number of theories are developed that may explain the relationship between farm investment and off-farm income. These theories are investigated using the National Farm Survey dataset. The chapter concludes with a discussion of the results of the analysis.

3.2 Defining Investment

The National Farm Survey (NFS) records data on both gross and net new investment. Net new investment is defined as investment (including both purchase and repair) in buildings, land improvements, machinery, and production quotas, less all sales, grants and subsidies. The net new investment measure does not include land purchases. It is a very apt definition of farm investment as it excludes all grants and subsidies and therefore accounts for only "actual" investment. Furthermore, the exclusion of investment in land purchases means that it does not include any potentially speculative investment, such as farmers buying land with the intention of re-selling for a profit.

NFS data show that over the period 1995 to 2004, average family farm income declined by 17 percent in real terms, while net new investment increased by almost 30 percent. Figure 3.1 shows net new investment as a percentage of income for the various farm systems that are defined in the NFS.

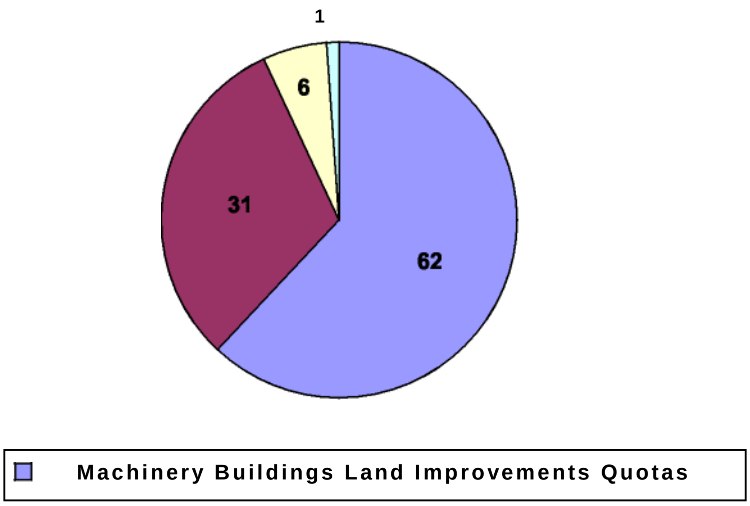
Figure 3.1: Net New Investment as a Percentage of Farm Income



Source: *NFS*

The data in Figure 3.1 show that while investment levels are volatile across the period, there is a consistent trend of increasing investment levels across most farm systems over time.[2] When all farm systems are combined, the percentage of farm income being reinvested in farming grew from 20 percent in 1995 to just over 30 percent in 2004.

Figure 3.2: Investment Type – 2004 National Farm Survey Data



Source: *NFS*

It is also interesting to consider the types of farm investment. Figure 3.2 decomposes the net new investment data into the different types of investment. Machinery is the most common source of investment, accounting for over 60 percent of net new investment. About 31 percent of investment relates to new buildings or repair to existing ones while investment in production quotas accounts for just 1 percent of net new investment across all farms in 2004.

3.3 The relationship between off-farm income and farm investment

It seems counter-intuitive that investment in farming would remain buoyant despite falling real farm incomes. It is possible however that farmers may use income earned off the farm, by either themselves or their spouse, to supplement the operation of the family farm and to reinvest in the farm business.

There are a number of economic theories as to why off-farm income may affect farm investment. These theories can be developed within the agricultural household as discussed in detail in previous chapters. They are briefly summarised and simplified

[2] A full description of farm systems is available from the National Farm Survey, see www.teagasc.ie

here, a more detailed explanation of the model and its application to labour and investment decisions have been outlined in previous chapters. The agricultural household model refers to the substitution effect. This theory suggests that it is economically rational for farmers that work off the farm to invest in farming if the farm investment allows them to maintain or increase farm output with less farm labour. In effect, farmers that work off the farm may maximise their total income by using some of their off-farm income to invest in labour saving devices. The presence of off-farm income may also relax the budget constraints in the farm household. Farm households that depend only on farm income have to use a larger proportion of farm profit to satisfy the consumption demands of the household. In households where additional income is present, the budgetary constraints are relaxed thereby making more of the farm profit available for reinvestment.

A number of previous studies have investigated these theories. Rosenzweig and Wolpin (1993) and Ahituv and Kimhi (2000) found that a substitution effect exists between farm labour and capital, where farmers working off-farm substitute capital for labour as capital deepening releases labour from farm production. Upton and Haworth (1987) examined the growth of farms in the UK using Farm Business Survey data. They found evidence to support a positive relationship between farm growth and off-farm income, thereby suggesting that farmers with higher levels of off-farm income were more likely to grow their farms through investment. These studies suggest that there may be a positive relationship between farm investment and off-farm income. However, the reverse can also be argued and supported with empirical evidence.

The transition from full-time to part-time farming can often be perceived as a first step out of farming and therefore farmers that work off the farm might not be expected to reinvest in farming. A number of studies, as reviewed by Hennessy and Rehman (2008), show that farmers that work off the farm typically operate more extensive and less profitable farms. Glauben et al (2003) conducted a review of studies that investigated these issues. They cite a number of studies that presented empirical evidence that farmers that work off the farm have lower expectations of continuing the farm business, are less likely to have a successor and as a consequence are less likely to invest in their farms. It follows then that farmers that work off the farm may be less likely to reinvest in the farm business. Furthermore, a study conducted by Anderson et al (2005) using farm data from the US shows that an increase in off-farm income increases the investment in non-farm assets relative to farm assets.

It seems that there are conflicting theories about the relationship between off-farm income and farm investment. On the one hand, farmers that work off the farm may choose to substitute capital for labour thus increasing farm investment. Furthermore, the presence of off-farm income in the household, earned by either farmer or spouse, may "free-up" more capital for reinvestment in the business. On the other hand however, farmers that work off the farm seem typically to operate less profitable, less intensive farms and therefore may be less likely to reinvest in a business that may provide a poor return.

In this chapter we test the hypothesis that off-farm income is driving farm investment. NFS data are used to estimate an econometric model of farm investment. The effect of off-farm income on the probability of investment is quantified. The following sections describe the model developed and data used.

3.4 Modelling the Investment Decision

The investment decision is a binary one, i.e. to invest or not, and thus can be analysed using a dichotomous choice probit model. The probit model, which is described in more depth in Appendix 3A, can be used to identify and quantify the factors that have a statistically significant effect on the probability of investment. All variables that are hypothesised to affect the investment decision can be included in the model as independent variables. Variables with a positive co-efficient increase the probability of investment while those with a negative co-efficient decrease the probability.

The model is estimated using NFS data for Ireland for 2004. The NFS collects detailed information on farming activities. However, the data on non-farm activities such as off-farm employment is more limited. The off-farm income earned by farmers and their spouses is collected as a categorical variable only, and there is no information relating to income earned or the labour force participation of any other household members or information relating to other sources of non-farm income.

Table 3.1 describes the investment activities of farms included in the 2004 NFS. The table shows that approximately two-thirds of all farmers in the sample invested in farming activities in 2004, with the average investment being approximately €12,500. To assess the contribution of off-farm income, the sample has been divided on the basis of off-farm labour market participation. On farms where there was no off-farm income present, the average family farm income in the 2004 sample was €27,300 compared to €24,900 for the full sample or €22,500 for sample farms where off-farm income was present. The frequency of investment is similar for both groups, with 65% of farmers having no off-farm income investing compared to 66% for farmers with off-farm income. The level of investment, however, was slightly larger on farms where no off-farm income was present, €13,398, compared to €11,827 for farms with off-farm income.

A sub-group of the off-farm income group of farms is presented separately in Table 3.1. This sub group is comprised of farms where the farm operator does not work off the farm and the off-farm income is earned only by the spouse. There are 266 observations in this group. This is the most profitable group of farms with an average family farm income of €35,247; this suggests that the spouses of more profitable farmers are more likely to work off-farm. It is also the group with the highest frequency of investment with 83% of observations having investment, compared to 66% of the full sample. The data presented in Table 3.1 suggests that the presence of off-farm income in general may not affect the probability of investment, but the source of the off-farm income may be significant. In other words, farms that are operated on a full-time capacity but where the spouse works off-farm are the most likely to invest. This hypothesis will be tested empirically.

Table 3.1: Sample Statistics for Farms with and without investment

Farmers	All	No off-farm Income	Off-farm Income	Spouse only off-farm income
No. of Farms (%)	1226 (100%)	611 (49%)	615 (51%)	266 (21%)
Average FFI	24,910	27,336	22,500	35,247
%. with Off-farm income	50	None	All	All
% Investing	66	65	66	83
Average Investment	12,599	13,398	11,827	15,477

***Source:** NFS 2004*

The variables included in the model are outlined in Table 3.2. To explore the effect of off-farm income on the decision to invest in farming activities, we have included both the presence of off-farm income earned by farmer or spouse as well as the level of income as categorical variables.[3] Both sets of variables are presented in the table for information purposes, but due to multicollinearity, indicators of the presence of off-farm income as well as the level cannot both be included. Table 3.2 also contains the other explanatory variables that are hypothesised to affect the investment decision, such as farm size and system among others.

[3] The level of off-farm earnings is not reported for all farms that indicate that off-farm income is present.

Table 3.2: Definitions and Summary Statistics of Variables used in the Investment Decision Model

Variable	Definition	Sample Mean (N= 1226)
	Dependent Variable	
Invested	Dummy (=1) if farm invests in farming activities	0.66
	Independent Variables	
System	Dummy variable = 1 if farm is in dairy production	0.4
Size	Total Agricultural Area in hectares	52.5
Size2	Total Agricultural Area in hectares squared	4790
Fjob	Dummy variable = 1 if farm operator has off-farm employment	0.28
sjob	Dummy variable = 1 if spouse has off-farm employment	0.33
FFI	Family Farm Income €000	24.91
FFI2	Family Farm Income €000 squares	1375
Age	Farmer's age in years	52.11
Age^2	Farmer's age squared	2863.37
No	Number living in farm household	3.69
Fless12	Farmer earns less than €12,000 off –farm	0.058
F12to20	Farmer earns between €12,000 and €20,000 off-farm	0.062
F20more	Farmer earns more than €20,000 off-farm	0.111
Sless12	Spouse earns less than €12,000 off –farm	0.09
S12to20	Spouse earns between €12,000 and €20,000 off-farm	0.062
S20more	Spouse earns more than €20,000 off-farm	0.14

3.5 Results

The results from the investment decision model are presented in Table 3.3 showing the estimated coefficients, the marginal effect (the effect of a unit change in each explanatory variable on the probability of participation) and some goodness of fit measures for the model. The likelihood ratio statistic suggests that the model is significant ($p<0.01$), correctly predicting investment in 71 percent of the cases. All the variables affecting the investment decision were included in the initial run of the model. Initial estimates of the participation model showed multicollinearity between the presence of off-farm income and the level of off-farm earnings. In one run of the model the level of earnings data was excluded and the results showed that the presence of off-farm income earned by the farmer reduced the probability of investment, while that earned by the spouse increased the probability. The results presented in Table 3.3 are for the model which includes the earnings data.

It is interesting that the age of the farm operator does not significantly affect the decision to invest in farming. Previous studies on investment decisions cite a life-cycle effect, whereby the probability of investment initially grows with age as young farmers grow their businesses but it then eventually declines with age as older farmers prepare for retirement.

Table 3.3: Results of the Probit Model of the Decision to Invest

Variable	**Coefficient (Z Values)**	**Marginal Effects**
Intercept	-.7842	
Size***	.01389	.00483
	(6.05)	
Size2***	.24644	-.00001
	(-5.21)	
FFI**	.00560	.00195
	(2.39)	
No***	.09067	.03 157
	(3.71)	
System***	.67169	.22261
	(6.95)	
Fless 12*	-.279243	-.10262
	(-1.72)	
Sless12*	.2464	.08085
	(1.65)	
Pseudo R_2 = 0.164	Correct Predictions = 71%	
	$_{27}$ = 257.81***	

N = 1226; *(p < 0.1) **(p < 0.05) *** (p < 0 .01)

The results show that farm size, the number of people living in the farm household and the system of farming are the most significant ($p<0.01$) variables affecting the decision to invest in farming. The effects of farm size are positive but non-linear, meaning that as farm size increases the probability of investment increases but at a declining rate. The effect of the number of people living in the farm household also increases the probability of investment. A previous study has found that a larger household size increases the probability of a farm successor being present (Hennessy and Rehman 2007). The result here may be inferred that the larger household size is a proxy for succession and thus increases the probability of investment. The effect of system is also positive. This suggests that, other things being equal, if a farmer is involved in dairy production the probability of investment is 0.236 higher than if there is no dairy enterprise on the farm. The effect of farm income is also significant ($p<0.05$) and positive. The squared term of income was not significantly different from zero indicating that the effect of income is linear. A one unit increase in farm income, i.e. €1,000, increases the probability by 0.0019. However it should be noted that there may be an endogeneity problem between farm income and farm investment. In summary, larger, more profitable dairy farms with a successor present have a higher probability of investment.

The main hypothesis under examination is whether the presence of off-farm income increases the probability of farm investment. Three off-farm income ranges for both farmer and spouse were included in the initial run of the model. However, as is evident from the results, only the first income range is significant. The effect of off-farm income earned by the farmer is negative. The results show that, other things being equal, when the farmer earns €12,000 or less off the farm the probability of investing in the farm is 0.102 lower than if the farmer had no off-farm income. The presence of off-farm income earned by the spouse is significant and positive but also in just one income range. If the farmer's spouse earns €12,000 or less off the farm the probability of investing in the farm is 0.08 higher than if the spouse has no off-farm income. The model was also run with simple binary dummies for the presence of off-farm income without specifying the income levels. The results of this model suggested that the presence of off-farm income if earned by the farmer reduced the probability of investment but if it is earned by the spouse it increases the probability of investment. This also supports the findings presented in Table 3.3.

The investment data used in the model above included net new investment in machinery, buildings, land improvements and quota. To investigate further the hypothesis that part-time farmers may invest in machinery in order to substitute capital for labour, the investment decision model was run for investment in machinery only. The presence of the off-farm income earned by the farmer still significantly negatively affects the decision to invest in machinery, while the spouse's off-farm income is not significant.

3.6 Conclusions

Anecdotal evidence suggests that farmers that work off the farm or who have spouses that work off the farm may be more likely to have a new tractor, for example. There are also economic theories that can be used to support this claim. The objective of this chapter is to explore using empirical methodologies whether part-time farmers reinvest their off-farm income in the farm business.

The results illustrate the importance of farm characteristics such as system, size and profitability but lead us to reject the theory that off-farm income is driving farm investment, at least income earned by the farmer. The conclusion is that when farm size, system and profit are controlled for, the presence of off-farm income earned by the farmer reduces the probability of farm investment. The results for the spouse are less clear. It seems that, other things being equal, the presence of off-farm income earned by the spouse increases the probability of investment. It follows then that we reject the theory of substitution of capital for labour. But, the theory that a relaxation of the budget constraint in the farm household facilitates greater farm investment may still be true.

If we conclude that off-farm income is not driving farm investment then it is difficult to explain why farm investment continues to increase despite the declining profitability of farming. One possible explanation may be the restructuring that is taking place in the farming sector. Taking the dairy sector as an example, the number of farmers engaged in milk production in Ireland has fallen from 31,000 producers in 2000 to just 22,000 in 2005. In an industry constrained by milk quota, the exit of some producers increases the average size of the remaining producers thereby increasing the need for farm investment. The results show that dairy farmers are more likely to engage in investment than non-dairy farmers and in fact dairy farmers account for half of all farm investment in 2004 even though they comprise just 26 percent of the weighted population of farms. So while it might seem counter-intuitive that an industry with a high exit rate such as farming still has strong investment levels, it may be the case that the restructuring induced by a high exit rate increases the need for investment.

The introduction of environmental and cross compliance legislation may explain why farm investment has increased. In Ireland the introduction of the Nitrates Directive means that farmers must have greater slurry storage capacity and the rules governing cross-compliance might increase the need for investment in land improvements. It would be interesting to explore these issues further by reviewing the investment data from the NFS over the last ten years in conjunction with a review of environmental legislation.

CHAPTER 4
UNDERSTANDING THE EFFECTS OF OFF-FARM EMPLOYMENT ON TECHNICAL EFFICIENCY LEVELS IN IRELAND

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4.1. Introduction

Previous chapters have outlined and discussed at length the increasing number of Irish farmers seeking off-farm employment to supplement their income has steadily increased in recent years. To date the effect of off-farm employment on the management and efficiency of the farm business has not been explored in an Irish context. The objective of this chapter is to examine the effect of off-farm employment on farm productivity levels, specifically, on a farm's level of technical efficiency. It is important to quantify the relationship between part-time farming and farm efficiency especially if we expect that this is a trend that will continue into the future

The productive effects of having an off-farm job are difficult to explain theoretically. On one hand, larger off-farm incomes could imply less time on the farm and possibly less efficient use of resources (Kumbhakar, Biswas and Bailey, 1989). Alternatively, the very existence of spare time to work off the farm may in itself demonstrate a degree of efficiency in farm operations (i.e. only very efficient farmers would have the spare time to work off-farm). Results from previous related studies are somewhat conflicting. Kumbhakar, Biswas and Bailey (1989) found that dairy farm efficiency decreases with the level of off-farm income. Goodwin and Mishra (2004), who define efficiency as gross cash income over total variable costs, also found that increased levels of off-farm activity is significantly associated with lower efficiency. Similar results are found by Rezitis et al. (2003) in Greece and Fernandez-Cornejo (2007) for US corn and soybean farms. However, Bozoğlu (2007) found that off-farm employment has a negative effect in Turkish vegetable farming while Baji (1984) could find no significant relationship.

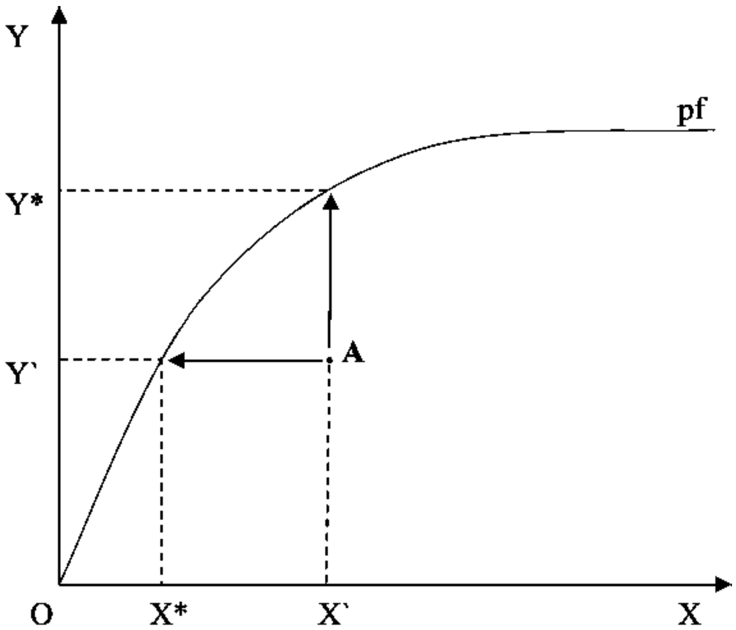
In order to quantify the individual effects of having an off-farm job, it is important to control for other possible influencing characteristics. Previous studies have uncovered a large number of significant variables affecting farming technical efficiency levels. Kumbhakar, Biswas and Bailey (1989) found that dairy farm efficiency increases with farm size and farmer education. For the Spanish dairy sector, Alvarez, Arias and Orea (2006) found that efficiency increases with higher stocking rates (cows per hectare). Hadley (2006) explored the effects of a large number of potential variables for eight separate farm types in the UK. Among his results, it is found that the most efficient dairy farms have low debt to asset ratios, have high subsidy to gross margin ratios, have high tenancy ratios (more owner occupied land) and are also less specialised. In an Irish context, O' Neill and Matthews (2001) explored the variables that affect the efficiency of Irish agriculture (aggregate measure). They found that farming in the east of the country, larger household size and higher levels of borrowings are positively associated with technical efficiency, while having an off-farm job and smaller farm size are negatively associated with efficiency. Furthermore, Boyle (1987) and O'Neill, Matthews and Leavy (2002) found that contact with the advisory service is associated with higher levels of efficiency. These factors will be included in the current analysis where possible.

Farm efficiency levels are estimated within the stochastic frontier framework for each of the main farming systems in the Irish National Farm Survey. Section 4.2 provides a detailed description of this methodology while Section 4.3 describes the dataset, including all production and efficiency variables employed in the analysis. Results and any implications are presented in the concluding two sections.

4.2. Methodology

Efficiency is very much a relative concept. A producer's efficiency level can only be compared to a group of similar producers or to itself through time. A producer is deemed technically inefficient if it could potentially increase its output level without increasing its input level, or alternatively, reduce its input level without reducing its output level. This potential is given by the productive capabilities of others in the industry and represented by a production frontier. This is illustrated in Figure 4.1 which presents a production frontier (pf) representing the maximum level of output (Y) possible for every input level (X), given a sample of producers. Producers operating on the production frontier are deemed fully technically efficient while producers operating below the frontier display a degree of technical inefficiency.

Figure 4.1: Input and Output Orientated Measures of Technical Efficiency



From an output-orientated perspective, producer A is technically inefficient as its output level is below that which is potentially attainable (Y` < Y*), given the level of input (X`). From an input-orientated perspective, producer A is technically inefficient as it is using more inputs than is potentially required, given the level of output (Y`). These concepts are the result of Farrell (1957) who drew on work by Debreu (1951) and Koopmans (1951). Formally, Farrell's measures of output-orientated and input-orientated technical efficiency are given by the ratios OY`/OY* and OX*/OX` respectively. Both of these measures are bounded between zero and one with a ratio of one representing full technical efficiency and both are equivalent when constant return to scale exists.

Papers by Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977) led the field of stochastic frontier analysis (SFA). Assuming a Cobb-Douglas production technology, the stochastic frontier model is written as:

$$\ln E_0 \quad \overset{K}{} E \ln \qquad \text{where} \qquad e_i V_i u_i \qquad (4.1)$$

where y_i is the farm's output level and x_{ki} is a vector of k production inputs (capital, labour etc). The composite error term (e_i) is made up of a statistical noise component (v_i) and a non-negative technical inefficiency component (u_i). The model is usually estimated by maximum likelihood after assuming a distribution for both components. A panel data extension of this model assuming a time-invariant inefficiency term is proposed by Pitt and Lee (1981):

$$\ln y_{it} = E_0 + \sum_{k=1}^{K} E_k \ln x_{kit} + v_{it} - u_i \qquad (4.2)$$

However, the interest of this chapter is not specifically each farm's efficiency level but the factors that influence it. Early attempts to capture this relationship first estimated firm efficiency in this standard stochastic framework and then regressed these estimates upon variables expected to influence this level of efficiency (e.g. education, experience of manager etc). This approach has been criticised on the basis that the exclusion of these explanatory variables in the first step would lead to biased estimators of the production parameters and also biased predictors of efficiency (see Coelli et al., 2005). Later extensions reparameterised the inefficiency term as a function of the efficiency variables and estimated the relationship in a single step (Kumbhakar, Ghosh and McGuckin, 1991; Reifschneider and Stevenson, 1991; Huang and Liu, 1994).

The model proposed by Battese and Coelli (1995) extends the approach of Kumbhakar, Ghosh and McGuckin (1991) to panel data. In their model, technical inefficiency (u_{it}) is assumed to be a function of a set of explanatory efficiency variables, z_{it}, and an unknown vector of coefficients, G:

$$u_{it} = z_{it} G + w_i \qquad (4.3)$$

where w_i is a random variable defined by the truncation of the normal distribution with zero mean and variance V_u^2 such that the point of truncation is $G_{it}Z$.

Although this model is widely employed in empirical research, it has been criticised on the basis that it assumes independence over time of the inefficiency term and that the panel structure of the data is not fully exploited (for example, see Alvarez, Arias and Orea, 2006).

The model proposed by Orea and Kumbhakar (2004) overcomes this potential shortcoming and assumes a time-varying inefficiency term (u_{it}) as the product of an exponential function of time-varying efficiency variables (z_{it}) and a nonnegative, time-invariant firm-specific inefficiency term (u_i):

$$u_{it} = u_i \times \exp(z_{it}'\delta) \qquad (4.4)$$

where δ are parameters to be estimated. A form of this model has been employed by Alvarez, Arias and Orea, (2006) for the Spanish Dairy sector (latent class cost frontier). The stochastic production frontier assuming a translog functional form is as follows:

$$\ln y_{it} = \beta_0 + \sum_{n=1}^{N} \beta_n \ln x_{nit} + 0.5 \sum_{n=1}^{N} \sum_{j=1}^{N} \beta_{nj} \ln x_{nit} \ln x_{jit} + \sum_{t=1}^{T} \gamma_t D_t + v_{it} - u_i \exp\left(\sum_{n=1} \delta_n z_{nit}\right) \qquad (4.5)$$

where D_t are annual time dummies employed to capture technical change. u_i is assumed to follow a half-normal distribution while v_{it} is a standard normally distributed error term. Both are assumed to have zero mean and constant variance and are independently and identically distributed.

4.3. Data

Data from the NFS is employed to estimate the model described in equation 4.5. Here the NFS dairy, cattle rearing, cattle 'other', sheep and tillage systems are employed for the 10 year period, 1997 through 2006 (sheep system 2000 through 2006, cattle other 1998 though 2006). These systems are analysed independently using system specific outputs and inputs. Although farms have been grouped according to their dominant output type, the majority of farms are also involved in a number of the other systems. Where inputs are not explicitly assigned in the data (capital, labour, machinery operating costs), they are allocated according to the proportion of gross output that is attributable to the main output type (for example, in the dairy enterprise, this would be the proportion of total gross output that can be attributed to the dairy enterprise). In addition, all monetary figures are deflated according to annual Irish agricultural price indexes which are available from the Irish Central Statistics Office.

For the dairy system, output is milk sales in euro and the standard production inputs are capital, labour, direct costs, herd size and land. A value figure for milk is chosen over quantity as milk is not strictly a homogenous good – farmers are paid according to the percentage of milk solids (fat and protein percentages) and a straight quantity figure would therefore ignore these differences. Capital includes the stock of machinery and buildings which is based on the market value as estimated by the farmer. Labour is measured in standard man days representing the number of eight hour days supplied by persons over 18 years of age. Direct costs comprise of concentrates, feed costs, machinery operating costs and lime costs. Herd size is the average number of dairy cows and land is the forage area (acres).

Farms in the cattle rearing system are mainly involved in providing cattle for the finishing and other cattle related systems. Output in this system equals total annual weanling, store and breeding cattle sales. Livestock production differs to that of dairy and tillage production in that it is not strictly an annual process. Annual sales are often determined by production activity in the previous year (cattle born this year may not be sold until sometime the following year). To account for this, the level of closing and opening stock (trading) is added and subtracted to and from annual output respectively. The standard production inputs are similar to those employed in the dairy system. Direct costs differ slightly and also include the value of milk and substitutes (used in the rearing of calves). Furthermore, the value of the breeding herd is considered a capital input and is estimated as the sum of opening breeding stock plus any breeding cattle purchases made during the year. This variable is added to the capital input already outlined.

The cattle 'other' system is predominantly involved in purchasing store and weanling cattle (accounting for an average of 91 per cent of total cattle purchases in this system), adding to their value, and then selling them on as either finished or store cattle (accounting for 90 per cent of total cattle sales). Output in this system is therefore the sum of annual finished and store cattle sales plus the level of closing trading stock. The herd input is the sum of store and weanling purchases plus the level of opening trading stock. Opening trading stock is added to this input as it is assumed that cattle in this category are not necessarily animals ready for sale but will be at some unknown stage of production. The remainder of the production process (and value added) will be completed during the current year. The remaining inputs are identical in construction to the cattle rearing system.

Output in the sheep system equals total annual sheep and wool sales less closing stocks (trading and wool) plus opening stocks (trading and wool). Labour and land inputs are identical in construction to previous systems. The capital input is similar in construction to that proposed for the cattle rearing system: the breeding herd (breeding stock + breeding purchases) is considered a capital input and is added to the standard variables (buildings and machinery). Furthermore, total sheep purchases (less breeding purchases) are added to the standard direct cost input. A dummy variable for hill-land sheep farmers is also included to control for the possibility of differing production technologies.

The final system to be analysed is the tillage system. Like the dairy system (and unlike the livestock systems), this system is essentially an annual process and is therefore relatively more straightforward. There are 11 main crop types in the tillage system: winter wheat, spring wheat, winter barley, spring barley, malting barley, winter oats, spring oats, oilseed rape, peas and beans, potatoes and sugar beet. Annual output therefore equals the sum of sales from each crop. Direct costs comprise of seeds, fertilisers, crop protection costs, machinery hire and operating expenses and lime. In the NFS, the number of man days and the amount of land associated with each crop is recorded. Total labour and land inputs are therefore the summation of these respectively. Capital is again the value of machinery and buildings (as estimated by the farmer).

The independent variables outlined above enter the model as standard factors of production – higher levels of each will lead to higher levels of output. In order to estimate the efficiency effects models described in the previous section, a second set of independent variables (Z_{it}) are required which are assumed to affect the efficiency at which farms convert these factors of production into output. The presence of an off-farm job enters the model as a categorical dummy variable. In addition to this variable, a number of variables are selected on the basis of results from previous studies. Considered here are: soil quality, the degree of specialisation, the farm's size, the use of extension services and the farmer's age.

Soil quality is classified into three groups according to their use range. Soil group one has the widest use range (highest quality) followed by soil group two and soil group three contains farms with limited use (low quality). These groups are divided into three separate dummy variable categories. It is expected that higher soil quality will result in higher levels of efficiency. The effects of farm size and the degree of specialisation are also explored. Farm size is the total acreage of the farm (compared to forage acres employed for the land input in the production function) while the degree of specialisation refers to the proportion of gross output that is attributed to the system under analysis (for example, in the dairy system, this would represent the proportion of total gross output that can be attributed to the dairy enterprise). The use of extension services is included in a number of previous studies and this effect is captured by a dummy variable. Age is also included and is used as a proxy for experience. Descriptive statistics for all variables employed are presented in Table 4.2, Appendix 4.

4.4. Results

A translog functional form is employed for each system with annual time dummy variables used to capture technical change.[4] All models are estimated in LIMDEP version 8.0 (Greene, 2003) and results are presented in Tables 4.1 through 4.3 for each system respectively (Appendix X). The elasticities and overall returns to scale parameters for each system are calculated and displayed in Table 4.1.[5]

Land is excluded from the final dairy and sheep specifications due to negative/insignificant coefficients for this input in preliminary regressions. It is possible that land is highly under-employed, particularly so in the sheep system

[4] The translog functional form is compared to the more general Cobb-Douglas using likelihood ratio tests. In all systems the translog performs significantly better.

[5] Elasticities are calculated by differentiating the production function with respect to each input and then dividing by sample means.

where hill-land sheep farmers with relatively high acreages are included. The coefficient for capital also appears relatively small in the majority of systems which may be linked to the substantial increases in capital expenditure in Irish farming in recent years. Such increased investment may be the result of convenience rather than improved productivity expectations. Only in the cattle rearing and sheep systems, where the herd input is included in capital, is the input prominent. While labour is significant in all systems, it appears relatively more important in the cattle rearing, sheep and cereals systems which all display considerably higher elasticities. However, it should be noted that the true effect of each input could be potentially biased by the presence of multicollinearity, a common problem in production functions. Overall, increasing returns to scale (calculated at sample means) is evident in the dairy and cereals systems while the cattle rearing, cattle 'other' and sheep systems display slight negative returns to scale. In the sheep system this result may be driven by the presence of unproductive, high acreage/scale hill-land sheep farmers. This is confirmed by the significant negative coefficient for the hill-land dummy in this system which indicates lower productivity levels in the rejoin of 16 per cent (compared to low-land sheep farmers).

Table 4.1: Weighted Elasticities and Returns to Scale by Farm System

	Dairy	Cattle Rearing	Cattle 'Other'	Sheep	Cereals
Herd	0.693	-	0.696	-	-
	(0.078)	-	(0.103)	-	-
Direct Costs	0.239	0.176	0.117	0.339	0.320
	(0.049)	(0.076)	(0.045)	(0.165)	(0.149)
Capital	0.070	0.309	0.009	0.143	0.002
	(0.019)	(0.076)	(0.011)	(0.066)	(0.050)
Labour	0.081	0.354	0.114	0.482	0.565
	(0.078)	(0.092)	(0.037)	(0.102)	(0.257)
Land	-	0.116	0.052	-	0.158
	-	(0.054)	(0.024)	-	(0.170)
Returns to Scale	1.084	0.955	0.988	0.964	1.046
	(0.068)	(0.061)	(0.029)	(0.032)	(0.037)

Table 4.2 presents descriptive statistics of the estimated technical efficiency estimates for each system. Although mean inefficiency estimates across systems are not strictly comparable, the inefficiency estimates in the sheep and cattle rearing systems are particularly large which suggests either considerable production problems or a degree of heterogeneity which the models fail to capture.

Table 4.2: Weighted Descriptive Statistics for Technical Inefficiency Estimates by Farm System

	Mean	Standard Deviation	Skewness	Kurtosis
Dairy	0.239	0.152	1.311	9.741
Cattle Rearing	0.331	0.215	1.275	5.078
Cattle 'Other'	0.100	0.065	1.678	8.862
Sheep	0.420	0.341	1.325	4.023
Cereals	0.276	0.204	1.331	4.241

The efficiency results are summarised in Table 4.3 for all sectors. These are displayed as percentage effects for the dummy variables (D) and elasticities for the continuous variables.[6] The coefficients describe each variable's effect on inefficiency and a negative sign therefore implies that the variable is correlated with higher efficiency levels.

Although the direction and significance of each of the efficiency variables differs across sectors, some general comments can be made. Not surprisingly, the soil dummy variables are statistically significant with higher soil quality levels being associated with higher technical efficiency levels in all systems. The coefficient for extension use, while predominantly negative (implying higher efficiency), is only statistically significant in the dairy and sheep systems. A positive effect was also found by Boyle (1987) and O'Neill, Leavy and Matthews (2002) in Ireland for a general aggregate measure of agriculture (all sectors). However, it should be highlighted that no account was taken in this study for the possibility of selection

[6] Percentage effects for the dummy variables are calculated as the percentage change in inefficiency resulting from a movement in the variable from zero to one. Elasticities are calculated by differentiating equation 4.4 with respect to each efficiency input and dividing by mean inefficiency.

bias in extension service contact. If the more efficient farmers are those that are more likely to make use of the extension service, then the coefficient will be potentially biased. Similarly, if extension workers deliberately seek to work with particular groups of farmers, there will be a selection bias at work here also. Age is negatively associated with efficiency in all but the cattle 'other' system and is significant in the dairy, sheep and cereals systems implying that older farmers have lower technical efficiency levels.

Table 4.3: Percentage Effects (Dummy Variables) and Elasticities (Continuous Variables) of Efficiency Variables

	Dairy	Cattle Rearing	Cattle 'Other'	Sheep	Cereals
Off-farm (D)	0.405	-0.007	-0.085	0.911	0.108
Soil 2 (D)	** 1.119	*** 1.824	*** 4.660	** 1.815	
Soil 3 (D)	1.808	*** 2.382	*** 9.749	*** 3.691	
Farm Size	***-0.154	-0.122	-0.020	0.082	***-0.381
Extension (D)	*-0.300	-0.321	0.106	**-0.506	0.214
Specialisation	***-0.726	* 0.297	-0.161	*** 0.368	***-0.424
Age	*** 0.243	0.031	-0.159	* 0.460	** 0.410

All but the cattle 'other' system displays a negative coefficient for farm size which implies that larger farms are more technically efficient. This effect is strongest in the cereals system followed by the dairy and cattle systems. Positive efficiency effects for farm size are also found by Kumbhakar, Biswas and Bailey (1989) and Hallam and Machado (1996). However, this result is contrary to previous results in Ireland (O'Neill and Matthews, 2001). The degree of specialisation leads to mixed results although most systems have a negative coefficient implying higher efficiency levels. It appears that specialisation leads to higher efficiency levels in the dairy, cereals and cattle 'other' systems and to lower efficiency in the cattle rearing and sheep systems (not significant in the cattle 'other' system). This may be a due to the poor financial position of the latter sectors in recent years and the need to expand into other sectors where possible (i.e. more efficient farmers in these systems would have identified the need to diversify into other systems). The general positive effects are contrary to the results of Hadley (2006) who found that specialisation leads to lower efficiency levels in UK dairy farming.

Finally, in relation to off-farm employment, the coefficient for the off-farm employment dummy variable is positive in all but the cattle systems. While this is somewhat complementary to the majority of previous studies, it is evident that this effect is not statistically significant in any system. Despite insignificance, this result has some important implications and implies that farmers with an off-farm job are no less efficient than farms without.

4.5. Conclusion

Both in Ireland and across Europe, it has become increasingly necessary for farmers to supplement their family income with sources from outside the farm. This situation is particularly prevalent in Ireland, where the relative size of farming income has declined significantly due to the rapidly growing non-agricultural economy. It is expected that the incidence of off-farm employment will further increase in future years, particularly in a decoupled policy environment. This chapter has attempted to quantify the effects of having an off-farm job on farm technical efficiency levels in the period 1997 through 2006. Efficiency is estimated within the stochastic frontier framework using Irish National Farm Survey data from dairy, cattle, sheep and cereals farming systems. Results show no significant effect for off-farm employment which implies that the average farm in each system can be operated quite efficiently while also pursuing outside employment. This result highlights the need for many full-time farmers to critically assess their on-farm time-management in an effort to explore the possibility of substituting a proportion of their on-farm labour with part-time off-farm employment.

It is also found that efficiency levels are, in general, positively correlated with extension use, soil quality, farm size and the level of specialisation. The importance of the scale of operations is of particular interest and presents a serious challenge for policy makers and for those involved in planning the future of Irish agriculture, which at present is characterised by relatively small scale operations (internationally). This issue is also highlighted by Donnellan, Hennessey and Thorne (2007), who outline the need for increasing the scale of production in order to meet the challenges of free trade. The degree of specialisation will also be an important issue for the competitive future of Irish farming. Higher levels of specialisation lead to higher efficiency levels in the dairy, cereals and cattle 'other' systems but to lower efficiency levels in the cattle rearing and sheep sectors (not significant in the cattle 'other' system). This may be due to the poor financial position of the latter systems and the need to expand into other sectors where possible.

CHAPTER 5
THE IMPACT OF AGRICULTURAL POLICY ON OFF-FARM LABOUR SUPPLY

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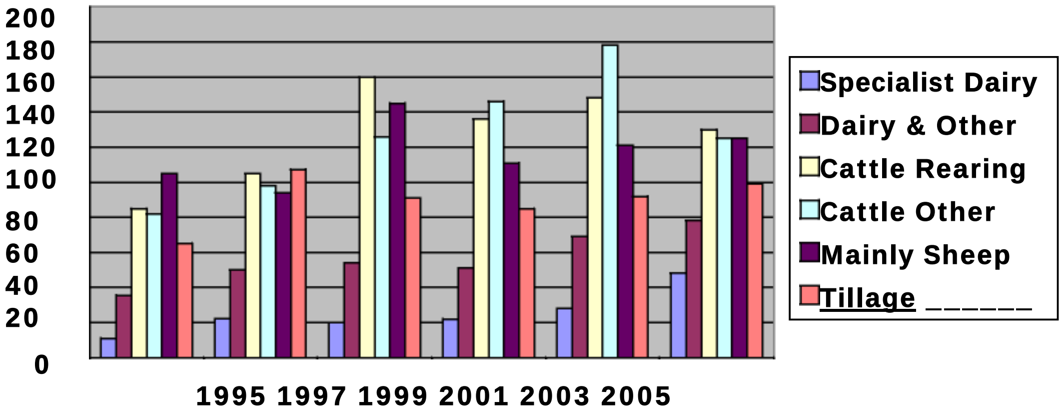
5.1 Introduction

Chapter 2 identified a number of factors that may have contributed to the substantial increases in the number of farmers working off farm. In this Chapter the effect of agricultural policy on farmers' off-farm employment decisions is examined in detail. In particular the focus is on the recent decoupling reform and its impact on the relative returns to farm labour.

The Mid Term Review (MTR) of the Common Agricultural Policy (CAP) allowed for the decoupling of all direct payments from production from 2005 onwards; the decoupling of direct payments from production breaks the link that existed between agricultural production and the entitlement to agricultural income subsidies in Ireland. This means that farm households will now receive a payment based on the number of premiums received in a historical reference period rather than current production levels.

It was in response to factors such as the difficulties of expanding the EU within the constraints of a limited agricultural budget, the desire to make agriculture more market oriented and, the perceived need to formulate policies that are justifiable within the current WTO processes, that the Luxembourg Agreement was ratified in June 2003, making it possible to decouple all (or some) direct payments from production, supplanting the direct payment system which was in operation for EU farmers. Prior to the introduction of decoupled payments, the culture adopted in Ireland with regard to farming was one of 'farming the subsidy' where farmers adapted farming practices to maximise their receipt of direct payments. The importance of direct payments is emphasised in Figure 5.1 which illustrates that by 1997, 100 percent of family farm income on cattle and tillage farms were derived from direct payments. Therefore, on average market based revenue was insufficient to cover total costs.

Figure 5.1: Direct Payments as a Percentage of Family Farm Income on Irish farms



Source: *NFS various years.*

Hennessy et al. (2006) examined the effect of decoupled payments on the labour allocation decision in Ireland. The relationship postulated is that 'decoupling' of agricultural support from production would probably result in a decline in the return to farm labour but it would also lead to an increase in household wealth. The main findings for the Irish situation are that the decoupling of direct payments is likely to increase the probability of farmers participating in the off-farm employment market and that the amount of time allocated to off-farm work will increase. Contrastingly, Ahearn et al (2003) in relation to farmers residing in the United States found that both decoupled and coupled payments help to decrease off-farm work hours.

This Chapter focuses specifically on garnering a better understanding of the factors behind farmers' decisions to participate in the off-farm labour market. Using a binary probit model of labour participation and an ordinary least squares model of labour supply this paper examines the effect of recent policy change towards decoupled payments as well as various background variables such as age, household size, presence of children on the probability of farmers participating in the off-farm labour market. To date the empirical research investigating the factors behind the labour allocation decision have encompassed cross-sectional data (see for example

Hennessy et al, 2006). In this paper longitudinal data gleaned from the National Farm Survey (NFS) is utilised, therefore allowing a more detailed exposition of the factors underlying farmers' labour market behaviour. The use of fixed and random effects specification enables us to control and identify the impact of random disturbances on the off-farm labour decisions of Irish farmers at each time period. An important advantage of panel data compared to time series or cross-sectional data sets is that it allows identification of certain parameters or questions, without the need to make restrictive assumptions. It enables, for example to analyse changes on an individual level.

This Chapter begins by providing some background information relating to the economics of decoupled payments. Following this, the proposed modelling approach is outlined and described. Next, the results of the modelling exercise are presented and finally this paper concludes with an evaluation of its main findings.

5. 2. Background to Decoupling and its effect on the labour allocation decision

A decoupled payment is a source of revenue for the farm household and thus it may indirectly affect production decisions through what is referred to as a 'wealth effect'. Hennessy (1998) and Sckokai & Moro (2002) have explored the interaction between decoupled payments, farmers' risk preferences and production decisions. They conclude that if farmers' aversion to risk declines as income increases, then an increase in wealth can induce them to take riskier production decisions; thus, output increases compared to the situation when no decoupled payment is made. Decoupled payments also relax the household's capital constraint, lowering the cost of capital to the household. According to Andersson (2004) the resulting effect is that farm investment is likely to be greater after decoupling than in the absence of such payments.

Additionally, Burfisher & Hopkins (2003) assert how a decoupled payment impacts the labour-leisure choice of the farm household as the resulting increase in wealth increases a household's ability to "consume" leisure and reduce work hours. More precisely, the argument here being that if an individual receives an increase in wealth, this relaxes the household budget constraint and the individual can work less and enjoy more leisure while maintaining consumption, i.e. a wealth effect. Ahearn et al (2003) concluded that government payments tend to increase the hours operators work on their farm and decrease the hours they work off the farm. Alternatively, commentators such as Hennessy et al. (2006) intimate that with decoupled farm income supports, where agricultural producers find that their market based returns are insufficient to cover production expenses, and their only profit comes from the decoupled subsidy receipts, they can be expected to cease or at least reduce their level of agricultural production and collect the decoupled income subsidy. Therefore, economic theory suggests that if decoupling results in a decrease in the returns to farm labour relative to non-farm labour, then the agricultural household model suggests that individuals will increase the number of hours allocated to the participation in the off-farm labour market, which is referred to as the substitution effect.

Therefore which ever has the greatest effect (substitution or wealth) will determine the impact of decoupling on the labour allocation decision. To sum up, there is a great deal of uncertainty surrounding the effect of policy changes such as the move towards decoupled payments on the participation of farmers in the off-farm labour market. In this regard, it is hoped that the following analysis will help to provide a much clearer understanding of the effect of this policy change as well as various personal and farm characteristics on farmers decisions relating to off farm work.

5.3 Theoretical Framework and Estimation Methods

Theoretically, the allocation of farm labour can be modelled using an agricultural household model that incorporates agricultural production, consumption and labour supply decisions into a single framework and operates to maximise Becker's (1965) utility function. The fundamental difference between an agricultural household model and a pure consumer model is that, in the latter, the household budget is generally assumed to be fixed, whereas in household-farm models it is endogenous and depends on production decisions that contribute to income through farm profits. The agricultural household model developed by Singh, Squire and Strauss (1986) has been frequently applied to the study of labour allocation for example, (see for example, Huffman and Lange (1989); Gould and Saupe (1989); and Weersink et al (1998)). This model has been discussed in depth in Chapter 2.

5.4 The Empirical Framework

The primary aim of this paper is to determine the effect of decoupling on the labour allocation decision of farm households. Therefore two independent decisions are under analysis, the first is what impact decoupling will have on the decision to engage in off-farm employment and the second is the decision of how many hours will be allocated to off-farm employment. Therefore, two empirical models are necessary, a participation model and a labour supply model. These models are outlined in the ensuing sections of this paper.

5.4.1 Participation Model

The participation model is binary and models the probability of each farmer engaging in off-farm employment across a five year period given the farm and demographic characteristics. As in the cross-sectional case, the binary choice model is formulated in terms of an underlying latent model

$$y_{it}^{*} \; x_{it}' E \quad D_i H_{it} \qquad (5.1)$$

where we observe y_{it} = 1 if y_{it}^{*} >0 and y_{it} = 0 otherwise. For example, y_{it} may indicate whether person i is working in period t or not. Let us assume that the idiosyncratic error term H_{it} has a symmetric distribution with distribution function

F(.), i.i.d. across individuals and time and independent of all x_{is}. Even in this case the presence D_i of complicates estimation, both when we treat them as fixed unknown parameters and when we treat them as random error terms.

The labour participation model in this paper is estimated using a random effects probit model. The latent variable specification is as follows:

$$y_{it}^{*} \; x_{it}' E \quad P_{it} \qquad (5.2)$$

with

y_{it} = 1 if y_{it}^{*} >0

y_{it} = 0 if y_{it}^{*} ~0

(5.3)

where P_{it} is an error term with mean zero and unit variance, independent of $(x_{i1},..., x_{iT})$.

To estimate E by maximum likelihood, we will have to complement this with an assumption about the joint distribution of $P_{i1},..., P_{iT}$. The likelihood contribution of individual i is the (joint) probability of observing the T outcome $y_{i1},..., y_{iT}$. This joint probability is determined from the joint distribution of the latent variables $y^*_{i1},..., y^*_{iT}$ by integrating over the appropriate intervals. In general, this will thus imply T integrals, which in estimation are typically to be computed numerically. When T=5 or more, this makes maximum likelihood estimation infeasible.

Clearly, if it can be assumed that all P_{iT} are independent, we have that $f(y_{i1},..., y_{iT} | x_{i1},..., x_{iT}, E) \sim \prod_t f(y_{it} | x_{it}, E)$, which involves T one-dimensional integrals only (as in the cross-sectional case). If we make an error components assumption, and assume that $u_{it}\ D_i\ H_{it}$ is independent over time (and individuals), we can write the joint probability as

$$f(y_{i1},..., y_{iT} | x_{i1},..., x_{iT}, E) = \int_{-\infty}^{\infty} f(y_{i1},..., y_{iT} | x_{i1},..., x_{iT}, D_i, E) f(D_i) dD_i \quad (5.4)$$

$$= \int_{-\infty}^{\infty} \left[\prod_t f(y_{it} | x_{it}, D_i, E) \right] f(D_i) dD_i \quad (5.5)$$

which requires numerical integration over one dimension. This is a feasible specification that allows the error terms to be correlated across different period, albeit in a restrictive way. The crucial step in (5.5) is that conditional upon α_i the errors from different periods are independent.

It is more common to start from the joint distribution of $P_{i1},..., P_{iT}$. Let us assume that the joint distribution of $P_{i1},..., P_{iT}$ is normal with zero means and variances equal to 1 and $\mathrm{cov}\{u_{it}, u_{is}\} = V_f^2,\ s \neq s$ corresponds to assuming that D_i is NID $(0, V_f^2)$ and H_{it} is NID $(0, 1 - V_f^2)$. Recall that as in the cross sectional case we need a normalization on the error's variances. The normalisation chosen here implies that the error variance in a given period is unity, such that the estimated β co-efficients are directly comparable to estimates obtained from estimating the model from one wave of the panel using cross sectional probit maximum likelihood. For the random effects model, the expressions in the likelihood function are given by

$$f(y_{it} \mid x_{it}, \alpha_i, \beta) = \Phi\left(\frac{x_{it}\beta + \alpha_i}{(1-\sigma_\alpha^2)^{1/2}}\right), \text{ if } y_{it} = 1 \quad (5.6)$$

$$\Phi\left(\frac{x_{it}\beta + \alpha_i}{(1-\sigma_\alpha^2)^{1/2}}\right), \text{ if } y_{it} = 0 \quad (5.7)$$

where Φ denotes the cumulative density function of the standard normal distribution. The density of α_i is given by

$$f(\alpha_i) = \frac{1}{\sqrt{2\pi\sigma_\alpha^2}} \exp\left\{-\frac{1}{2}\frac{\alpha_i^2}{\sigma_\alpha^2}\right\} \quad (5.8)$$

It can be shown (Robinson, 1982) that ignoring the correlations across periods and estimating the β coefficients using standard probit maximum likelihood on the pooled data is consistent, though inefficient.

5.4.2 Modeling the Labour Allocation Decision

The dependent variable in the labour supply model is the number of hours worked off-farm and it is incidentally truncated, that is for some observations, those who do not work off farm, the number of hours recorded is zero.

The labour supply model is structured as follows;

$$y_{it} = \beta_0 + x_{it1}\beta_1 + x_{it2}\beta_2 + \dots + x_{itk}\beta_k + \eta_i + \nu_{it} \quad (5.9)$$

(5.10)

where y_{it} measures the number of hours worked off-farm as a function of a vector of independent variables and unobservable factors and the η_i are the unobserved constraint individual effects.

i 1,...........$N; t$ 1, ...T, with N large and T small.

The labour supply model is specified as follows

$$y_{it}\; x'_{it} E \;\; P_{it} \qquad (5.11)$$

$$P_{it} K_i \; v_{it} \qquad (5.12)$$

$$E\, v_{it} \;\; 0;\; E\, v_{it} \qquad (5.13)$$

The Random Effects specification further assumes that

$$E\, K_i \;\; 0;\; E\, K_i x_{it} \;\; 0 \qquad (5.14)$$

i.e. it is assumed that the individual effect K_i is uncorrelated with the regressors x_{it}.
Therefore

$$Ey_{it}\; x_{it} \quad x'_{it} E\; E_i\, x_{it}\; E v_{it}\, x_{it} \quad K \quad x'_{it} E \qquad (5.15)$$

and therefore the simple OLS estimator on the pooled data is unbiased. However, it is not efficient, and the estimated standard errors are wrong, as it does not take account of the dependence of the error term within individual over time.

Let $u_{it} K_i \; v_{it}$ and assume independence of v_{is} and v_{it}, $s \neq t$, and of K_i and the v_{it}, then

$$Eu_{is} u_{it} EK_i^2 \quad V_n^2 \qquad (5.16)$$

and therefore the u_{is} and u_{it} are correlated. The within individual variance-covariance matrix is given by $u_i \; u_{i1} u_{i2} .... u_{iT}$

$$\Sigma: Eu_i u'_i \quad \begin{bmatrix} V_n^2 V_v^2 & V_n^2 & V_n^2 \\ V_n^2 & V_n^2 V_v^2 & \\ & & V_n^2 V_v^2 \end{bmatrix} \qquad (5.17)$$

$$\hat{E}_{RE} \quad \left(\sum_{i=1}^{N} X'_i \hat{\Sigma}^{-1} X_i \right)^{-1} \sum_{i=1}^{N} X'_i \hat{\Sigma}^{-1} y_i \qquad (5.18)$$

The more likely and interesting case is when the observed individual effects are correlated with the regressors:

$$E K_i x_{it} \text{ z } 0 \quad (5.19)$$

Clearly, in this case OLS and the Random Effects estimator are biased and inconsistent as

$$E y_{it} x_{it} \; x_{it} E \quad K \; E_i x_{it} \; E v_{it} x_{it} \quad (5.20)$$

$$= ' \quad ' E \quad K E$$

$$x_{it} \; E_i \; x_{it} \text{ z } x_{it} \quad (5.21)$$

For the fixed effects estimator to be unbiased, one needs that the x_{it} in all periods are uncorrelated with the Q_{is} in all periods:

$$E(Q_{is} x_{it}) \; 0 \; ; \; s \; 1,...,T, t 1,....T$$

(5.22)

When x_{it} satisfies this condition, we call it to be strictly exogenous. Assuming strict exogeneity, the Hausman test can be used to test whether the unobserved heterogeneity is correlated with the regressors. When they are not correlated the RE estimator is efficient. If they are correlated, the FE estimator is consistent, but the RE estimator is not.

$$H E\hat{}_{FE} E\hat{}_{RE} > Var\hat{} \; E\hat{}_{FE} \; Var\hat{} \; E\hat{}_{RE} @ \; _1 E\hat{}_{FE} E\hat{}_{RE} \quad (5.23)$$

If H is large, RE is rejected in favour of FE.

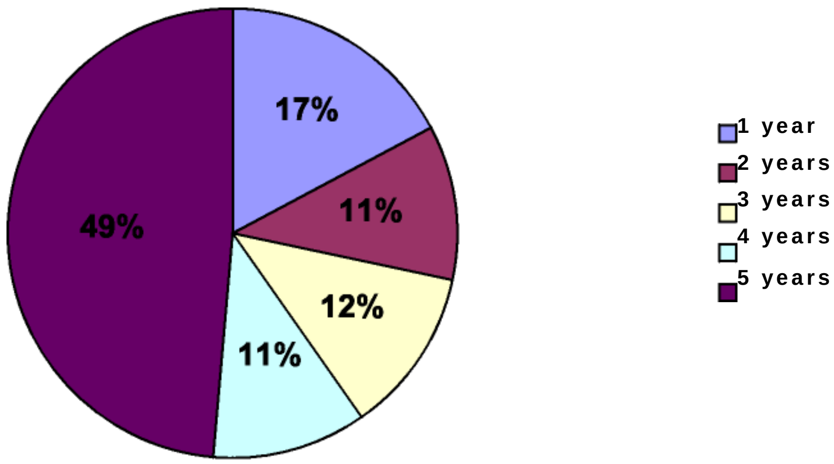
5.5 Data

The main data source employed in this analysis is the Irish National Farm Survey (NFS), for the years 2002 to 2006 inclusive. The NFS represents panel data of the form x_{it} , where x_{it} is a vector of observations for farmer i in year t. The data

analysed in this study uses 5 years of the NFS, 2002 to 2006 to model the participation decision of farmers in the off-farm labour market. The panel is unbalanced in the sense that many farmers do not stay in the sample for the full 5 years. Some drop out permanently while others drop out in one year but re-enter in the following year. New farmers are introduced as well during the period to keep the sample representative and at the approximate 1200 figure. Once a farm remains in the sample for a 2 year period (which need not be concurrent) it may be used in the panel data model of off-farm labour participation. The population size of the dataset is 5,941, while the sample size is 1,649. The minimum number of years spent by any one farmer in the sample is 1 while the maximum length of time is for the full 5 year period (Figure 5.2).

Figure 5.2 shows that of the 1,649 observations sampled over the 5 years of the NFS, approximately 49 percent of farms were surveyed for the full 5 years, while 17 percent were in the sample for a period of one year.

Figure 5.2: Duration of Farms in NFS Panel



Source: *NFS*

In the participation model WORK is the dependent variable and it is a binary indicator of whether the farm operator is engaged in employment off the farm or not. There are approximately 37 per cent of the 5,941 observations engaged in off-farm employment. The dependent variable for the labour supply model is HOURS, it measures the number of hours supplied off-farm for those that have an off-farm job. The average weighted number of hours worked by those engaged in off-farm employment is recorded as 1,571 hours, which is approximately 40 standard working weeks.

Most of the factors identified to significantly affect labour allocation decisions in previous studies are recorded by the NFS. For example, farm characteristics such as farm system, farm income, number of livestock units, land area and the value of direct payments to the farm are recorded. Various demographic information such as the farmer's age, the spouse's off-farm job status and the number of people living in the farm household were also collected and included in the model.

The variables used in the analysis are presented in Table 5.1. Returns to on farm labour (FWage) were estimated by dividing the total family farm income of a farm household by the total labour units employed on the farm. In some cases the return was negative as a negative farm income was recorded, to avoid negative farm wages the variable was constrained to a lower limit of zero.

Table 5.1: Data for Labour Allocation Models

Variable	Definition	Sample Mean (N=5941)	Standard Deviation (N=5941)
Dependent Variables			
WORK	Dummy =1 if operator engages in off-farm employment	0.37	0.48
POSHOURS	Number of hours supplied off-farm	1571	649
SYSTEM	Dummy = 1 if farm is specialist dairy or dairy/other systems and 0=Otherwise	0.12	0.33
Independent Variables			
NW	Net Worth €000	678.48	721.46
NW2	Net Worth Squared €000	980761.9	3378944
FWAGE	Family farm income per hour of total labour €	23.45	111.67
FWAGE2	Family farm income per hour of total labour squared €	13019	428349
AGE	Farmer's age in years	51.95	12.03
NO	Number living in farm household	3.73	1.82
LAB	Number of unpaid labour units on the farm	0.97	0.63
OFJS	Dummy =1 if the spouse is engaged in off-farm employment.	0.73	0.44
Child<5	Dummy = 1 if there are children less than 5 years of age in the farm household.	0.16	0.48
Child5-15	Dummy = 1 if there are children aged between 5 and 15 years in the household.	0.41	0.87
Child16-19	Dummy = 1 if there are children aged between 16 and 19 years in the household.	0.35	0.69
YEAR	Dummy variable for each year of NFS data represented		

As explained in the theoretical framework, decoupled payments are a source of non labour income which increases a household's wealth. In order to explore the link between wealth and labour allocation decisions, a variable representing non labour income should be included in the models. However, the identification of such a variable is problematic as the NFS does not collect any data pertaining to non-farm activities, for example, interest on savings or returns on non-farm investments are not recorded. Mishra and Goodwin (1998) and Ahituv and Kimhi (2002) considered farmers' net worth as a proxy for exogenous household wealth. This is one possible route although not ideal as many farmers are asset rich but relatively income poor. Nevertheless, there are no other data available to use as proxies for household wealth and so net worth is used in this study. The estimated value of the farm is recorded for every observation; it typically includes the value of the machinery, buildings, livestock or other closing inventories and the estimated value of the farm land. In this analysis, estimated farm value will be included as a proxy for household wealth.

5.6. Results:

5.6.1 Result of the Labour force Participation Model

The random effects model extends the pooled cross-sectional model to include a case specific random error term this helps to account for residual heterogeneity. Davies and Pickles (1985) have demonstrated that the failure to explicitly model the effects of residual heterogeneity may cause severe bias in parameter estimates. Using longitudinal data the effects of omitted explanatory variables can be overtly accounted for within the statistical model and this greatly improves the accuracy of the estimated effects of the explanatory variables.

When rho is zero, the panel-level variance component is unimportant and the panel estimator is not different from the pooled estimator. A likelihood-ratio test of this is included at the bottom of the output table (Table 5.2). This test formally compares the pooled estimator (probit) with the panel estimator (random effects model). The Chi squared test suggests that we reject the null hypothesis that there is no difference between the pooled and panel estimator, and we accept the panel estimator as being a significantly better estimator.

The results of the labour participation model are presented in Table 5.2 showing the estimated co-efficients. All the variables hypothesised to affect the participation decision were included in the model. A dummy is also included for each year of NFS data, the results show that farm operators in 2002 and 2003 were less willing to participate in the off-farm labour market as indicated by the negative (and significant) sign on the year dummies relative to the base year of 2004 but farm operators in 2005 and 2006 were significantly more likely to work off-farm.

Table 5.2: Results of Probit Model of Labour Participation

	Pooled Model	RE Model
Intercept	2.73	5.04
	*(19.95)****	*(11.30)****
SYSTEM	-0.849	-2.087
	*(-17.73)****	*(-1 1.88)****
NW	-0.0005	-0.0009
	*(-9.28)****	*(-5.24)****
NW2	8.33E-08	1.06E-07
	*(6.98)****	*(3.61)****
F Wage	-0.017	-0.03
	(-8. *18)****	*(-4.79)****
FWage2	0.0001	0.0002
	*(6.50)****	*(3.65)****
AGE	0.121	-0.09
	*(-21.08)****	*(-12.84)****
NO	0.086	0.133
	*(5. 99)****	*(3.84)****
LAB	-0.751	-0.974
	*(-13.11)****	*(-6.88)****
Children<5	-0.111	-0.124
	*(-2.51)****	*(-1.00)*
Children 5-15	-0.037	-0.119
	(-1.35)	(-1. *78)**
Children 16-19	0.117	0.157
	*(3.70)****	*(2. 03)***
OFJS	0.107	0.414
	*(2.47)***	*(2.72)****
2002	-0.141	-0.381
	*(-2.17)***	*(-2.80)****
2003	-0.873	-1.29
	*(-1 0.27)****	*(-6. 78)****
2005	0.195	0.485
	*(3. 10)****	*(3. 79)***
2006	0.324	0.812
	*(4. 96)****	*(5.89)****
Log-Likelihood	-2651.52	-1522.10
Wald 2 Statistic^		540.29

N= 5,941; * Significant at 10% ** Significant at 5% *** Significant at 1%

In relation to human capital variables, many models have supported the hypothesis of a life cycle effect (Huffman 1980 and Sumner 1982), which contends that individuals will increase their work effort in earlier years in order to accumulate assets to draw on later in life. Previous research has found that older farm operators are less likely to work off the farm, which may reflect differences in attitudes regarding work that are correlated with age (Mishra and Goodwin 1998). Our results reiterate the findings of Mishra and Goodwin (1998); the age variable having a significant and negative effect on the decision to work off-farm suggesting that as farmers get older the probability of off-farm employment decreases.

In relation to farm household characteristics, the number of household members has a significant positive effect on the operators' decision to work off-farm, which means that as the household size increases so does the likelihood of the farm operators' participation in the off-farm labour market. According to Woldehanna, et al. (2000), households with a larger family size have relatively higher marginal utility of income and a stronger desire to participate in off-farm work. The composition of the household was also found to have a significant effect on the labour allocation decision. We included a dummy variable for the presence of children in the farm household. The results of the model showed that a farm operator is more likely to work off-farm when there are children aged between 16 and 19 but the operator is significantly less likely to work off-farm when households have children aged between 5 and 15. The latter results reaffirm those of Sumner (1982) and Lass et al (1989) who demonstrated that the presence of children and other household members had a significant effect both on the off-farm participation decision and on the off-farm hours supplied by the farm operator. Mishra and Goodwin (1998) found that the presence of children under the age of thirteen years in the household significantly reduces the supply of off-farm labour.

The number of farmers' spouses participating in the off-farm labour market has increased significantly with 37 per cent of the spouses in the NFS 2007 employed off the farm compared to 23 per cent in 2000. The results of the labour participation model demonstrates that the off-farm job of the spouse has a significant positive effect on the operators' decision to work off the farm, suggesting that the farm operator is more likely to work off-farm when the spouse is employed off the farm. This may suggest that the increased rate of both the spouse and operators participation in the off-farm labour market may be due to pressure on the budget constraint caused by the size of the family.

In relation to farm characteristics, previous research (Barlett (1991), Mishra and Goodwin (1997), Hennessy and Rehman (2005)) showed that farm size had a significant negative and linear effect on the operators decision to work off-farm, therefore suggesting that operators' of larger farms and those farms with greater livestock units are less likely to participate in the off-farm labour market and at an increasing rate. However, our model suggested the problem of multicollinearity arising when variables such as farm size and the number of livestock units, given that the Net Worth variable was the estimated value of the farm and typically included the value of the machinery, buildings, livestock or other closing inventories and the estimated value of the farm land. In lieu of this finding, the model will be estimated without including the size of the farm and the number of livestock units.

Previous studies note the impact of different farming systems on the decision to work off the farm (Sumner 1982; Lass et al 1989, Gould and Saupe 1989). The reason for such a specification is that farming systems that are labour intensive will be less likely to have operators involved in off-farm employment. The profitability of farming systems also assumes an important role in the decision to participate in the off-farm labour market. For example, in terms of the NFS 2004, specialist dairy farming had the lowest number of farmers employed off farm and has the highest number of economically viable farms. In the labour participation model, a dummy variable is included to compare dairy farms (this combines specialist dairy farms with dairying and other farms) with all other systems. The results show that farmers involved in systems of farming other than dairying were found to be significantly more likely to work off the farm than farmers involved in the dairying system. This is expected as dairy farming is very labour intensive and is one of the more profitable farm enterprises, hence a higher return to farm labour. Our results also show that as the number of unpaid labour units (which is a proxy for the amount of time allocated to on-farm activities) increase, the time allocated to off-farm activities decreases.

In relation to the economic situation of farm households, the effect of on-farm wage, which was estimated by dividing the total family farm income of a farm household by the total labour units employed on the farm, is as expected, negative and linear, suggesting that as the farm wage increases the probability of working off-farm declines but at an increasing rate. Finally, the non-labour income variable, net worth, is significant at the 1 percent level and is negative as expected, suggesting that an increase in overall wealth reduces the probability of off-farm employment and at an increasing rate. This result is consistent with the findings of Burfisher and Hopkins (2003) where an increase in an individuals non-labour income, relaxes the household budget constraint leaving the individual to work less and enjoy more leisure while maintaining consumption.

5.6.2 Results of the Labour Supply Model

If there is a unit specific error term, inference based on Ordinary Least Squares (OLS) will be wrong unless we adjust the standard errors for serial correlation within units. If there is no unit specific error component, we will want to impose $V_C^2 = 0$ as a restriction, i.e. use Pooled OLS. Breusch and Pagan (1980) derived a Lagrange multiplier test that is based directly on the estimator for V_C^2. Whether a panel specification was preferred to a pooled specification was tested for, and the Likelihood Ratio test statistic of X confirmed the need for a panel rather than pooled regression (i.e., the standard deviation of the permanent component of the error term in the random effects specification is significantly different from 0). Therefore the results of the Pooled model cannot be used.

The next decision is the choice between fixed versus random effects estimation. Traditionally, the emphasis has been on whether one should think of c_i as a parameter to be estimated (fixed) or a stochastic variable (random) that is drawn from a distribution. If the panels can be considered random draws from a population, e.g. individual or firm data, it is natural to think of c_i as a random error component.

Whether x_i and c_i are correlated is a key issue and important to test. Hausman (1978) proposed a test based on the difference between the Fixed Effects (FE) and Random Effects (RE) estimates. The intuition is simple; if x_i and c_i are uncorrelated, both estimators are consistent and we would expect the difference to be relatively small. If x_i and c_i are correlated, RE is biased, and we would expect the difference to be large.

There is considerable debate over whether and when a fixed effect specification should be adopted over a random effects specification when using panel data.

Conceptually the difference is this; the fixed effects model assumes each farm in our study differs in the intercept term; the random effects model assumes each farm differs in its error term. When the data set contains all existing cross-sectional units (e.g., a specific set of N firms or a set of N Irish counties), one finds that the fixed effect model works best. In other cases, where one has a limited sample of the existing cross-sectional units (as is the case with the NFS dataset for Irish farmers, where we have data on the behaviour of a thousand farm households over time – where these are only a few of the full population of Irish farm households), the random effects model is to be preferred (Greene, 2003). Also, the fixed effects specification only utilises the information on farmers that have gone from a state of not participating in the off-farm labour market to one of participation or vice versa while the random effects specification uses the information on the farmer in all years whether he or she ever participated in the off-farm labour market or remains employed off-farm for all periods. On the other hand, the random effects specification assumes that the latent heterogeneity picked up in the error term is uncorrelated with any of the explanatory variables used in the model, which may be an unrealistic assumption.

As can be seen from the results of Table 5.3, variables such as returns to on farm labour and system of farming which a priori, one would assume would be drivers in terms of the number of hours farmers' allocate to the off-farm labour market are not significant in the fixed effects model (even though they have a similar sign to the pooled and random effects specifications). This is because there is very little variability in these variables over time for each observation in the fixed effects model. As a result, we use the results of the random effects specification when discussing the amount of labour (as measured by time) allocated to the off-farm labour market by farmers in the remainder of this section as it more accurately fits the nature of our data better.

Table 5.3: Results of the Labour Supply Model

	Pooled Model	FE Model	RE Model
NW	-0.312	0.171	-0.143
	*(-3.72)****	*(1.21)*	*(-1.73)****
NW2	0.00007	-0.00004	0.00003
	*(2. 71)****	*(-1.24)*	*(1.33)*
FWAGE	-1.838	-0.778	-0.763
	*(-1.61)**	*(-0.56)*	*(-0.70)*
FWAGE2	0.007	0.001	0.003
	*(2.51)****	*(0.31)*	*1.35*
SYSTEM	-272.86	-83.146	-270.27
	(-6. *13)****	*(-0.97)*	*(-5.65)****
LAB	-221.25	68.03	-64.37
	(-4. *96)****	*(1.40)*	*(-1.66)**
AGE	-7.406	-8.876	-5.855
	*(-4.70)****	*(-1.44)*	*(-2.95)****
NO	29.833	12.06	16.65
	*(3.24)****	*(0.86)*	*(1. 72)**
OFJS	-19.946	-177.38	-57. 153
	(-0.60)	*(-2.62)****	*(-1.44)*
2002	4.65	-21.65	-12.77
	(0.09)	*(-0.63)*	*(-0.41)*
2003	-201.29	48.59	-67.78
	(-3. *17)****	*(0.93)*	*(-1.52)*
2005	218.49	85.74	131.62
	*(4. 19)****	*(1.85)**	*(3.38)****
2006	60.37	*9.86*	41.438
	(1.21)	*(0.25)*	*(1.32)*

N= 1613; * Significant at 10% ** Significant at 5% *** Significant at 1%

The results of the labour supply model show that the farmers' age, net worth, the amount of unpaid labour on the farm, the system of farming, the number living in the farm household and the year 2005 all have a significant effect on the number of hours farm operators supply to off-farm employment. In relation to the system of farming, the results suggest that farmers engaged in specialist dairy or dairy/other systems of farming are significantly less likely to allocate hours to the off-farm labour market than farmers engaged in alternative farming enterprises. The results also show that the number of unpaid labour units have a significant negative effect on the off-farm labour allocation decision, therefore the greater the number of hours allocated to on-farm work, the less number of hours allocated to off-farm labour.

The age of the farm operators also has a significant negative effect on the hours worked off-farm, the results intimate that as the operators gets older the number of hours worked in the off-farm labour market decreases. In relation to the effect of time, the results illustrate that farm operators in 2005 were likely to increase the number of hours allocated to off-farm employment as indicated by the positive (and significant) sign on the year dummy relative to the base year of 2002. Given that decoupling was introduced in January of 2005, this suggests that as a result of the implementation of this policy, farmers increased the number of hours allocated to the off-farm labour market relative to 2002. The household composition also has a significant and positive effect on the number of hours allocated to off-farm employment, suggesting that the bigger the household the greater the number of hours worked off-farm by the farm operator. Finally, the effect of the net worth chosen as a proxy for overall wealth is negative as expected. It follows, therefore, that other things being equal, any increase in household wealth, which is likely to occur, decreases the number of part-time farmers and hence the amount of time spent working off-farm. The effect of decoupling, therefore, depends on the extent of the increase in nonlabour income. Our results therefore are similar to those postulated by Ahearn et al (2006) in that the wealth effect supersedes that of the substitution effect and that decoupled payments are likely to result in a decrease in off-farm work hours.

5.6 Conclusion

In Ireland, all direct payments were decoupled from production in 2005. Prior to this, the prevalent culture was one of 'farming the subsidy'. Direct payments therefore represented a significant proportion of farm household's family farm income, signifying that on average market based revenue was insufficient to cover total costs.

In this paper, we attempted to provide a deeper understanding of the variety of factors behind the labour participation and labour allocation decisions of farm operators using data gleaned from the NFS for the period 2002-2006. Firstly, this paper sought to examine the impact of farm and household characteristics such as age of farmer, household size and composition, off-farm labour status of the spouse, overall household wealth, system of farming and returns to farming on the off-farm labour supply of farmers. Finally, this paper also sought to examine the influence of decoupled payments on the labour allocation decisions of farmers. This question, in particular, has proved somewhat divisive among commentators, with some predicting (Hennessy et al; 2005) that the introduction of decoupled payments will lead to an upsurge in the percentage of farm operators entering the off-farm labour market. Alternatively Ahearn et al (2003) contend that decoupling will lead to a wealth effect and the reduction of the number of hours allocated to off-farm employment.

Firstly, in relation to the decision to participate in the off-farm labour market, the results showed that as farmers get older, the probability of participating in the off-farm labour market decreases. Farm households with children between the ages of 5 and 15 in the household reduces the likelihood of farm operators working off-farm. While dairy farmers are less likely to work off-farm compared to other farming systems due to the labour intensive nature of the enterprise. The number of unpaid labour units (a proxy for time allocated to on-farm labour), the family income per hour of total labour and the Net Worth which is used as a proxy for the farm households' wealth also have a significant negative effect on the farm operators participation in the off-farm labour market.

Contrastingly the number of household members and the years 2005 (the year decoupled payments were introduced) and 2006 increased the likelihood of farmers participation in the off-farm labour market. The dummy variables which measures the effect of time would support the hypothesis advocated by among others Hennessy et al (2005) that all things being equal decoupled payments increase the probability of farmers participating in the off farm labour market.

The previous model examined the participation of farmers in the labour market. This model examined the extent of hours worked in the labour market once farmers had made the decision to participate. In relation to the farm operators' allocation of labour to the off-farm labour market, the results showed that dairy farmers were significantly more likely to reduce the number of hours worked off-farm compared to alternative farming enterprises. Similarly, the age of the farm operator had a significant negative effect, suggesting that the older a farmer gets the fewer hours allocated to off-farm employment. The results also showed that as the number of unpaid labour units increases, the number of hours worked off-farm decreases.

The farmhousehold composition had a significant positive effect on the hours worked off-farm, the results show that as the number of household members increases, the hours worked off-farm also increase. In relation to the time effect, 2005 had a significant positive effect on the number of hours that operators worked off-farm. This result suggests that the introduction of decoupled payments has a significant positive effect on the labour allocation of farm operators. The results also showed that Net Worth is significant and negative; therefore an increase in Net Worth (i.e. wealth) will reduce the number of hours worked off-farm by farmers participating in the off-farm labour market.

In conclusions however, it should be noted that the impact of decoupled payments on the behaviour of farm operators may be underestimated given that the data in this model is gleaned for the years 2005 and 2006. Therefore by expanding the dataset to include the 2007 and 2008 National Farm Survey may provide a more accurate indication.

CHAPTER6

EXAMINING THE ROLE OF OFF-FARM INCOME IN INSULATING VULNERABLE FARM HOUSEHOLDS FROM POVERTY

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6.1 Introduction

The previous chapters of this report have outlined the increasing prevalence of off-farm participation by farm households and farm households increasing reliance on non-farm incomes. Chapter 2 highlighted the large number of farm households that are sustainable only because of the presence of off-farm income. Chapter 5 identified that the introduction of decoupled payments would lead to an increase in the number of farm operators participating in the off-farm labour market. In lieu of these findings, the objective of this chapter is to examine off-farm incomes role in protecting vulnerable farm households from experiencing poverty.

In a developing economics context, Barrett *etal.* (2001) observes that income diversification is common for most households with only a minute proportion of individuals deriving all household income from any one source. Diversification involves adding income-generating activities, including local non-farm and off-farm pursuits undertaken by members of a farm household. Cited benefits of farm diversification are for higher and more stable farm incomes and employment, greater long-term prospects for farm income growth, and more environmentally sustainable farming systems (Barrett *etal.,* 2001).[7]

[7]Their results show that livelihood strategies that include non-farm income sources – especially those derived from other than unskilled labour – are associated with higher income realizations and greater income mobility, especially upward earnings mobility. In contrast, those households that have neither access to non-farm activities nor sufficient productive non-labour assets (i.e., land and livestock) to devote themselves entirely to on-farm agricultural production, typically must rely on a low return strategy of complete dependence on the agricultural sector and often find themselves caught in a dynamic stochastic poverty trap.

The motive for diversification has traditionally been for income security reasons. On the one hand, "push factors", such as risk reduction or a reaction to crisis or liquidity constraints etc motivate income diversification strategies. The second set of motives comprise of "pull factors"; such as income enhancement i.e. where off-farm wages surpass the reservation wage offered from on-farm activities.

The objective of this chapter is to identify and examine the livelihood strategies implemented in households located in rural Ireland, with particular emphasis on the role of off-farm income in insulating vulnerable farm households from poverty. This objective will be achieved by updating work previously conducted by Keeney (2005) who sought to show that in the space of a relatively short period, the income situation of Irish rural households is less dependent on farming and more so on the non-farm economy such that there has been an improvement in the distribution of incomes accruing to farm households and also that non-farm incomes are having a significant positive effect on lowering the risk of income poverty in rural areas.

Our theoretical premise is that the viability of a household is dependent on the total income flowing into the household, which in turn must depend on the income sources open to household members. The empirical approach used is to consider livelihood strategies, namely income diversification, by household members to mitigate the risk of income vulnerability. An analysis of relative income poverty will show that farm households relying solely on the returns from farming are at a significantly higher risk of experiencing relative income poverty. On the other hand, by resorting to additional income sources (which may include an old-age pension or any source of social welfare including Farm Assist payments); the income risk was diversified, reducing variations in farm household income. It also follows that any other household member with an independent income source outside of farming will significantly decrease the likelihood of the household being defined as poor compared with all households nationally. The main risk of exposure, as defined by consistent poverty, originates from having all household income derived from less diversified sources that is compounded if the sole income source is a variable one such as farm income.

This chapter will present a comparative perspective on income and poverty rates of farm, non-farm rural and urban households. The paper is divided into six main sections. The first section of the chapter deals with the EU-SILC data used in the analysis. In Section 3, we compare the incomes of farm households with non-farm rural households and urban households, using data from the EU-SILC survey.

In Section 4, we attempt to determine the extent of inequality among families in the farm, rural non-farm and urban sectors for a more recent period and some factors influencing this inequality. We will undertake a decomposition of various indices of income distribution based on the components of income accruing to rural households. The income components studied were farm returns, off-farm income earned, social welfare receipts and other direct income flows (such as private pensions). The indices studied were the Gini index of income inequality and the General Entropy Indices, which are additive measures of income inequality.

In section 5, we will identify the rural poor in Ireland and decompose a well-known index of income poverty that takes account of the intensity of poverty experienced replicating work conducted by Keeney in 2005. In section 6, we describe the household characteristics in determining a household's propensity to diversify by incorporating a propensity score matching method.

Finally, in section 7, to characterise the poor farm households in rural Ireland, we use a probability model in which the chances of falling below the poverty line (and experiencing deprivation) are tested against household factors such as household income structure, age, and household composition.

6.2: Data

The data incorporated in this paper is gleaned from various years of the EU-Survey on Income and Living Conditions (SILC), which is conducted by the Central Statistics Office (CSO). The objective of the survey is to obtain information on the income and living conditions of different types of households. The survey also collects information on poverty and social exclusion. This is achieved by selecting a representative random sample of households throughout Ireland.

The data is required in both cross-sectional (pertaining to a given time in a certain time period) and longitudinal (pertaining to individual-level changes over time) dimensions. The results of SILC give a very comprehensive picture of income, living conditions and poverty throughout the European Union.[8]

6.2.1 The farm questionnaire

Farm households are not deliberately part of the EU-SILC sampling frame. If a household surveyed was found to have a member engaged in farming, a farm questionnaire is then produced and completed. The target respondent to complete the farm questionnaire is the actual farm operator if the household reference person is not the person engaged in the farm business. One farm questionnaire is completed in respect of each separate, independent farm operated by household members, so that if more than one farm is farmed, more than one farm questionnaire could be relevant for a household. The farm income data collected relates to the income earned in the year previous. In 2006 there were 305 farm questionnaires completed.

Land and farm size

The average farm size for farms encompassed in the 2006 EU-SILC was 29.7 hectares with a maximum farm size of 90.6 hectares.

8 The results of SILC play a central role in meeting Irish national requirements in the area of poverty, social exclusion and household income, with particular reference to the National Anti-Poverty Strategy[8] and tax-benefit modelling.

Table 6.1 Distribution of Farm size (hectares)

Hecta res	Percent
<10	22.1
10-20	15.2
20-30	17.7
30-50	29.2
50-100	15.8
Total	100.0

Source: *EU-SILC 2006*

Farm System

The farm system types are based on the EU farm typology set out in the Commission Decision 78/463 and its subsequent amendments. This farm system assignment is based on a methodology that uses a standard gross margin unique to each type of farm animal and each hectare of crop.[9] Farms are then classified into groups called particular types and principal types, according to the proportion of the total standard gross margin of the farm, which comes from the main enterprises after which the systems are named. For the purposes of adapting the EU typology to suit Irish conditions more closely, a regrouping of the farm types has been carried out as outlined below in the EU description:

"The system titles refer to the dominant enterprise in each group and their results should not be confused with those of individual farm enterprises. For example, the two specified cattle systems refer to those farms where the greater proportion of their activity is cattle production, but there are many other farms (including those in the tillage and other systems) that have a cattle enterprise". (Con nolly et al: 2005).

Previous work on the farm data has shown that the farm system variable is a very significant indicator of overall farm income (estimated as family farm income), as enterprise incomes are significantly determined by the main enterprise or activity carried out on the farm. Table 6.2 illustrates the systems of farming of those farms encompassed in the 2006 EU-SILC. The table shows that the Dairying system

[9]The standard gross margins used are in line with those published annually in "*Management Data for Farm Planning*" by Teagasc. An estimate of the economic size of the farm measured in European Size Units (ESU) is also derived from this data. ESUs are an alternative measure to farm size (measured by surface area) and measures the size of the farm business where 1 ESU = 1,200 euro of Standard Gross Margin.

accounts for the largest proportion of farming activity, while the smallest percentage of farms are in the Dairying & Other system.

Table 6.2 Frequency of farm system

Farm System	Percen
Dairying	21.2
Dairying & Other	6.9
Cattle Rearing	11.7
Cattle & Other	17.1
Mainly Sheep	17.4
Tillage	16.1
Other	9.6
Total	100.0

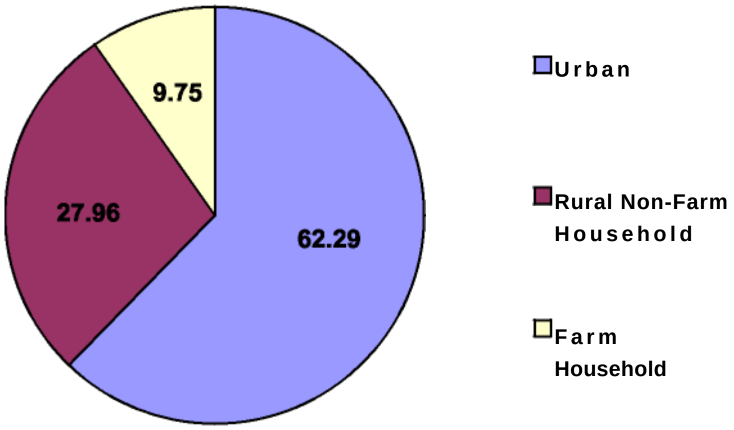
Source: *EU-SILC 2006*

Section 6.3: Household type and an assessment of Income components The analysis in this report is conducted at the household level and classifies three types of households. First, a distinction is made between rural and urban households. A household was classified as rural if it was in either 'open country' or a town or village with a population of up to 1,500. Households residing in all other areas were taken to be urban households. Within the rural classification, a farm household was broadly defined as a household attached to a farm and where some farm income contributed to the total household gross income.[10] In the results that follow, farm households, non-farm rural households and urban households are compared and contrasted.

This approach defines a farm household as any household in which a farm is owned or rented and there is some income from farming in the household. Households where the only farm income is from the renting out of agricultural land are excluded. Figure 6.1 shows that 62 percent of the households encompassed in the 2006 EUSILC were classified as urban, 28 percent were classified as rural non-farm households, with farm households accounting for the remainder.

[10] In a very small number of cases, farm income accrues to a non-farm rural household. This occurs where a respondent reports a household member as having some income from farming but a farm questionnaire was not completed for that household. It is likely that the farm is let out and is not currently operated by a household member.

Figure 6.1: Percentage breakdown of Household Types in 2006 EU-SILC



Source: *EU-SILC 2006*

6.3.1 Total Household Income

Like the Household Budget Survey – and unlike the National Farm Surveys – the EU-SILC measures non-farm as well as farm income accruing to farm households, and includes non-farm rural households and urban households as well as households engaged in farming. This means that the overall income position of rural households and its components can be studied, and a comparative perspective on the income and poverty rates of farm, non-farm rural and urban households can be provided. In addition, an in-depth analysis of poverty risk can be undertaken by household type. Data available in the EU-SILC surveys also allows the measurement of poverty not only on the basis of income, but also combining relative income and deprivation indicators to quantify 'consistent' poverty and the risk of social exclusion.

6.3.2 Measurement of household income

Household income is defined by the CSO "to include all money receipts that accrue to the household together with the value of any free goods or services regularly received by household members and the retail value of own farm or garden produce consumed by the household" (CSO, 1997, p.210). Taking this definition we define *gross household income* as the gross income of all household members from all sources, including the farm income, other earned and non-earned income, together with state transfers. We distinguish four components of gross income. The first is income from farming. The second is non-farm employment income including income from self-employment. The third is other direct income, all other income from the market not derived from farming or non-farm employment, which includes for example, investment income and rental income from non-farm property. The fourth is state social welfare transfers, including Child Benefit. Going beyond gross income we also look at total deductions of income tax, health and social insurance contributions, and at *disposable household income* measured as gross income minus these deductions.

Farm income represents all income accruing to any member of the household as the return for self-employment in a farming activity. An estimate is assigned on the basis of a farm questionnaire completed in respect of each separate, independent farm operated by household members. Non-farm employment income includes all earned income from employment as an employee or from self-employment. Other direct income includes non-earned income including rental and investment income, lump sums and other sundry income. State transfers include all social welfare income including pensions and child benefit receipts. The relative importance of each income source in the total gross income of farm households is shown in Table 6.3. Gross household income represents total income before tax and other deductions.

Table 6.3 Source of income for farm households

	Farm income	Non-farm employment	Other direct income	State Transfers	Total gross income
1994	54.8	26.7	3.5	15.0	100%
1997	51.2	29.8	4.9	14.1	100%
1998	51.9	28.2	4.9	15.0	100%
2000	41.7	41.7	4.4	12.2	100%
2001	36.8	48.0	0.2	13.2	100%
2004	30.3	53.9	1.4	14.3	100%
2005	31.4	52.0	2.3	14.3	100%
2006	34.7	51.3	2.2	11.8	100%

Source: *Living in Ireland Surveys 1994 to 2001, EU -SIL C 2004-2006*

In recent years the existence of off-farm employment income has become more prevalent, making the situation quite different from earlier decades where the main sources of off-farm income would have been pensions and social assistance. According to Table 6.3, non-farm employment accounts for in excess of 50 percent of total farm household income for the farm households encompassed in the 2006 EU-SILC.

6.3.3 Income of farm households compared with other households

In 2006, 9.7 per cent of the (weighted) sample from the EU-SILC survey was classified as being a farm household according to the criteria outlined above. Urban households made up 62.3 per cent of the population with the remaining 28 per cent classified as non-farm rural households.

Table 6.4 outlines the average household income by source according to each household type in the Living in Ireland Survey of 2001. The average of each of the income components is also given for all households. At €42,880, farm households had a lower average gross income than urban households, but their average disposable income was higher due to lower taxes. Average gross household income for farm households was higher than that for rural non-farm households. Both average gross and disposable incomes per household member were however lower for farm than for urban and non-farm rural households, as farm households tend to be larger. Average gross and disposable income per household member is highest for urban households.

Table 6.4 Average household income by income source 2001

Average (€ʹs)	Farm Households (€ʹs)	Non-farm rural Households (€ʹs)	Urban Households (€ʹs)	All households Average (€ʹs)
Farming income	15,765	540	-	1,244
Non-farm Employment inc.	20,580	30,048	36,472	33,073
Other direct income	868	1,407	2,806	2,169
Total state transfers	5,667	5,352	5,052	5,202
Gross income	42,880	37,348	44,330	41,688
Less total direct taxation	3,668	4,160	5,533	4,911
Disposable income	39,212	33,187	38,797	36,777
Persons per household	4	3	3	3
Gross income per household member	10,720	12,449	14,777	13,896
Net Income per household member	9,803	11,062	12,932	12,259

Source: *Living in Ireland Surveys 2001*

By adjusting for inflation, we can compare the income of households in real as oppose to nominal terms for those households encompassed in the 2001 Living in Ireland Survey and those included in 2006 EU-SILC sample. Table 6.5 outlines the average gross household income by source for 2006. When we compare the figures for 2001 with 2006, we can see that the average gross household income for farm households has augmented to €63,819. In relation to the households' source of income, the figures show that there has been a 40 percent increase in the farming income from 2001 figures. Incomes from social transfers, non-farm activities and other direct income sources have also increased significantly on 2001 figures. The tables illustrate that the rate of increase in farm income was outstripped by a higher rate of increase in average non-farm employment income accruing to farm households. This is consistent with the increasing propensity for farm households' members to engage in non-farm employment as seen in Table 6.3. In line with the increase in non-farm employment, the proportion of household income paid in direct taxation also expanded from 8.58 per cent in 2001 to 15.7 per cent in 2006. In contrast to 2001, farm households no longer have the lowest gross or disposable income per household member.

Table 6.5 Average gross household income by source of income in Real Terms 2006[11]

Average (€'s)	Farm Households (€'s)	Non-farm rural Households (€'s)	Urban Households (€'s)	All households Average (€'s)
Farming income	22,136	0	0	2,156
Non-farm Employment inc.	32,746	34,822	49,876	44,000
Other direct income	1,402	694	1,647	1,357
Total state transfers	7,536	9,758	9,552	9,413
Gross income	63,819	45,274	61,075	56,925
Less total direct taxation	10,002	8,162	14,069	12,021
Disposable income	53,817	37,112	47,006	44,567
Persons per household	4	4	4	4
Gross income per household member	15,955	11,318	15,269	14,231
Disposable income per household member	13,454	9,278	11,751	11,142

Source: *EU-SILC 2006*

11 Table is adjusted for inflation between 2001 and 2005. The CPI is used as a deflator. Base year 2001=100; 2005=111.3 & 2006=115.7.

6.3.4 Income distribution analysis by household type

We now turn from average household income and its components to the distribution of income. In analysing the distribution of income the conventional approach is to divide households into income deciles – that is, successive one-tenths moving up the distribution. Here we first construct deciles from the distribution of gross income for the total weighted sample. Average income from different sources received by farm households categorised by gross income deciles are shown in Table 6.6 for 2001 and Table 6.7 for 2006.

Table 6.6 Farm household income components by deciles of population gross income 2001

Decile of gross in come	1st €	2nd €	3rd €	4th €	5th €	6th €	7th €	8th €	9th €	10th €
Farm income	2982	4289	7315	11453	13941	19225	15594	29662	38362	22589
Non-farm income	-	102	1507	3763	8458	14227	25778	24369	29736	96742
Other direct income	119	145	649	1374	960	1099	789	611	2592	931
Social transfers	1645	5561	6532	6594	7371	4467	4928	5155	2978	8000
Gross income	4746	10097	16003	23185	30731	39069	47089	59797	73666	128261
Disposable income	3717	10063	15309	22051	28393	35162	42318	53486	64162	117271
Gross income/person	2373	5048	8001	7728	7683	7814	11772	11959	14733	25652
Disposable income/person	1858	5031	7654	7350	7098	7032	10579	10697	12832	23454
Farm as % of gross income	62.8	42.5	45.7	49.4	45.3	49.7	33.1	49.6	52.1	17.6
No of persons	2	2	2	3	4	5	4	5	5	5

Source: Living in Ireland Surveys 2001

Farm households in the lower deciles tend to have fewer household members while average non-farm employment income is very low or non-existent. According to the Living in Ireland Survey, in 2001 there was no consistent relationship identified between the proportion of income derived from farming and gross income distribution, with income from farming most often comprising about half of all income coming into farm households across the deciles.

In relation to the 2006 EU-SILC, farm incomes accounted for about 40 percent of the gross income across all income deciles. When compared to that of 2001, the most notable transformation is the reduced reliance on farm income for those in the lowest income decile, in 2001 farm income accounted for 63 percent of gross income for those in the first income decile, in 2006 it accounted for 51 percent. What is significant to note is that there has been an increased reliance on social transfer payments for those households located at the lower end of the income spectrum with social transfer payments accounting for approximately 50 percent of gross income for those households located in the first three income deciles. There also has been a shift the in farm income proportion of gross income for those in the highest income deciles. Over the 2001-2006 period, the non-farm income proportion of households' income increased significantly for farm households located at the top of the income distribution.

Table 6.7 Farm household real income components by deciles of population gross income 2006

Decile of gross in come	1st €	2nd €	3rd €	4th €	5th €	6th €	7th €	8th €	9th €	10th €
Farm income	4,544	6,612	8,342	10,399	14,562	14,374	26,225	25,734	29,424	49,670
Non-farm income	106	850	2,929	8,282	12,517	19,902	18,743	37,278	53,434	123,968
Other direct in co me	266	337	220	492	835	917	943	1,900	2,647	3,786
Social transfers	4,030	7,572	9,902	8,694	7,823	8,855	9,760	5,000	4,987	5,537
Gross income	8,946	15,371	21,393	27,868	35,738	44,048	55,671	69,912	90,493	182,960
Disposable income	8,647	15,223	20,527	26,027	32,789	38,629	49,022	53,445	71,045	153,485
Gross income/person	4,473	7,685	7,131	6,967	8,934	11,012	11,134	17,478	18,099	36,592
Disposable income/person	4,323	7,612	6,842	6,507	8,197	9,657	9,804	13,361	14,209	30,697
Farm as % of gross income	51	43	39	37	41	33	47	37	32	27
No of persons	2	2	3	4	4	4	5	4	5	5

Source: *EU-SILC 2006*

6.3.5 Conclusions

This section has compared the incomes of farm households with non-farm rural households and urban households, using data from the EU-SILC survey. First, the average income of each household type and its components were tabulated. In 2006, farm households had an average disposable income above the national average, higher than both urban and non-farm rural household. Between 2001 and 2006, farm income grew less rapidly than non-farm employment income earned by farm household members, on average, income from farming activity is not the most important single source of gross income for farm households. We also found that farm households in the lowest decile of the income distribution are least likely to have family members with off-farm jobs.

Section 6.4: Income inequality in Irish Rural Households: how significant is farm income as a component of total household income?

6.4.1 Introduction

The National Anti Poverty Strategy (1997) emphasises that a number of dimensions should be considered in assessing the types of rural households at particular risk of disadvantage. Marginalised rural communities exist which face the decline of primary industries, especially agriculture, small non-viable farms, underemployment, low income, dependence on social welfare and isolation. "It is important in identifying poverty in rural areas that the people who are at greatest risk of poverty are identified i.e. the heterogeneity of rural areas needs to be recognised" (NAPS; 1997).

This section attempts to determine the extent of inequality among families in the farm, rural non-farm and urban sectors for a more recent period and some factors influencing this inequality.

6.4.2 The importance of using equivalised income in measuring Income inequality in Irish Rural Households

Differences in household size and composition need to be taken into account when assessing the welfare implications of income differences across households – as there are systematic differences between farm households, non-farm rural ones, and those in urban areas in terms of size and composition. We therefore employ at this point what are known as adult equivalence scales. Applying an equivalence scale has the effect of normalizing household income taking account of the number of adults and children relying on that income.

With the help of *equivalence scales* each household type in the population is assigned a value in proportion to its needs. The factors commonly taken into account to assign these values are the *size of the household* and the *age of its members* (whether they are adults or children). A wide range of equivalence scales exist, many of which are reviewed in Atkinson *et al.* (1995). Some of the most commonly used scales include:

> **"OECD equivalence scale".** This assigns a value of 1 to the first household member, of 0.7 to each additional adult and of 0.5 to each child. This scale (also called "Oxford scale") was mentioned by OECD (1982) for *possible* use

in *"countries which have not established their own equivalence scale".* For this reason, this scale is sometimes labelled "(old) OECD scale".

"OECD-modified scale". After having used the "old OECD scale" in the 1980s and the earlier 1990s, the Statistical Office of the European Union (EUROSTAT) adopted in the late 1990s the so-called "OECD-modified equivalence scale". This scale, first proposed by Haagenars *et al.* (1994), assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child.

Square root scale. Recent OECD publications comparing income inequality and poverty across countries use a scale which divides household income by the square root of household size. This implies that, for instance, a household of four persons has needs twice as large as one composed of a single person. However, some OECD country reviews, especially for Non-Member Economies, apply equivalence scales which are in use in each country.

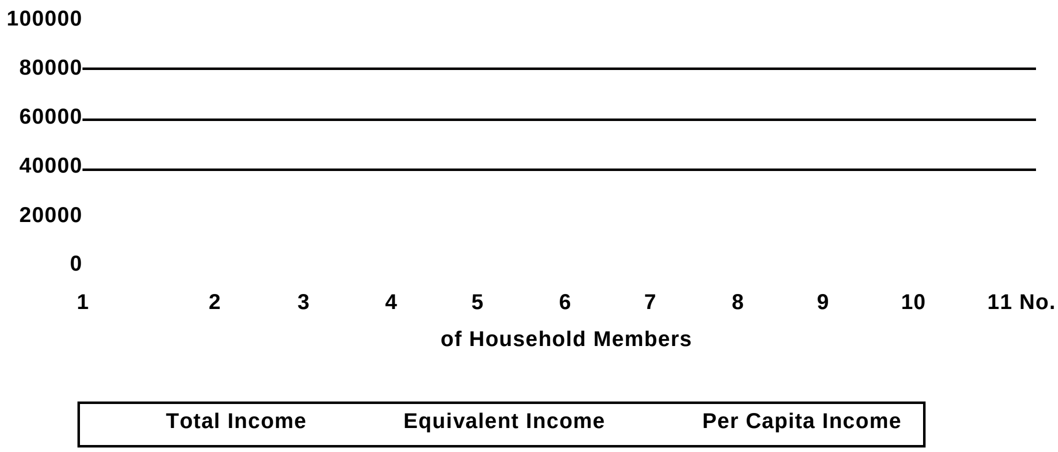
Table 6.8 Types of Equivalent Scales

Household Size	Equivalent Scales					
	Per-capita Income	"Oxford" scale ("Old OECD Scale")	"OECD-modified" scale	Square root scale	Irish scale	Household Income
1 adult	1	1	1	1	1	1
2 adults	2	1.7	1.5	1.4	1.66	1
2 adults, 1 child	3	2.2	1.8	1.7	1.99	1
2 adults, 2 child	4	2.7	2.1	2.0	2.32	1
2 adults, 3 child	5	3.2	2.4	2.2	2.55	1

In Ireland, the national scale attributes a weight of 1 to the first adult, 0.66 to each subsequent adult (aged 14+ living in the household) and 0.33 to each child aged less than 14. Therefore in this analysis, we will use the Irish national scale in calculating the total number of "equivalent adults" in the household, thereby allocating a value of 1 to the first adult in a household, a value of 0.66 to each subsequent adult thereafter and assigning a value of 0.33 to each child located in the household. Equivalent or equivalised household income is then calculated by dividing total income by the number of adult equivalents in the household. The disposable household income is then divided by the *equivalised household size* to calculate the equivalised income for each individual, which essentially is an approximate measure of how much of the income, can be attributed to each member of the household. This *equivalised income* is then applied to each member of the household.

It can be seen from Figure 6.2 that, when no use is made of any equivalence scale the household income is positively but less than proportionally related to household size. In other words, any additional member increases the average per household income but reduces the per capita household income. This is in line with the findings of a number of relevant studies (e.g. Kuznets, 1976). The per capita income appears to have an almost constant relationship with household size in rural areas, the only exception being households with three members where the average income is highest and slightly higher than that of two-member households. Finally, the equivalent income is negatively associated with the size of household for households sized between 3 and 6.

Figure 6.2 Average total, equivalent and per capita disposable household income by number of members per rural household

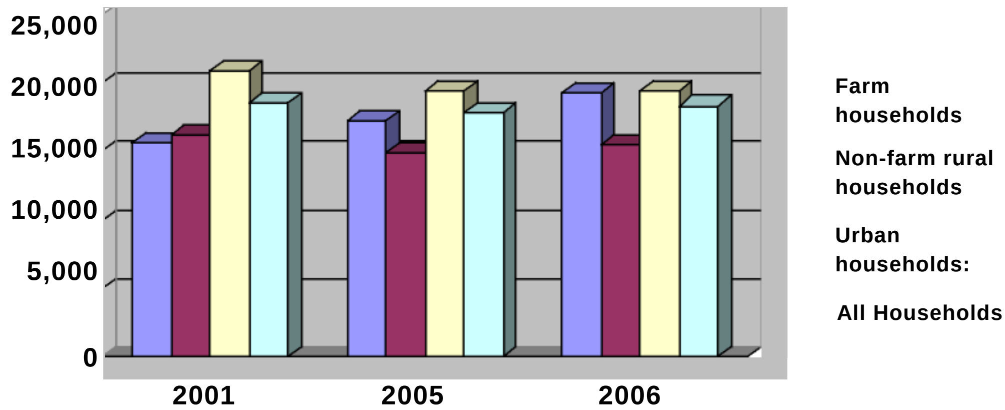


Source: *EU-SILC 2005*

The composition of the household appears to be reflected not only in the total household income but also in its synthesis as far as the contribution of each individual source is concerned. Therefore, the analysis by income source proves to be quite revealing in understanding and explaining particular issues in the distribution of income among population subgroups.

Figure 6.3 shows the average disposable income per adult equivalent for farm, non-farm rural and urban households. In 2001, non-farm rural households had higher incomes per adult equivalent than farm households but lower than that of urban households'. By 2006, farm households' income per adult equivalent had surpassed those of rural non-farm households but was still lower than that of urban households. The results showed that over the period 2001-2006 farm households experienced the highest percentage improvement in equivalised incomes with gross and disposable income per adult equivalent increasing by 34 and 23 per cent respectively, compared to an approximate 5 per cent increase in the gross income per adult equivalent for urban and rural non-farm households but these households envisaged a decrease in their equivalent disposable income over the aforementioned time period.

Figure 6.3 Disposable income per adult equivalent, Living in Ireland surveys 2001, and EU-SILC 2005-2006.



Source: *Living in Ireland Surveys 2001, EU -SIL C 2004-2006*

Table 6.9 presents the distribution of equivalent disposable income, gross income from various sources and deductions by the size and composition of the household for 2006. We define a child as anyone aged under 14, as this is the equivalising factor used in constructing equivalent income per household. The share of primary income (wages and salaries, self-employment income and farm income) in total equivalent household income is positively related to the presence of children in the household. The table also shows that the fewer the adults, the more important state transfers are to the household. This may be due to the fact that households with one or two adults having a high proportion of elderly members whose incomes are mainly attributed to pensions. As Table 6.9 and Table 6.10 show, the presence of elderly members and children are found to have a depressing effect on the total equivalent household income. Concurrently, farm income contributes most to equivalised household income in these types of households, predominantly headed by an elderly person, and where there are three or more children. It follows that a higher dependence on farm income for total household income is concurrent with a higher than average dependence on state transfers including state pensions and other social welfare payments.

Table 6.9 Gross household income from various sources, disposable income and deductions by household type in rural areas only in Real Terms, 2006

Household Types	Sources of Income							
€ 2006	Non farm employment	Farm income	Other direct income	State transfers	Total gross income	Total tax/ PRSI deductions	Av. Equiv. Disp household	% of households
1 Adult. No child	5.400	2.313	622	7.495	15.830	1.670	14.160	7.8
2 Adults, No child	19,941	3,464	896	10,806	35,107	5,313	17,948	18
3+ Adults, No child	45,918	10,204	1,112	9,277	66,511	11,878	18,304	22.2
1 Adult, 1+ Child	4,972	73	661	12,712	18,418	1,629	9,525	3.1
2 Adults, 1-3 Children	39,948	3,160	787	6,424	50,318	9,919	17,357	24.6
Other with Children	41,487	7,701	849	10,783	60,819	9,958	14,591	24.4
Total	5,723	34,286	877	9,183	50,069	8,638	16,509	100.0

Source: *EU-SILC, 2006*

Table 6.10 Percent of Gross household income from various sources, disposable income and deductions by household type in rural areas only, 2006

Household Types	Sources of Income							
% 2006	Non farm employment	Farm income	Other direct income	State transfers	Total gross income	Total tax/ PRSI deductions	Av. Equiv. Disp household	% of households
1 Adult, No child	34.1	14.6	3.9	47.3	100	10.5	89.5	7.8
2 Adults, No child	56.8	9.9	2.5	30.8	100	15.1	84.9	17.9
3+ Adults, No child	69.0	15.3	1.7	13.9	100	17.8	82.2	22.2
1 Adult, 1+ Child	27.0	0.4	3.6	69.0	100	8.8	91.2	3.1
2 Adults, 1-3 Children	79.4	6.3	1.6	12.8	100	19.7	80.3	24.6
Other with Children	68.2	12.7	1.4	17.7	100	16.4	83.6	24.4
Total	68.5	11.4	1.7	18.3	100	17.2	82.8	100

Source: *EU-SILC, 2006*

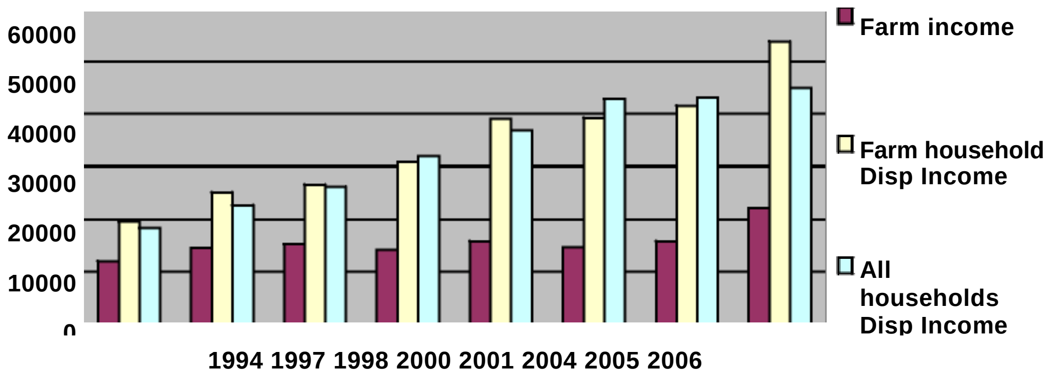
6.4.3 Farm household specific analysis

Empirical research has identified three factors that influence the labour market as being a major determinant of income/earning inequality. These factors included supply-side, demand-side and institutional factors. Institutional factors relate to the role of certain organisations, including government policy, in influencing the return to labour and investment. While the supply and demand side factors are considered in the context of the availability of employment opportunities in the labour market for higher paid versus low paid workers. According to the National Anti Poverty Strategy (NAPS) working group on rural poverty, the economic structure of many rural areas were undermined due to an overdependence on agriculture, the absence of alternative employment opportunities to sustain or generate off-farm income, the lack of 'quality' job opportunities and the brain drain phenomena (i.e. the out-migration of those with high levels of educational attainment).

Von Witzke (1984) identified a significant correlation between the household and farm decisions making process and that the agricultural performance (in terms of monetary returns) depends on many factors that render theoretical and empirical analyses more difficult. In relation to Ireland, agricultural supports account for a large proportion of gross agricultural receipts and are therefore an important determinant of farm income. This is substantiated by statistics from the National Farm Survey (NFS). According to the 2006 NFS, the single farm payment accounted for 66 percent of farm income across all farms, when other direct payments (e.g. REPS, disadvantaged area payments etc) are included this increases to approximately 98 percent of farm income for all farms. Nevertheless, research (OECD, 2002; Keeney, 2005) show it is increasingly income from non-farm employment, other earned income, such as revenues from investments and social transfers that generate adequate levels of income for farm households. Research such as Keeney (2005) showed that off-farm income not only raises the total level of income for farm households but also lowers its variability and partially offsets the inequality of the distribution of farm income. Therefore, farm income solely is not an accurate measure of the income of farm households.

Figure 6.4 shows the mean incomes of farm households compared to all households between the years 1994 and 2006. The graph shows that when all sources of income are taken into account, farm households have, on average, incomes that are close to the all-household average and higher than that of the national average in 2006. This exact trend has been identified previously in the US, Europe and elsewhere (Mishra and Sandretto, 2002). Hill and Cook (1996) concluded that average disposable income per farm household in the European Union (EU) is typically higher than the all-household average. A similar pattern can be confirmed within an Irish context.

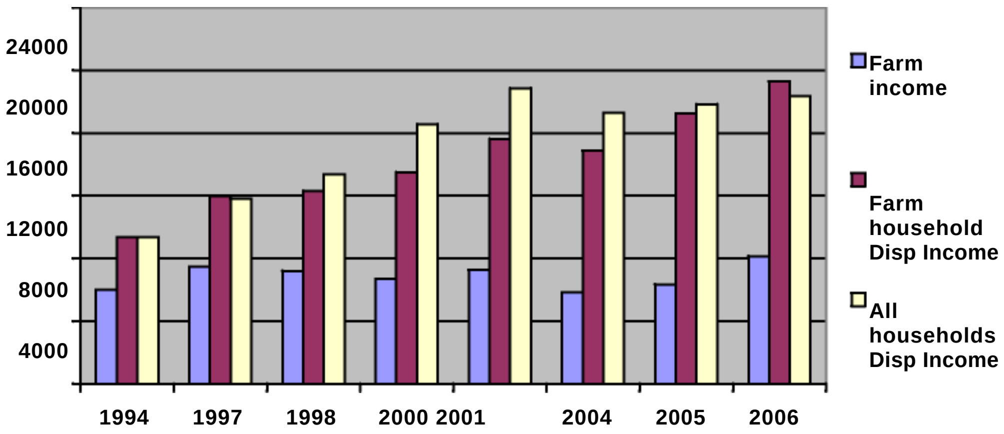
Figure 6.4 Mean incomes of farm and all households in real terms 1994-2006



Source: *LIIS 1994-2001, EU-SILC 2004 -2006*

Figure 6.5 shows how the relative situation changes when the incomes are equivalised. Farm households tend to be larger in size than average and this is reflected by a scaling down of incomes when equivalised. There has been a widening divergence between disposable incomes for farm households and disposable incomes of all households between 1998 and 2001. All households' disposable income is greater than farm households for 2004 and 2005; however farm households' disposable income was greater than the average in 2006. Figures 6.3 and 6.4 shows that those farm households relying solely on farm returns have incomes substantially lower than the national average and are likely to be at significant risk of income poverty.

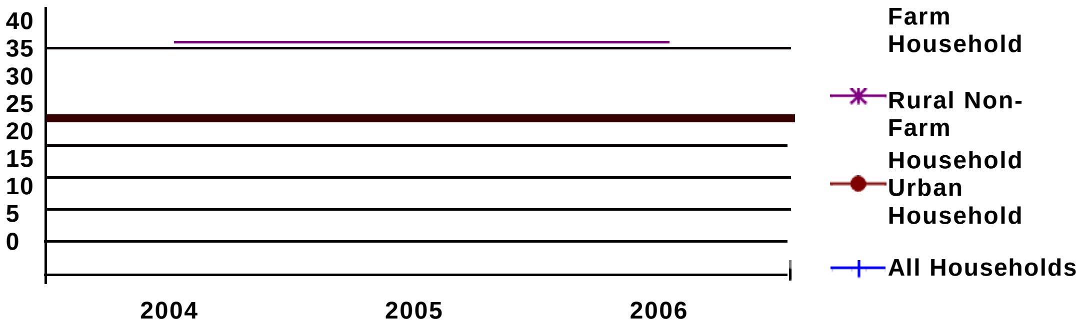
Figure 6.5 Equivalised Mean Income of farm and all households 1994-2006



Source: *LIIS 1994-2001, EU-SILC 2004-2006*

According to the 2001 Living in Ireland survey between a fifth and a quarter of all farm households were at significant risk of income poverty. At risk of poverty is calculated in this context by setting the line at 70 per cent of the median income (the mid-point on the scale of all incomes in the State from the highest to the lowest), any household below this line is deemed to be at risk of poverty. When we compare this with the 2006 EU-SILC the number at risk of relative income poverty has decreased to approximately 19 percent.

Figure 6.6 Relative Poverty statuses of households encompassed in the EU-SILC 2004-2006



Source: *EU-SILC 2004-2006*

This leads to the important question of what is the significance of differentiating between farm and off-farm income in studies of income inequality and relative poverty. In researching the answers, one has to consider both income from employment and income from all other sources, including government transfers and direct payments. Differences in dependence on off-farm income, farm size, enterprise specialisation (farm system) and lifecycle stage (age of farm operator/household size) have been shown to be associated with farm income variability and therefore contribute to the extent to which the farm income is sufficiently close to average disposable income levels of households nationally (Keeney; 2000).

6.4.4 Inequality: Measures and consequences

We have shown so far that the differences in household incomes between certain population subgroups could explain part of the differences in average levels of income, as well as in the structure of household income. These estimates do not tell us anything about how incomes are distributed within population subgroups or according to the source of income for the rural population. This section deals with inequality within household groups and across sources of income.

Income inequality within each group can simply be measured by one (or more) of the relevant indices. Although this allows us to compare the inequality among population subgroups, it does not directly say much about the extent to which this inequality contributes to the overall inequality. In order to investigate these issues, we need to be able to decompose inequality into within-group and between-group components.

The between-group inequality is the component that would result if all units in each population subgroup had an income equal to the average income of the subgroup. The within group component is the inequality which would remain if the average income in all groups were equalised but the inequality within each group remained unchanged. The within-group component is, therefore, the sum of the inequalities within each group, weighted by a coefficient that depends on certain aggregate characteristics. As Cowell (1995) has pointed out, an inequality index is decomposable if the total inequality can be expressed as an aggregate function of the inequality in each subgroup, the mean income and of the population of each group (see also Cowell 1984). Thus the total inequality for any income distribution can be written as:

$$I_T = F(I_1, I_2, \ldots I_k; P_1, P_2, \ldots P_k; n_1, n_2, \ldots n_k) \quad (6.1)$$

where I_T is the overall inequality of the population, while I_k is the inequality in group *k*, P_k is the main income in group *k* and n_k is the population in group *k.*

Although a large class of inequality indices is decomposable by population subgroup, not all of them are suitable for this purpose.[12] A number of authors have already discussed extensively the indices that are suitable and have the most desirable properties for this type of exercise (Bourguignon 1979, Cowell 1984, 1995, Shorrocks 1978, Anand 1983). All inequality indices that are additively[13] decomposable by population subgroup are members of the family of generalised entropy indices.

6.4.5 Commonly used measures of inequality

Gini coefficient of inequality

The most widely used measure of inequality is the Gini coefficient. The Gini coefficient is based on the Lorenz curve (Lorenz, 1905), a cumulative frequency curve that compares the distribution of a specific variable (e.g. total income) with a uniform distribution that represents equality. Thus, the Lorenz curve is concerned with shares of income rather than with relative income levels. To construct the Lorenz curve, the cumulative percentage of households from poor to rich is graphed on the horizontal axis against the cumulative percentage of income on the vertical axis. This gives the Lorenz curve shown in Figure 6.7 below.

Mathematically, the Gini co-efficient is calculated by letting x_i be a point on the X - axis and y_i a point on the Y-axis. Then

$$\text{Gini} = 1 - \sum_{i=1}^{N} (x_i - x_{i-1})(y_i + y_{i-1}) \quad (6.2)$$

---

12 As Cowell (1995) showed, the relative mean deviation, the variance and the logarithmic variance cannot be decomposed based only on information on group means and populations. He also showed that the Gini coefficient is decomposable only if the subgroups are not overlapping and are strictly ranked by income.

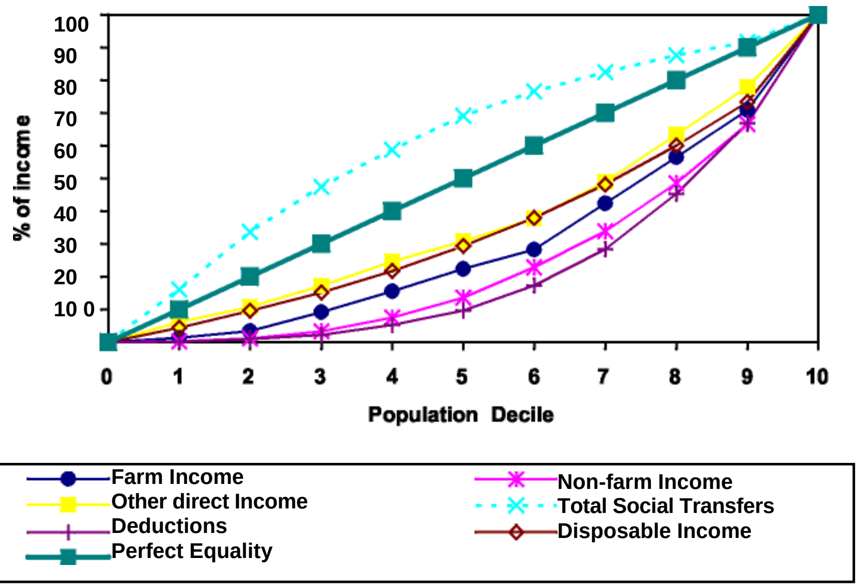
13 According to Shorrocks (1980) an additively decomposable inequality measure is one which can be expressed as a weighted sum of the inequality values calculated for population subgroups plus the contribution arising from differences between subgroup means.

When there are N equal intervals on the X-axis this simplifies to

$$Gini = 1 - \frac{1}{N}\sum_{i=1}^{N}\left(y_{i-1} + y_i\right) \qquad (6.3)$$

Figure 6.7 shows the
concentration curves of components of income and the Lorenz curve of equivalised disposable income in rural households in 2006. The graph shows that the bottom 30 percent of the population has less than 4 percent of the non-farm income; less than 10 percent of farm income; 15 percent of disposable income and nearly 50 percent of the social transfers. In contrast, the top 30 percent of the population have 66 percent of the non-farm income; 52 percent of the disposable income; 58 percent of the farm income and less than 18 percent of the social transfers. Therefore the graph illustrates the inequity which exists within rural households.

Figure 6.7 Concentration curves of components of income and Lorenz curve of Equivalised Disposable Income in rural households, 2006



Source: *EU-SILC 2006*

However, the Gini coefficient is not entirely satisfactory. A good measure of income inequality encompasses the following criteria:

- Mean independence. This is also known as scale invariance and means that if all incomes were doubled, the measure would not change. Inequality depends solely on relative incomes and not on levels of income. The Gini satisfies this.

¾ Population size independence (population homogeneity, replication invariance). If the population were to change, the measure of inequality should not change, ceteris paribus. The Gini satisfies this too.

¾ Symmetry (anonymity). If you and I swap incomes, there should be no change in the measure of inequality. The Gini satisfies this.

¾ Pigou-Dalton Transfer sensitivity (strong principle of transfers). The principle of transfers imposes an important normative property on the concept of inequality by requiring that inequality is reduced if we transfer income from a richer to a poorer person without changing their relative positions. The Gini satisfies this too.

It is also desirable to have

¾ Decomposability. This means that inequality may be broken down by population groups or income sources or in other dimensions. The Gini index is decomposable but it is not additive across groups. That is, the total Gini of society is not equal to the sum of the Gini's for its subgroups but is a more complex formula of them.[14]

¾ Statistical testability. One should be able to test for the significance of changes in the index over time. This is less of a problem than it used to be because confidence intervals can be typically generated using bootstrap techniques.

Generalised entropy measures

There are a number of measures of inequality that satisfy all six criteria.[15] Among the most widely used are the Theil indices and the mean log deviation measure. Both belong to the family of generalised entropy inequality measures. The general formula is given by:

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14 Of course there are objections in that it requires a degree of independence between subgroups. It is not entirely intuitive why inequality in one group should be independent of inequality in another group.

15 These non-Gini indices cannot be expressed in a simple way by the Lorenz curve and they therefore do not admit a similar geometric interpretation either.

$$GE(\alpha) = \frac{1}{\alpha(\alpha-1)}\left[\frac{1}{N}\sum_{i=1}^{N}\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right] \quad (6.4)$$

where $\bar{y}$ is the mean income. The values of GE measures vary between 0 and ∞, with zero representing an equal distribution and higher values representing a higher level of inequality. The parameter α in the GE class represents the weight given to distances between incomes at different parts of the income distribution and can take any real value – positive, zero or negative. For lower values of α, GE is more sensitive to changes in the lower tail of the distribution and for high values of GE is more sensitive to changes that affect the upper tail. The commonest values of α used are 0, 1 and 2. GE(1) is Theil's T index, which may be written as

$$T = GE(1) = \frac{1}{N}\sum_{i=1}^{N}\frac{y_i}{\bar{y}}\ln\left(\frac{y_i}{\bar{y}}\right) \quad (6.5)$$

GE (0), also known as Theil's L, is called mean log deviation measure because it gives the standard deviation of log(y):

$$L = GE(0) = \frac{1}{N}\sum_{i=1}^{N}\ln\left(\frac{\bar{y}}{y_i}\right) \quad (6.6)$$

$$CV = \frac{1}{\bar{y}}\left[\frac{1}{n}\sum_{i=1}^{n}(y_i - \bar{y})^2\right]^{1/2} \quad (6.7)$$

Each index of this family can be additively decomposed as

$$GE(\alpha) = GE(\alpha)_W + GE(\alpha)_B \quad (6.8)$$

where $GE(\alpha)_W$ is the within-group inequality and $GE(\alpha)_B$ is between-group inequality.

The between-group inequality can be written as:

$$GE_B(D) = \frac{1}{D(D-1)}\left[\sum_k \frac{n_k}{n}\left(\frac{\bar{y}_k}{\bar{y}}\right)^{D} - 1\right] \quad (6.9)$$

and the inequality within-group as:

$$GE_W(D) = \sum_K \left(\frac{n_k}{n}\right)^{1-D}\left(\frac{n_k \bar{y}_k}{n \bar{y}}\right)^{D} GE_k(D) \quad (6.10)$$

where $\frac{n_k}{n}$ is the population share of group k and $\frac{n_k \bar{y}_k}{n \bar{y}}$ and is, therefore, the share of income group k in total income of the population.

The same results might not be necessarily be derived using alternative inequality indices. Each of the GE indices has particular properties and is more sensitive to differences at different parts of the distribution. Moreover, the use of a number of alternative indices can be used to reveal different aspects of the issue. It also helps to see if and how the relative contribution of within-group and between-group components is affected by the inequality index. It thus serves as a test for the robustness of the estimates in each decomposition exercise.

Atkinson's inequality measures

Atkinson proposed another class of inequality measures. This class also has a weighting parameter H (which measures aversion to inequality) and some of its theoretical properties are similar to those of the extended Gini Index. The Atkinson class is defined as:

$$A_H = 1 - \left[\frac{1}{N}\sum_i \left(\frac{y_i}{\bar{y}}\right)^{1-H}\right]^{\frac{1}{(1-H)}} \quad (6.11)$$

For measuring inequality within each group only, the Gini (G) index and Atkinson indices $A_{H0.5}$ and A_{H2} will be used. These indices have been extensively used by researchers in the field and therefore all the (potential) comparison with the findings of other studies. A_{H2} Index is relatively more sensitive to differences at the bottom of the distribution than $A_{H\,0.5}$, while G is more sensitive to differences at the middle of the distribution.

For the decomposition analysis of the inequality the Theil's Entropy index (GE (1)), Theil's L/Mean Log Deviation (GE (0)) and Half the Squared Coefficient of Variation ($C^2/2$ also known as GE (2)) will be used. These are also the inequality measures with the most desirable properties for the decomposition and have been widely used in relevant studies (Bourguignon 1979, Jenkins 1995). Among these indices, L is more sensitive to differences at the bottom of the distribution, whereas $C^2/2$ is more sensitive to differences at the top.

6.4.6 Inequality Comparisons

Measures of poverty focus on the situation of individuals or households who find themselves at the bottom of the income distribution; typically this requires information both about the mean level of income as well as its distribution at the lower end. Inequality, on the other hand, is a broader concept in that it is defined over the *entire* population, and not just for the population below a certain poverty line. The analysis in Section 6.2 showed that average income of households in rural areas was below the relevant figures for all households. However, most inequality measures do not depend on the mean of the distribution, and this property of mean independence is considered to be a desirable property of an inequality measure.

Table 6.11 provides an income comparison for the households encompassed in the 2005 and 2006 EU-SILC. In 2005, farm households accounted for 11 per cent of the households sampled. Non-farm rural households had the lowest mean income, while farm households mean income is higher than that of non-farm rural households but lower than the overall mean income. In terms of income shares, farm households had a 3 per cent share of total income earned by households in comparison to approximately 30 percent for non-farm rural households.

Table 6.11a Income Inequality Comparison of Households in 2005

Location	Popn. Share $\frac{n_k}{n}$	Mean P_k	Relative mean $\frac{P}{P_k}$	Income share $\frac{P_k}{P}$	Log(mean) $\ln(P_k)$
Farm	0.11	18378.42	0.92440	0.025	9.81893
Non-farm rural	0.29	16645.24	0.83722	0.295	9.71988
Urban	0.60	21775.26	1.09539	0.680	9.98866
All	1.00	19854.65	1.00000	1.000	

Source: *EU-SILC 2005*

In 2006, farm households accounted for 10 per cent of the households sampled. Non-farm rural households continue to have the lowest mean income of all households. Farm households mean income is slightly lower than that of urban households and larger than the overall mean income, which represents a significant increase in their mean income in comparison to that of 2005. Farm households share of overall income has increased significantly from 2 per cent in 2005 to 10 per cent in 2006.

Table 6.11b Income Inequality Comparison of Households in 2006

Location	Popn. Share $\frac{n_k}{n}$	Mean P_k	Relative mean $\frac{P}{P_k}$	Income share $\frac{P_k}{P}$	Log(mean) $\ln(P_k)$
Farm	0.10	22310.58	1.0509	0. 1025	10.0128
Non-farm rural	0.28	17985.24	0.8472	0.2368	9.7973
Urban	0.62	22517.50	1.0606	0.6607	10.0221
All	1.00	21224.25	1.0000	1.0000	

Source: *EU-SILC 2006*

Tables 6.12 and 6.13 demonstrate the decomposition of inequality according to a households' location in 2005 and 2006. In 2005 when the Atkinson index is set at A_H $_{0.5}$ suggests that the income inequality among farm households is greater than that among non-farm rural households but lower than that of urban households. In 2006, the level of income inequality experienced by farm and non-farm rural households has increased and is comparable to that experienced by urban households. When the index is set at $A_{H\ 2}$ which is more sensitive to differences at the bottom of the distribution, the income inequality among farm households is greater than all other households in 2006. The Theil indices suggest that inequality among farm households is higher than that among rural non-farm households and lower than that among urban households in 2005 but lower than all other households in 2006.

Table 6.12a Decomposition of inequality by locality of household (2005)

Location	$A_{H\,0.5}$	$A_{H\,2}$	MLD GE(0)	T GE(1)	CV GE(2)
Farm	0.076	0.290	0.159	0.158	0.193
Non-farm rural	0.068	0.249	0.139	0.143	0.184
Urban	0.098	0.312	0.193	0.236	0.510
Total	0.092	0.298	0.181	0.214	0.438
Of which:					
Within-group inequality	0.089	0.293	0.173	0.206	0.430
Between-group inequality	0.003	0.005	0.008	0.008	0.008

Atkinson indices, A(H), where H > 0 is the inequality aversion parameter

Table 6.13b Decomposition of inequality by locality of household (2006)

Location	$A_{H\,0.5}$	$A_{H\,2}$	MLD GE(0)	T GE(1)	CV GE(2)
Farm	0.086	0.282	0.173	0.188	0.248
Non-farm rural	0.089	0.273	0.171	0.219	0.555
Urban	0.088	0.275	0.173	0.205	0.421
Total	0.090	0.283	0.177	0.213	0.455
Of which:					
Within-group inequality	0.088	0.276	0.172	0.208	0.450
Between-group inequality	0.002	0.007	0.005	0.005	0.005

Atkinson indices, A(H), where H > 0 is the inequality aversion parameter

Across a single year from 2005 to 2006, the inequality decompositions did not change in any significant way indicating stability in the relative trends of the average income situation across locality of the household, despite increases in mean incomes across the three subgroups. The share of the overall income inequality which can be accounted for exclusively on the basis of locality (between-group inequality) is only 2 per cent of the total income inequality on average across the selected decomposable indicators.

Section 6.5: The Dimensions of Rural Poverty in Ireland in 2005

6.5.1 Introduction

According to Tovey *et al.* (1996), the decline in the numbers engaged in agriculture, and the increasing similarity in the composition of the rural and urban labour forces have increasingly raised the question as to whether there is anything distinctly different about poverty in rural areas. Indeed, their work suggests that the limited development opportunities of Ireland's more remote areas may have more to do with their economic and social peripherality than with anything inherently rural. According to the NAPS working group on rural poverty, "the combination of a high dependence on agriculture, the lack of a diversified employment base to sustain or generate off farm income and employment opportunities (particularly the absence of quality jobs) and the out-migration of those with higher levels of education has undermined the economic structure of many [Irish] rural areas" (NAPS: 2001).

6.5.2 The concept of poverty

A large literature exists on approaches on how to assess poverty. According to Townsend (1979) people are in poverty when "... their resources are so seriously below those commanded by the average individual or family that they are, in effect, excluded from ordinary living patterns, customs and activities." In Ireland the definition of poverty adopted through the National Anti-Poverty-Strategy (NAPs) is:

"People are living in poverty if their income and resources (material, cultural and social) are so inadequate as to preclude them from having a standard of living which is regarded as acceptable by Irish society generally. As a result of inadequate income and other resources people may be excluded and marginalised from participating in activities, which are considered the norm for other people in society".

According to Keeney (2005), many rural areas are becoming increasingly 'exclusive' in the sense that richer people are moving in and poorer people are becoming less obvious. This supports McLaughlin's (1986) concept of polarisation of income levels in rural areas, where poverty does exist in rural areas, it is experienced alongside relative affluence, contributing to the "hidden nature" of rural disadvantage much commented on in the literature (Scott *etal.* 1991; Shucksmith *etal.* 1996; Cloke and Milbourne, 1992). This means that evidence of high and rising incomes in rural areas requires careful interpretation. Significant numbers of households experience disadvantage and exclusion in rural areas, but its extent and severity are often averaged out in aggregate statistics. The section will address this issue by properly identifying the rural poor in Ireland and decomposing a well-known index of income poverty that takes account of the intensity of poverty experienced replicating work conducted by Keeney in 2005.

6.5.3 The farm context and rural disadvantage

According to the OECD (2002), it is increasingly other earned income, revenues from investments (property income) and social transfers that generate adequate levels of income for farm households. According to the National Farm Survey (NFS), in 2007, on 80 per cent of farms the farmer and/or spouse had some other source of off-farm income be it from employment, pension or social assistance. As a result, farm income is not an accurate measure of the income of farm households. Off-farm income not only raises the total level of income for farm households but also lowers its variability and partially offsets the inequality of the distribution of farm income. Table 6.14 shows that the greater the households dependency on farm income, the greater the risk of experiencing relative income poverty.

Table 6.14 Risk of poverty (60% line) by reliance on farm income for Farm Households in 2005

Reliance on Farm Income	Not Poor	Risk of Poverty
No Farm Income	84.2	15.8
< 1/3 Gross Income	84.6	15.4
Between 1/3 & 2/3 Gross Income	90.7	9.3
>2/3 Gross Income	79.4	20.6
>95% Gross Income	77.5	22.5

Source: *EU-SILC 2005*

Off-farm work is no longer viewed as a transitional position between the agricultural and the industrial economy, but a lifestyle choice with farming as a second job or investment. Keeney (2005) found several indicators of this process including: the average share of nonfarm income being high and increasing; nonfarm wage income exceeding self-employment income and nonfarm earnings being nearly always greater than agricultural returns (on a full-time basis).

Relatedly, Keeney (2005) comments that many farmers feel a deep attachment to agriculture as a way of life and are willing to pay, in the form of foregone profits, to maintain the family farm. In the presence of working capital constraints, off-farm earnings may be essential to maintaining a viable farm that requires purchased inputs or that cannot generate enough cash income to satisfy the household's requirements. While farm business income exhibits considerable variability, farm household income is relatively stable. Fluctuations in farm output, commodity prices and agricultural policy change all contribute to the variability in farm income. Since these factors are beyond any farmer's control, many farm households have relied successfully on off-farm income to stabilise their total household income.

Between 1987 and 1997, Frawley *et al.* (2000) found a decline in the incidence of poverty for farmers in Ireland. While households headed by farmers made up 12 per cent of all poor households in 1987, it was down to 4 per cent in 1997.[16] The study stated that the decline in the incidence of farm poverty in the late 1990s reflected partly improvements in basic levels of income from farming due both the current mix of farm support policies, and the long-term decline in the actual number of farm households.[17] Despite these compositional and policy changes, Keeney (2005) showed that one-in-four households headed by a farmer were at risk of poverty in 2001.

Current income tells only part of the story as far as poverty and exclusion are concerned. Deprivation indicators, combined with income, allow a more complete picture to be provided and have been incorporated into the National Anti Poverty Strategy (NAPS).

6.5.4 The Poverty Decomposition Model

The Incidence of Poverty

The measurement of poverty can be seen as consisting of two distinct though interrelated exercises: following the identification of the poor, the subsequent aggregation of the statistics regarding those identified as poor should derive an overall index of poverty (Nolan and Whelan, 1996). With the increased awareness

16 Keeney (2005) reported that this rose slightly to 5.7 per cent across all households in 2001.
17 The number of farm holdings has been in decline, with Eurostat reporting a reduction from 170,600 in 1991 to 126,000 in 2005.

and availability of data, various measures of poverty have been developed over time, among which the Foster, Greer and Thorbecke (1984) (FGT) class of poverty index is the most commonly applied.[18] These enable the overall level of poverty to be allocated among subgroups of the population, such as those defined by geographical region, household composition or labour market characteristics.[19]

The FGT poverty index is defined as,

n (6.12)

Where n is the total sample size, z is the chosen poverty line, and y_i is the standard of living indicator for person i, normally denoted as income. The parameter measures the sensitivity of the index to transfers between the poor units. The conditional term means that individual i's income must be below the chosen poverty line. The poverty aversion parameter is given by$D$ t 0. The parameter$D$ represents the weight attached to a gain by the poorest. The commonly used values of D are 0, 1, and 2. When we set D equal to 0, equation (6.12) is reduced to the headcount ratio, which measures the incidence of poverty. There is no special attention given to the poor as they are just counted with respect to the poverty line chosen. When D is set to 1, we obtain P_1 or the poverty deficit (poverty gap). P_1 takes into account how

far the poor, on average, are below the poverty line. It is the only one of the three indices that does not range between 0 and 1 until it is expressed as a percentage of the poverty line used. However, the poverty gap and poverty gap index do not capture differences in the severity of poverty amongst the poor and ignore "inequality among the poor" and are therefore insensitive to transfers among the poor.

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18 These indices are commonly applied as they meet a set of strict axioms that a poverty measure must satisfy including the monotonicity axiom stating that: given other things, a reduction in the income of a poor household must increase the poverty measure. The second axiom is known as the transfer axiom and states: given other things, a pure transfer of income from a poor household to any other household that is richer must increase the poverty measure. Another related condition is also met and is known as the transfer sensitivity axiom that relates the size of any such transfer to or from a poor household to the magnitude of the decrease or increase in the level of the poverty index.

19 Recent examples include Grootaert (1995), Szekely (1995), Thorbecke and Jung (1996).

Setting D equal to 2 gives the severity of poverty or FGT (2) index. This poverty index gives greater emphasis to the poorest of the poor. It is more sensitive to redistribution among the poor in that an income unit gained by the very poor would have more effect on poverty as that gained by the moderately poor.

The population is divided into m collections of households or individuals with ordered income vectors y_j and subgroup population sizes n_j . Due to its decomposable feature, we are assured that subgroup and total poverty move in the same direction – an extension of the monotonicity requirement for all poverty indices. In our case, the location of the household forms the most important subgroup for discussion.

Decomposition results: Severity of poverty

The three FGT indices, namely: (1) the incidence of poverty or head count index, (2) the depth of poverty also known as the percentage poverty deficit and (3) the severity of poverty also known as the weighted poverty gap are shown in tables 6.15 and 6.16 below. We have decomposed the indices according to the location of the household such that at each poverty line, the incidence of poverty across the three types of household sum to 100 per cent in the head count index shown in Column 1. We show the results at three different levels of the poverty line in order to show the effect of the choice of poverty line on the results. One weakness of the FGT indices is that they are, by definition a function of the level of the poverty line chosen and cannot be discussed without fully considering the consequences that the choice of poverty line is having on the conclusions drawn (Foster and Shorrocks, 1988).

The incidence of poverty using relative income is presented in Table 6.15 but we have already noted that the limitation of the head count of the number of households below an income line as an aggregate measure of poverty is that the depth of their poverty is not captured. Thus, if the number below a particular line was stable but they were moving closer to or further away from that line over time, this would have implications for poverty monitoring which would be missed by the head count.[20]

[20] This has given rise to an extensive sub-literature on summary measures of poverty attributable to Sen's (1976) seminal paper on the issue.

The data in column (1) of Tables 6.15 and 6.16 represents the head count measure for households in 2005 and 2006. The head count measure shows that the position of the poverty line chosen is most sensitive for the farm household category reflecting the small numbers of households and individuals covered by this category relative to the total population. As Nolan and Callan (1989) have shown, income gaps and the Foster *et al.* (1984) measures show the same pattern whether calculated on a household or an individual basis. The FGT (0) measure is sensitive to the size of the population it covers. Tables 6.15 and 6.16 demonstrate that non-farm rural households have the highest propensity to experience poverty across all poverty lines, as is the case for the poverty profile based on individuals in 2006. Farm households have also a higher propensity to experience poverty across all poverty lines than their urban counterparts both at the household and individual levels. Rural households tend to be larger than urban households so that the population balance changes slightly when the individual-level calculations are compared with the household-level ones.

Table 6.15 Decomposition results by location:

Location	Head count index FGT(0)	% Poverty Deficit FGT(1)	Weighted gap FGT(2)	Average income gap
	Column 1	Column 2	Column 3	€ per annum
Farm households:				
50% line	0.2000	0.0645	0.0307	3198.82
60% line	0.2901	0.0939	0.0455	3854.21
70% line	0.4047	0.1335	0.0637	4583.42
Non-farm rural households:				
50% line	0.2202	0.0549	0.0238	2475.04
60% line	0.3655	0.0958	0.0394	3123.59
70% line	0.4754	0. 1428	0.0607	4173.89
Urban households:				
50% line	0.1561	0. 0344	0.0126	2186.85
60% line	0.2464	0.0625	0.0235	3020.40
70% line	0.3213	0. 0942	0.0381	4074.95
Overal				
50% line	0.1797	0.0426	0.0171	2340.08
60% line	0.2886	0.0751	0.0298	3098.97
70% line	0.3770	0. 1123	0.0468	4132.85

Source: *EU-SILC 2005*

Table 6.16 Poverty Individual Level, 2005 [Mean Equivalised income poverty line] – Percentage terms

Location	Head count index	Poverty Deficit	Weighted gap FGT(2) index	Average income gap
	Column 1	Column 2	Column 3	€ per annum
Farm households:				
50% line	4.62%	6.28%	7.44%	136.7%
60% line	4.17%	5.19%	6.34%	124.4%
70% line	4.45%	4.93%	5.65%	110.9%
Non-farm rural households:				
50% line	41.59%	43.74%	47.12%	105.8%
60% line	42.97%	43.30%	44.86%	100.8%
70% line	42.78%	43.13%	43.97%	101.0%
Urban households:				
50% line	53.79%	49.99%	45.44%	93.5%
60% line	52.86%	51.52%	48.80%	97.5%
70% line	52.77%	51.94%	50.39%	98.6%
Overal				
50% line	100%	100%	100%	100%
60% line	100%	100%	100%	100%
70% line	100%	100%	100%	100%

Source: *EU-SILC 2005*

The poverty deficit measures how worse off the identified poor are as a percentage of the poverty line chosen. It reflects the income gap or deficit of the poor households relative to the respective poverty lines. It is, therefore, a much more powerful measure than the head count ratio because it takes into account the distribution of the poor under the poverty line. Table 6.16 show poverty at the individual level in percentage terms. In 2005 the income gap between the poor farm households relative to the poverty line is greatest at the 50 percent poverty line with the poorest farm households experiencing an income deficit of over 6 percent relative to the 50 percent poverty line. This has decreased to 5 percent in 2006. Across all poverty lines, in 2005 there was an income deficit of over 43 percent between the poorest rural non-farm households relative to the respective poverty lines. This income gap has closed somewhat in 2006. While the income gap between the poorest households relative to particular poverty lines is greatest among urban households in 2005 with the income deficit widening across all poverty lines in 2006.

The poverty deficit also reflects the per capita cost of eliminating poverty. In 2006, an overall poverty depth of .107 (at the 70 per cent line) means that if the resources could be mobilised equal to 10.7 per cent of the poverty line for every individual and distributed to the poor in the amount needed so as to bring each individual up to the poverty line, then at least in theory, poverty could be eliminated. However, the FGT (1) index above shows us that such an average payment to all households (Table 6.15) or individuals (Table 6.16) would not be effectively targeted as it would still over-compensate urban households and leave residual income deficiencies in rural areas. This arises because the poverty deficit for farm and non-farm rural households is higher than for urban areas.

Table 6.15a Poverty Individual Level, 2006 [Mean Equivalised income poverty line]

Location	Head count index FGT(0)	Poverty Deficit or Poverty gap FGT(1)	Squared normalised pov gap FGT(2)	Average income gap
	Column 1	Column 2	Column 3	€ per annum
Farm households:				
50% line	0.15735	0.04273	0.01479	2881.55
60% line	0.25727	0.06750	0.02704	3341.03
70% line	0.39972	0.10563	0.04267	3926.06
Non-farm rural households:				
50% line	0.22418	0.04681	0.01682	2215.80
60% line	0.35712	0.08783	0.03223	3132.04
70% line	0.48107	0.13482	0.05328	4163.60
Urban households:				
50% line	0.14845	0.03021	0.00932	2159.59
60% line	0.25587	0.05890	0.01997	2931.52
70% line	0.33986	0.09241	0.03480	4039.71
Overal				
50% line	0.17390	0.03626	0.01205	2237.57
60% line	0.28957	0.06888	0.02434	3068.94
70% line	0.38934	0.10707	0.04127	4129.16

Source: *EU-SILC 2006*

Table 6.16a Poverty Individual Level, 2006 [Mean Equivalised income poverty line] – Percentage terms

Location	Head count index FGT(0)	Poverty Deficit or Poverty gap FGT(1)	Squared normalised pov gap FGT(2)	Average income gap
	Column 1	Column 2	Column 3	€ per annum
Farm households:				
50% line	3.9%	5.1%	5.3%	2881.55
60% line	3.8%	4.2%	4.8%	3341.03
70% line	4.4%	4.2%	4.4%	3926.06
Non-farm rural households:				
50% line	42.8%	42.9%	46.4%	2215.80
60% line	41.0%	42.4%	44.0%	3132.04
70% line	41.0%	41.8%	42.9%	4163.60
Urban households:				
50% line	53.3%	52.1%	48.4%	2159.59
60% line	55.2%	53.4%	51.3%	2931.52
70% line	54.5%	53.9%	52.7%	4039.71
Overal				
50% line	100%	100%	100%	2237.57
60% line	100%	100%	100%	3068.94
70% line	100%	100%	100%	4129.16

Source: *EU-SILC 2006*

When concerned about the poor in a population, the severity of poverty should also be mentioned alongside the incidence and depth of poverty. Severity of poverty is a measure closely related to the poverty gap but giving those further away from the poverty line a higher weight in aggregation than those close to the poverty line – the less poor households. In all cases (table 6. 15a), relative income poverty is shown to be more severe for rural and farm households than urban households. The findings reveal that income poverty is most severe for non-farm rural households across all poverty lines. The results show that as the poverty line is raised, the severity of poverty between farm and non-farm households and urban households converges.

6.5.5 Incorporating non-monetary deprivation indicators

In advanced societies poverty is generally understood to be the measurement of two core elements: it is about the inability to participate, due to inadequate resources. In such societies a one-dimensional approach to distinguishing the poor is employed, namely the use of income. The most common practice in Western Europe in recent years has been to rely on relative income lines, with thresholds such as 40 per cent, 50 per cent, 60 per cent or 70 per cent of median or mean income being used (Eurostat, 2000). The broad rationale is that those falling more than a certain 'distance' below average income are unlikely to be able to participate fully in the life of the community. Table 6.17 shows the risk of relative income poverty according to geographical location for the households encompassed in the 2006 EU-SILC. We can see from the Table that non-farm rural households have the highest proportion of households at risk of relative income poverty across all income thresholds.

Table 6.17 Risk of relative income poverty by location of households (%)

Relative Income Line	Farm Household	Rural Non-Farm Household	Urban	All
40%	1.7	4.7	3.0	3.4
50%	8.3	12.2	7.6	8.9
60%	12.9	24.3	14.3	17.0
70%	18.8	35.8	23.8	26.7

Source: *EU-SILC 2006*

Ringen (1987; 1988) established that low income may be an unreliable indicator of poverty as it fails in practice to identify those who are unable to participate in their societies due to lack of resources. According to Bradshaw (1993), poverty and social exclusion may be measured either indirectly in terms of resources (income) or directly in terms of outcomes (direct standards of living). According to Whelan et al (2007), a complementary rather than an alternative route to the use of income is to incorporate non monetary indicators to measure levels of deprivation directly, and see whether these can assist in improving the measurement of poverty, for example where income has been misreported as low, non-monetary indicators might correctly show a higher standard of living than income.

Research conducted by (Callan *etal.,* 1993; Nolan and Whelan, 1996) have defined those who are "consistently poor" as households falling below relative income thresholds and also reporting what has been termed "basic deprivation", as captured by a specific set of eight non-monetary indicators. This has been since updated by Whelan *et al* (2007) to include 11 items which are outlined in the figure below.

Whelan *et al* (2007) identify five distinct dimensions of deprivation; basic; consumption; housing facilities; neighbourhood environment; and health status. The second dimension relating to consumption deprivation comprises nineteen items that refer to a range of consumer durables such as telephone; CD player; dishwasher; and PC. Deprivation of these items is considered to constitute a significantly less serious form of exclusion than the basic items. The third dimension of deprivation comprises four items relating to rather basic housing facilities; a bath or shower, an indoor toilet, central heating and hot water. The fourth dimension relates to the quality of the neighbourhood environ ment such as pollution, crime, noise, violence, vandalism, leaking roof and dampness. The final dimension relates to the health status of the household reference person. The three indicators relating to this dimension are, namely, self-assessed health status, an indication of the existence of chronic illness or disability and restricted mobility.

Box 6.1 Indicators of Style of Living and Deprivation in EU-SILC

	Deprivation measure
Going without Heating	Basic
Two pairs of strong shoes	Basic
A roast or its equivalent once a week	Basic
A meal with meat, fish or chicken every 2nd day	Basic
New rather than second-hand clothes	Basic
A warm waterproof overcoat	Basic
Household adequately warm	Basic
New not second hand furniture	Basic
Family for drink or meal	Basic
Able to afford afternoon or evening out	Basic
Presents for family/friends	Basic
A week's annual holiday away from home	Basic
Telephone	Consumption
PC	Consumption
Satellite Dish	Consumption
Video	Consumption
Stereo	Consumption
CD	Consumption
Camcorder	Consumption
Clothes Dryer	Consumption
Dish Washer	Consumption
Vacuum Cleaner	Consumption
Fridge	Consumption
Freezer	Consumption
Micro Wave	Consumption
Deep Fat Fryer	Consumption
Liquidiser	Consumption
Food Processor	Consumption
Car	Consumption
Washing machine	Consumption
Bath or Shower	Housing
Toilet	Housing
Central Heating	Housing
Leaking roof & Damp	Neighbourhood
Rooms too Dark	Neighbourhood
Pollution	Neighbourhood
Crime, Violence, Vandalism	Neighbourhood
Noise	Neighbourhood

Table 6.18 outlines that the risk of deprivation due to an enforced lack of the items in Box 6.1 is above average in rural households. However, the deprivation profile for farm households is different for the basic deprivation indicators than for the housing non-monetary items, which is, consistent with previous research on farm households.

Mean basic deprivation is lowest for farm households whereas housing/living conditions are significantly higher for low-income farm households. Urban and rural households, on the other hand, experience the highest level of basic deprivation while rural non-farm households experience the greatest lifestyle deprivation (lack of secondary items). We can explain the lower level of basic deprivation for farm households as a feature linked to farming activity requiring most of the items listed as basic and consumption indicators in order to facilitate the work undertaken. They are likely to be seen as necessities for the business activity rather than facilities for the farm household. Moreover, where sacrifices have to be made due to lack of resources these are more likely to be in terms of housing facilities which are not related to the farm business, particularly as all farm households in our sample are owner-occupiers of the family home.

Table 6.18 Mean deprivation score and risk

Household type	Mean Basic deprivation	Mean Consumption deprivation	Mean Housing deprivation
Farm	0.15	0.15	0.01
(Risk)	(15.3%)	(14.9%)	(0.8%)
Non-farm rural	0.33	0.16	0.01
(Risk)	(32.7%)	(15.6%)	(1.4%)
Urban	0.32	0.08	0.002
(Risk)	(31.7%)	(7.7%)	(0.2%)
All	0.31	0.11	0.01
(Risk)	(30.6%)	(10.62%)	(0.6%)

Source: *EU-SILC 2006*

Whelan *et al.* (2007) found that the consistent poverty measure incorporating the broad basic deprivation index with a threshold of 2+ successfully identifies those exposed to generalised deprivation arising from lack of resources in a manner consistent with their use as a target in Ireland's National Action Plan for Social Inclusion. Table 6.19 segregates the population encompassed in the EU-SILC according to their economic viability and geographic location. In this table, 'poor' is defined as those at risk of relative income poverty, which are those individuals with equivalised incomes below a certain percentage median line. 'Consistent poverty' combines relative income poverty with experiencing two or greater forms of basic deprivation as outlined in the previous table. We can see that 1.5 per cent of farm households are in consistent poverty at the 70 per cent median line. Urban households have the largest percentage (10.9 per cent) of households experiencing consistent poverty.

Table 6.19 Percentage of households in consistent poverty

Consistent Poverty	Farm	Rural Non-Farm Household	Urban	All
40	0	1.2	1.8	1.4
50	0.7	3.1	4.8	3.9
60	1.0	7.3	7.7	6.9
70	1.5	9.4	10.9	9.6

Source: *EU-SILC 2006*

This task concentrates on the household income situation of rural households compared with their urban counterparts. The analysis for this task shows that income diversification is a key factor to stabilising incomes in Irish rural areas. Reducing dependence on farm returns for household income contributes to a statistically significant improvement in the household's income situation and may lead to the reallocation of land and labour towards more efficient usage (in income generation terms). Not all households, however, are willing to combine on- and off-farm activities. Moreover, gradual diversification rarely leads to a complete withdrawal from farming.

Section 6.6: Earning differentials

The chapter so far has outlined a comparison of household income situation and a comparison of returns from diversification and farm income specialisation i.e. relying mainly on on- or off-farm employment in rural Ireland. Moreover, we have examined what factors account for earning differentials from those strategies and together with previous tasks can now go forward to describe the household characteristics in determining a household's propensity to diversify. Using a propensity score matching method we find that combining on- and off-farm activities provides higher benefits than relying mainly on one source of income. This result is supported by our analysis of the 'explanatory factors' associated with a farm household being recorded as being in "consistent poverty".

The indicator of interest is the mean impact of a "treatment" on a variable. It is also described in the literature as the average treatment effect on the treated (ATT). In our context, treatment means that there is another source of income for farm households other than from its agricultural production activities or that the farm household has diversified at least some of its total household income away from solely relying on farm income. Let Y_1 be the equivalised income level when the household is treated and Y_0 be the 'untreated' income when the only source of income is from agriculture. Then the mean impact on the treated can be written as a conditional mean:

$$ATT = Y_1 - Y_0 = E(Y_1 | X, D=1) - E(Y_0 | X, D=1) \qquad (6.13)$$

where *X* is a vector of covariates and *D* is a treatment indicator.

The main evaluation problem is that one cannot actually observe $(Y_0 | X, D=1)$ that is, what average income that would have been if the household had not diversified its income away from relying on farm income only. The matching method, which is completed using a nonparametric estimation, is one possible solution to this problem. Its main role is to recreate or mimic conditions similar to the "diversification experiment" so that the assessment of the impact of the income diversification can be based on the comparison of outcomes for different groups depending on their income diversification strategy. The outcome for participants $D = 1$ is compared with the non-participant outcome drawn from a group of non-participants ($D = 0$). The chosen comparison group selected from all non-treated observations should be a close as possible to the treated one in terms of observable characteristics.

Matching methods rely on a fundamental assumption described as conditional independence or 'selection' on observable non-income characteristics *X* of the groups studied. The assumption can be formulated as:

$$(y_0, y_1) \perp D \mid X \qquad (6.14)$$

This assumption assigns any selection bias that might be present to depend only on variable included in *X* and is exploited by this methodology. Therefore any systematic difference in outcome between participant and non-participants can be wholly attributed to having diversified their income source and for no other non-income reason.

Another important feature is that there must exist observations in the comparison group with the same non-income characteristics as the participant of interest. This requires that there is an overlap in the distribution of observables between the treated and the comparison group. Existence of the counterfactual assumption is usually stated as:

$$0 \quad \Pr(D 1 | X) \, 1 \tag{6.15}$$

This assumption usually provides that there is at least one non-participant for each treated individual. If there is no overlap in characteristics, it will mean that there will be no counterpart in the control group for some observations in the treatment group. In such a case, it is impossible to use matching methods (Heckman *etal.,* 1997).

These two matching assumptions (6.14) and (6.15) specify that the matched sample at each propensity score *p*(X) is equivalent to that derived from a random sample. Conditioning on the propensity score, each individual has the same probability of being assigned to the treatment group as not, just as it would be in a randomised experiment. As a result individuals with the same value of *p(X),* but with different treatment status, can act as counterparts for each other (Blundell *etal.,* 2001).

The matching procedure requires that the non-participant sample or comparison group has a distribution of observed characteristics as similar as possible to the distribution of the same characteristics among participants (those who income diversified). In practice matching becomes more difficult to complete as the number of observable characteristics used for matching grows.

The use of propensity scores is motivated by Rosenbaum and Rubin (1985) who showed that such a dimensionability problem can be resolved by utilising the concept of a propensity score. It is nothing more than the probability of participation in the 'treatment' given the same list of observed characteristics. It provides a simple solution due to the fact that multiple matching dimensions are replaced by a scalar probability ranging between zero and one. The conditional independence assumption discussed above (6.14) remains valid if one controls for propensity score $p(x)$ instead of X.

$$(y_0)A\, D|\, P(X) \qquad (6.16)$$

The propensity score matching procedure uses several different algorithms. Each method requires a measure of *proximity of observations.* The most common method used is to match nearest neighbour pairs on the basis of the propensity score vector values. In this setting each element from the treatment group is matched with the observation nearest, with respect to the chosen measure to an observation from the comparison group. In an extended version, which is called near neighbour 1-to-n matching, more than one observation from the comparison group can be used. The matched "observation" used becomes the average of these *n* observations. This method can be used with or without replacement. Allowing for replacement increases the quality of the match on average, but on the other hand increases the variance of the measured impact (Smith and Todd, 2005). An additional device called **calliper matching** is also often used and sets a criterion for matched pairs and discards poorly matched pairs. The closest neighbour is selected within the range of G.

$$- \quad \min$$

$$^{N}j(1 \;)\circledR\; | \quad pp_i \;\; j \quad G \qquad (6.17)$$ ¿¾½

However, the nearest neighbour match is exposed to the problem of the existence of outliers in the dataset. A more robust measure of proximity is known technically as **'Mahalanobis distance'.** This metric assigns weights to the observation according to the reciprocal of the variance.[21]

The central issue in the matching method is choosing the appropriate matching variables and evaluating matching success (Blundell and Costa Dias, 2002). There

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[21] More advanced techniques uses the **kernel method,** which is a non-parametric method, associated with the outcome of the treated group (p_i) as a function of the outcome of all non-participants (p_j) (wont be used for our analysis).

are generally two ways to determine the validity of the matching. One is to see how close are treated group objects to their matched comparisons in terms of the list of descriptive variables X. This is a tedious micro way of evaluation. Another approach is to see how the list of X variables is balanced across the two groups at an aggregate level. It is an extension of Rosenbaum and Rubin (1985) idea of sample stratification.

6.6.1 Propensity score matching of income diversified households compared with those relying on farm income only

In this part of the paper we apply the methodology described above to identify and quantify the differences between various income strategies adopted by rural households in Ireland. For robustness, we will attempt a number of different estimation techniques. We will use a combined dataset of farm households from the 2006 National Farm Survey and from the 2006 EU-SILC household survey.

A specially constructed dataset pooling farm households from the 2006 EU SILC survey with the 2006 NFS was used for this propensity score analysis. The total number of successfully matched farms is 1,268. These are made up of two categories. The first category consists of 594 households for whom agriculture is the main source of income. The second group consists of 674 farm households who combine income from both on- and off-farm activities – households who have diversified at least some of their household income away from farming. The variables household size, the number of independent income streams, farm size, farm system, a household member receiving unemployment and or pension payments and finally the share of farm income in total household income are used as the set of independent covariates on which the samples were matched, using a calliper technique for nearest neighbour (calliper set at 0.1).

Earning differences between these two groups is of key interest. As the outcome variable we chose total household income (equivalised). The evidence for earning differential between households that use income diversification strategies was quite explicit. The income difference between the 'matched' cohorts was found to be significant (€11637.96 less for households relying on farm income returns only). This was verified with a t-stat test of statistical significance of 3.3 (significant at 1%

level). A test for systematic differences in the level of farm income between the two cohorts rejected the hypothesis that the matched pairs had very significant farm income returns. This was as expected as the pairs would have been matched on farm size and system variables, which are excellent predictors of farm income returns. (T-stat was found to be 0.000 and could not be rejected even at the 10 per cent level of significance).

The following table sets out the detailed propensity score results after an in-built probit regression model was used to separate the cohort groups and derive an index or covariate score for the matching analysis of the 'treatment' effect (ATT) of having an off-farm income.

Table 6.20: Probit Regression to assign matching score

Dep var: diversification	Coef.	z	P> |z|
No of household independent income sources	.711	15.07	0.000***
Pension	- .902	-9.85	0.000***
Dole	-1.245	-5.99	0.000***
System: ref= Dairying Dairying + Other	.105	0.72	0.469
Cattle Rearing	.703	5.55	0.000***
Cattle + Other	.395	3.28	0.001***
Mainly Sheep	.446	3.03	0.002***
Mainly Tillage	.426	2.50	0.013**
No FADN system	-.032	-0.03	0.973
Farm size (uaa ha)	- .002	-2.54	0.011**
Share of farm income in household income	-.131	-1.82	0.068*
Household composition	.458	9.92	0.000***
Constant	-1.296	-7.37	0.000***

*** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level

Table 6.21: Propensity score results on key outcome variable (Total Household Income)

	Mean	Controls	Difference	S.E.	T-stat
Unmatched	27578.87	29644.89	-2066.02	1603.50	-1.29
ATT (after treatment)	27578.87	39216.83	-11637.96	3521.33	-3.30***

*** Significant at 1% level

Table 6.22: Pstest on Farm income

	Mean (Outcome)	Total household income	% bias	% Reduction |bias|	T-stat
Unmatched	24135	29645	-20.3	-173.7	-3.62 -10.78
Matched	24135	39217	-55.3		

Several interesting issues arise from these results. The propensity score outcome on higher total household incomes from income-diversified households tends to support the hypothesis that diversification may provide a "feasible way out of the vicious circle of fragmented farms, poor profitability and low household incomes" (Chaplin et al: 2005:3). It is worth mentioning that as long as the diversified income sources are not the main household income they facilitate farm-earning ability. This is confirmed by the *pttest* result (table 6.22 above), which shows that there is no discernible farm income difference between identical farm households. Consequently there may be no adverse effects for the farm sector while there is income coming from labour resource reallocation outside of agriculture. This may only be in the form of structural changes in the farm system e.g. moving from dairying to cattle rearing for which predicted farm income would fall.

The next section takes these findings further and undertakes a probability model of household poverty among farm households and also finds that outside earning ability is a key variable to reducing the probability of consistent poverty in the Irish rural context.

Section 6.7: A Probability Model of consistent poverty among farm households in Ireland

6.7.1 Introduction

To characterise the poor farm households in rural Ireland, we use a probability model in which the chances of falling below the poverty line (and experiencing deprivation) are tested against household factors such as household income structure, age, and household composition.

Given the dependent variable of main interest is that a household may be classified as being poor or non-poor, a maximum likelihood probit model can be used for the analysis of the data. A household is considered to be consistently poor if it has income below the defined poverty line (POOR=1) defined according to the mean or median income plus a threshold of 2 plus basic deprivation indicators. On the other hand, non-poor (POOR=0) is defined if such a shortfall does not occur. We believe that a set of factors, discussed below, gathered in a vector, *X*, explain the response so that

$$Y \; * X' {}_i E \; u_i \tag{6.18}$$

where Y^* is the underlying latent variable that indexes the measure of consistent poverty, u_i is the stochastic error term and E is a column vector of parameters to be estimated. Following Greene (2000) and assuming that the cumulative distribution of u_i is normally distributed, we employ a probit model. In this case the probability of being poor can be given by:

$$\text{Prob}\,(POOR=1 \; X_i)^3 \; {}_{f\,E} I \; ' \; () \; {}_x z \, dz \tag{6.19}$$

where z is the density function of the standard normal variable and I is the standard cumulative normal. Then, the marginal effect of a particular independent variable, X_i, on the probability of the occurrence of the response is given by

(Maddala, 1993):

$$\frac{w P poor\,(1)}{w X_i} \; I('E).E_k \tag{6.20}$$

Unlike linear models in which the marginal effects are constant, in the case of probit models, we may need to calculate them at different levels of the explanatory variables to get an idea of the range of the resulting changes in the probabilities.

6.7.2 Data

The data encompassed in the model is gleaned from the 2005 EU-SILC; the sample is collapsed to provide one record per household and therefore results in a sample of 6,085 observations. The dependent variable is entitled "poor" where households are defined as consistently poor if they have income below the defined poverty line (POOR=1) defined according to the mean or median income plus a threshold of 2 plus basic deprivation indicators. The data shows that approximately 7 percent of the sample is experiencing consistent poverty.

Farm households in poverty are likely to differ from the non-poor households in identifiable ways but it may not be by virtue of household classification. Analysing the associated features of poverty provides some insight about factors associated with rural poverty as well as the feasibility of targeting such factors with policy instruments. For the purpose of analysing determinants of poverty, household poverty is hypothesised to be a function of a household's resource endowment, age, composition and size of the household as well as life cycle situation of the farm family.

A maximum likelihood binary probit regression model has been estimated considering whether or not a household is below the 60 per cent poverty line, or experiencing positive deprivation as the response variables. Resource endowments outlined in Table 6.23 are captured by the number of independent income sources accruing to the household as well as whether or not some of this income is sourced in the form of a state unemployment payment. Results from previous research (Keeney 2005) dictates that consistent poverty is less likely to happen where there are multiple income streams. Also by definition, a higher amount of available disposable income per household member, having controlled for household size, should lower the propensity to experience an enforced lack of the basic living conditions items. The model also includes a variable relating to debt to ascertain whether a problem with debt is likely to be associated with both a low level of disposable income and the experience of consistent deprivation. *A priori,* where personal or household debt is mentioned as a factor, we expect consistent poverty to be higher. We also control for the characteristics of the household and accept that a household headed by an older person could be expected to have a higher propensity to experience consistent poverty. We also include the highest educational levels attained by a household which would be expected to have a significant effect on the probability of households' experiencing consistent poverty.

Table 6.23 Variables Used in Consistent Poverty Probability Model

Variable	Definition	Sample Mean (N=6085)	Standard Deviation (N=6085)
	Dependent Variable		
Conpov60	Consistently Poor at 60% Relative Poverty Line Dummy variable = 1 if household consistently poor.	0.067	0.249
	Independent Variables		
Ageofhoh	Age of Head of household Dummy Variable = 1 if head of household <65+	0.67	0.47
Size	Total number of persons in the household	2.61	1.54
Gfinch	Annual Farm income	1073	5688
Noindepinc	Number of Independent Incomes	2.43	1.27
Rural	Dummy Variable=1 if households located in rural location	0.37	0.48
Tenure	Tenure Dummy Variable = 1 if household owns house	1.48	0.96
Dole	Total Households annual unemployment benefits	942	4982
Debt	Household had to go into debt in the last 12 months to meet ordinary living expenses Dummy Variable = 1 if household is in debt	0.067	0.249
Lessthanuprsec	Highest level of education attained is less than upper secondary. Dummy variable =1, 0 = otherwise	0.414	0.492
uprsecplc	Highest level of education attained is upper secondary/PLC. Dummy variable =1, 0 = otherwise	0.284	0.451
thirdlevel	Highest level of education attained is third level. Dummy variable =1, 0 = otherwise	0.301	0.459

Source: *EU-SILC 2005*

6.7.3 Results of the Probit model on the determinants of consistent poverty in 2005

The results of the determinants of consistent poverty model are presented in Table 6.24 showing the estimated coefficients, the marginal effect (i.e. the effect of a unit change in each independent variable on the probability of participation) and some goodness of fit measures for the model.

A glance at the results verifies that our model fits reasonably well and most of the regressors in the model have signs that conform to our prior expectations. All regressors other than household compositions are significant. Being an owner-occupier as opposed to renting or living rent-free decreases the probability that the household will experience consistent poverty. Resource variables such as a higher level of farm income, more independent sources of net factor income and the absence of debt concerns all serve to improve the consistent poverty situation of the household. As expected, the more the household relies on unemployment payments, the more likely that the household will have experienced consistent poverty.

Table 6.24 Probit Results of Determinants of Consistent Poverty in 2005

	df/dx	Robustz	P > ¦ z ¦
(1/0) Rural	0.009	-1.85*	0.064
(1/0) Farm		5.45***	
(1/0) Debt	0.17	14.37***	0.000
Tenure	-0.04	-9.12***	0.000
Ageofhoh	0.026	-7.79***	0.000
No of indep. Incomes	-0.02	-12.18***	0.000
Dole	4.68e-07	2.77***	0.006
Household Size	0.003	2.52**	0.012
Gfinch	-2. 12e-06	-3.55***	0.000
Lessthanuprsec	0.039	6.32***	0.000
uprsecplc	0.016	2.38**	0.017
No. of observations	6041		
Wald $Chi^2(10)$	636.18		
Prob> chi^2	0.0000		
Pseudo R_2	0.3333		

ns= not significant, *Significant at 10%, ** Significant at 5%, *** Significant at 1%

Source: *EU-SILC 2005*

The results also show that household location affects the likelihood of experiencing consistent poverty (i.e. lacking at least one of the basic deprivation items as well as having an equivalised disposable household income of less than half the average for all households). The results demonstrate that those households located in rural locations are significantly more likely to be in consistent poverty than urban dwellings. In relation to human capital, households with less than upper secondary education and those with upper secondary education/PLC are statistically more likely to be in consistent poverty than households with a third level qualification.

Table 6.25 Determinants of different levels of non-monetary deprivation

	Basic Deprivation	Consumption Deprivation	Neighbourhood Deprivation	Housing Deprivation
Farm household	-. 17ns	1 .029***	-.289ns	0.256**
Rural household	-. 134**	.273***	-.545***	.012ns
Farm income level	-.00001	-.00001ns	-.3.08e-06ns	-.00001***
Age of household head	-.216***	.65***	-.071ns	.074ns
Tenure	-.567***	-.611***	-.436***	.018ns
Household size	-.022ns	-.343***	-. 106***	-.032*
No. of indep. incomes	-.087**	-. 162***	.011ns	-.015ns
Dole	.00002**	.0000*	.00001ns	5.96e-06ns
Debt problems	1.212***	-. 153ns	.626***	-.042ns
Resources per household member	- .00006***	- .00004***	-.00001***	-9.36e-08ns
Less than upper secondary education	.382***	.764***	-. 115ns	-.0046ns
Upper secondary/PLC	.154ns	.225**	-.016ns	-.024ns
N=	2226	6041	2226	6041
Pseudo R_2	0. 1876	0.3427	0.0921	0.0066

ns= not significant, *Significant at 10%, ** Significant at 5%, *** Significant at 1%

Separate regression analyses of the effect of known household characteristics as explanatory variables on the three dimensions of deprivation add considerably to our understanding of the processes at work. The results from Table 6.25 show that distinguishing rural households from urban households is an important control factor when assessing the influence of these explanatory variables. Relative to urban households, rural households are significantly less likely to experience basic and neighbourhood deprivation and significantly more likely to experience consumption and housing deprivation. The results are similar for farm households, with farm households significantly more likely to encounter consumption and housing deprivation than their urban counterparts.

The financial resources at the households' disposal have a significant effect on their probability of experiencing deprivation in relation to basic necessities; consumer goods, housing and neighbourhood environment. The results show that the level of farm income in the household has a statistically significant effect with respect to housing deprivation; an increase in farm income reducing the likelihood of a household experiencing housing deprivation. The results also show that an increase in the number of independent incomes in the household and the disposable income per household member reduces the likelihood of a household experiencing basic and consumption deprivation. While an increase in the resources per household member results in a reduced likelihood of a household experiencing deprivation in relation to the neighbourhood environment. Contrastingly, a household experiencing financial difficulty, for example having to go into debt to meet ordinary living expenses are significantly more likely to experience basic and neighbourhood deprivation. In addition, households in receipt of social welfare payments are significantly more likely to encounter deprivation in relation to basic necessities, consumption and housing.

The household composition also has a significant effect on the households' probability of experiencing deprivation. An increase in the size of a household significantly increases the likelihood of the household experiencing deprivation in relation to the basic necessities, consumption, housing and the neighbourhood environment. The age of the household head has a contrasting effect on the likelihood of experiencing basic and consumption deprivation. The results show that where the household head is greater than 65 there is an increased probability of encountering deprivation in relation to basic necessities but a household head of this age group is statistically less likely to experience consumption deprivation. The educational attainment levels of households have a significant effect on a household experiencing basic, consumption and housing deprivation. A household where the maximum educational attainment level is less than upper secondary education increases the probability of that household experiencing basic, consumption and housing deprivation than households with third level qualifications. While households with upper secondary/PLC qualifications are more likely to experience consumption deprivation than households with a third level qualification.

6.8 Conclusions

Our analysis showed that income diversification is a key factor to stabilising incomes in Irish rural areas. Reducing dependence solely on farm returns for household income contributes to a statistically significant improvement in a household's income situation and may lead to the reallocation of land and labour towards more efficient usage (in income generation terms). The propensity score outcome on higher total household incomes from income-diversified households tends to support the hypothesis that diversification may provide a "feasible way out of the vicious circle of fragmented farms, poor profitability and low household incomes".

The financial resources at the households' disposal have a significant effect on their probability of experiencing deprivation in relation to basic necessities; consumer goods, housing and neighbourhood environment. Our results show that an increase in the number of independent incomes in the household and the disposable income per household member reduces the likelihood of a household experiencing basic and consumption deprivation.

The income situation of Irish rural households is less dependent on farming and more so on the non-farm economy such that there has been an improvement in the distribution of incomes accruing to farm households and non-farm incomes are having a significant positive effect on lowering the risk of relative income and consistent poverty in rural areas.

CHAPTER 7
ASSESSING THE AVAILABILITY OF OFF-FARM EMPLOYMENT AND FARMERS' TRAINING NEEDS

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7.1 Introduction

During the Celtic Tiger period, the reliance on sectors such as agriculture and the traditional industrial sectors as a source of employment diminished, while the high tech manufacturing and services sector experienced significant growth and provided a significant proportion of total employment provision. The declining importance of agriculture as a source of employment is evidenced by the fact that in 1973, primary agriculture (the farming sector) accounted for 24 percent of total employment compared to approximately 5 percent in 2006. The number of farm holdings has been in decline, with Eurostat reporting a reduction from 170,600 in 1991 to 126,000 in 2005.

At the same time, there has been an increasing number of farm households participating in the off-farm labour market: in 2006, results from the National Farm Survey (NFS) showed that more than a half of all farm households had an operator and/or spouse engaged in the off-farm labour market. Empirical research conducted by Hennessy et al (2004) found that off-farm income has assumed an integral role in sustaining farm households and insulating them from impoverishment: results showed that more than a half of the farm households included in the NFS were safeguarded from an economically vulnerable position by the participation of a farm operator and/or spouse in off-farm employment.

Given the growing reliance on off-farm income, we explore the position of farmers in terms of their prospects of securing off-farm employment in this paper. Specific objectives of this chapter are:

1. to explore the skill profiles of farmers with off-farm employment
2. to estimate the probability of different farmer profiles securing off-farm employment

3. to provide an off-farm employment outlook for the existing farmer profiles
4. to examine policy options in relation to training provision needed to increase the employability of farmers seeking off-farm employment.

The chapter is divided into four main sections. The first section involves analysing the skill profiles of farmers with off-farm employment. In this analysis we used education attainment and work experience as a proxy for the skill levels of farm operators. The data encompassed in this objective was gleaned from the second quarter of the 2006 Quarterly National Household Survey (QNHS) and the NFS.

In the second section we assess the overall working age population and calculate the probability of individuals with different skills profiles attaining employment using a Multinomial logit (MNL) model. This enables us to make inferences on the off-farm employment prospects of farm operators given their skill profile.

In the third section we provide an employment outlook for the sectors synonymous with off-farm employment provision. This analysis incorporates work conducted by various research bodies in Ireland.

In the fourth section we investigate policies which have been implemented to increase the employability of farmers seeking off-farm employment. We examine the existing *Options for Farm Families Programme,* which was established by Teagasc with the intention of assisting farm families in generating additional household incomes.

In the final sections of the chapter we outline conclusions and recommendations.

7.2: Skill profiles of farmers with off-farm employment

This section addresses the current skills profiles of farm operators. In our analysis, farmers' human capital is assessed using two variables: education attainment and off-farm work experience. Education attainment indicates skills and competencies acquired through the formal education and training process. It is considered as one of the key factors in farmer's ability to attain off-farm employment. This is complemented by the skills and competencies attained through previous off-farm employment.

To account for any regional variability in farmers' skills profiles, we divide the farm population into the eight NUTS (Nomenclature of Territorial Units) regions, as defined by the Central Statistics Office (CSO). The motivation for examining this from a regional perspective is to compare farmers' skills to the local labour market, thereby assessing whether their skills commensurate those demanded.

According to the 2006 Quarterly National Household Survey (QNHS), 20 percent of the farming population reside in the South West region, 18 percent in the West region, 17 percent in the South East, 16 percent in the Border region, 12 percent in the Mid West region with the remaining farming population evenly distributed between the Midlands and Mid East regions. The Dublin region accounts for approximately 1 percent of the farming population and is, therefore, omitted from the analysis.

7.2.1 Education

Educational attainment refers to the highest level of schooling a person has attained through the formal education and training process. It indicates the level of knowledge, skills and competences a person is equipped with to enter the labour force.

Education data included in this analysis is gleaned from the CSO's Quarterly National Household Survey (QNHS[22]). The QNHS defines educational attainment in terms of the following categories:

[22] The QNHS is a large-scale, nationwide survey of households in Ireland. It is designed to produce quarterly labour force estimates that include the official measure of employment and unemployment in Ireland; farmers are defined as per Standard Occupational Classification (SOC 1990)

no formal or primary only education

lower secondary (Junior Certificate)

upper secondary (Leaving Certificate)

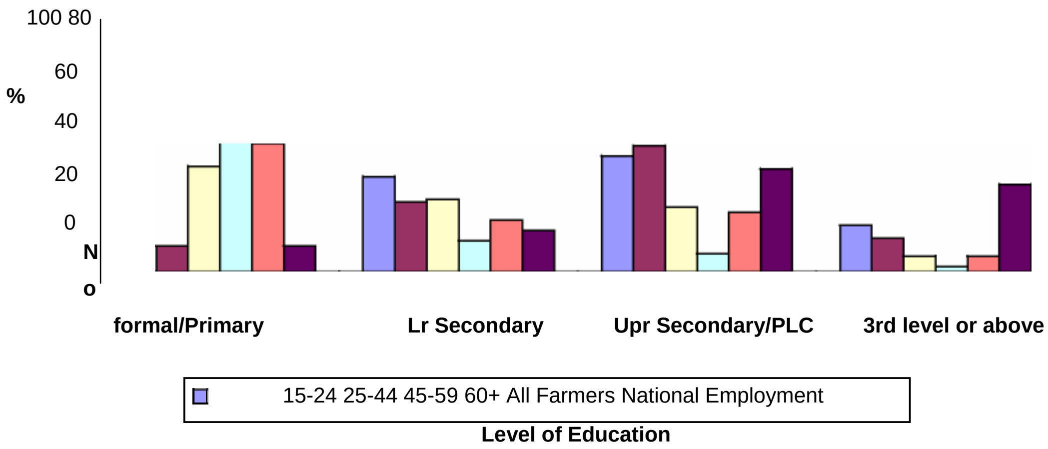
post Leaving Certificate (PLC) (technical or vocational)

third level non-degree (certificate and diploma)

third level degree or above (primary and postgraduate degrees)

Our analysis shows that the education distribution of farmers is skewed towards lower educational attainment (Figure 7.1): in 2006, approximately 70 percent of farmers had less than secondary education. Older farmers' education distribution has more pronounced negative skewness: almost 90 percent of the 60+ age category (45 percent of the farming population) have less than secondary education, compared to 65 percent of the group aged 45-59 (28 percent of farming population) and just over 38 percent of the 25-44 age grouping (24 percent of the farming population). Similarly, younger farmers are more likely to hold third level qualification: 22 percent of the 15-24 age cohort holds at least a college Certificate, compared to 2% of those aged 60+.

Figure 7.1: Age by Level of Education of Farm Operators and Working Age Population in 2006



Source: *'analysis done by Teagasc/FÁS using the CSO QNHS data"*

Figures from the QNHS show that between 1999 and 2006 the number of farmers with no formal/primary only education has been increasing: from 41 percent to 50 percent of the total farming population. The figures also show that the share of farmers with secondary education has decreased, while the proportion of the farming population with a third level qualification has been increasing over this period: in 2006, 6 percent of the farming population had a third level qualification or above, compared to 3 percent in 1999.

When compared with the national employment stock, the proportion of farmers with low educational attainment levels is above the national employment average. Figures from the 2006 QNHS show that approximately 34 percent of those in employment nationally have a third level qualification in comparison to 6% of farmers. For younger farmers the education gap is lesser: 14 percent of 25-44 farmer age cohort has third level education compared to 34 percent of the national employment. Importantly, 37 percent of farmers aged 25-44 are early school leavers not holding upper secondary school qualifications, compared to 26 percent of the national employment stock.

Figures 7.2, 7.3 and 7.4 illustrate the education attainment levels of the farming population across age groups in the seven NUTS regions in 2006. For simplicity, the number of educational groups has been reduced to three: those individuals with less than secondary education, those individuals with secondary education/PLC and those with a third level qualification.

Farmers aged 60+ account for the largest share of the farming population across all regions. In addition, this age cohort has the lowest level of education attainment across all regions: in excess of 87 percent of the 60+ year olds in all regions have less than secondary education. In the Border region, 100 percent of the 60+ age grouping are early school leavers. However, research contends that older farmers are less likely to work off the farm (Mishra and Goodwin 1998).

The next largest cohort is the 45-59 years of age category. This age group has the highest propensity to participate in the off farm labour market. In 2004, NFS showed that 51 percent of those participating in the off-farm labour market were aged between 45 and 59 years of age, with the average age of a farmer with an off-farm job estimated at 47. According to the QNHS in excess of 25 percent of the farming population in all regions are in this category. The educational attainment of this age cohort is also skewed towards lower levels: more than 50 percent of this cohort in all regions having less than secondary education, the highest proportion being in the Border region with 83 percent.

Finally, the proportion of the farming population in the 25-44 age cohort ranges from 16 percent in the West region to 33 percent in the Mid East region. According to the QNHS data, in excess of 25 percent of the 25-44 age cohort across all regions have less than secondary education, 56 percent of the farmers in the West region have attained this level of education. The figures also show that a significant proportion of this cohort have a third level qualification: 23 percent of the 25-44 age category in the West region have a third level qualification.

Our analysis suggests that a significant share of working age farmers have low levels of educational attainment in comparison to the national employment stock. Our results also showed significant differentiation in the educational attainment levels of farmers with differing age profiles, with education distribution becoming more skewed towards lower levels as age increases. The results also showed that education distribution for farmers aged 45+ does not vary significantly across regions. However, there appears to be some regional variation in the educational attainment levels of the 25-44 cohort[23]. Overall, with respect to the regional variation in educational attainment, the West region was found to have the poorest education profile across all age groups.

Using education attainment as a sole determinate of employability, our results imply that a significant share of farmers, particularly those in the West and Border regions, have low skill profiles and are likely to encounter difficulty in securing off-farm employment.

7.2.2 Work Experience

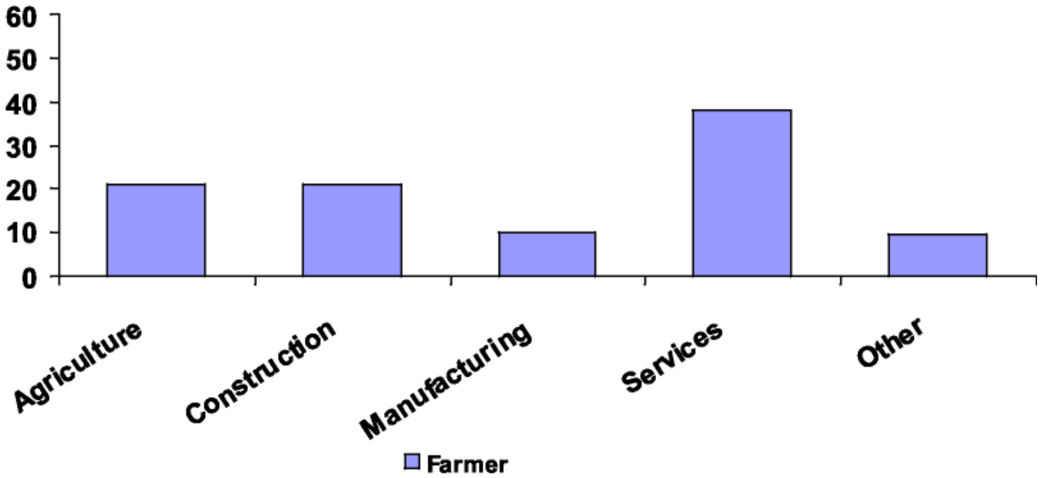
Work experience data is taken from the National Farm Survey (NFS). The NFS provides data on off-farm employment in terms of sectors and occupations.

The results (Figure 7.5) suggest that farmers who work off the farm tend to be employed in the traditional sectors of the economy such as, agriculture,

[23] It should be noted that the regional analysis could be subject to sampling error given the reduced number of observations captured at high level of desegregation of the overall sample.

construction and manufacturing. By contrast, farmers' spouses are typically employed in the services sector (>70%).

Figure 7.5: Employment by Sector for Farm Operators (%)



Source: *NFS, 2004*

Figure 7.6 outlines the sectors where farm operators are typically employed across all regions. The diagram demonstrates that the regions differ in terms of their reliance on particular sectors. The diagram shows that the services sector accounts for the largest percentage of off-farm employment provision for farm operators in the Mid West, South West and West regions. In excess of a third of the farm operators in the Mid East, Midlands, South East and South West regions are employed in the agriculture, forestry and fishing sector. While the building and construction sector accounts for approximately 40 percent of off-farm employment jobs in the Border region. If we combine the agriculture, forestry and fishing sector with manufacturing and building and construction, in excess of fifty percent of all farm operators across all regions are employed in these three sectors.

In terms of occupational employment, the distribution of employment for farm operators and their spouses is distinctly different: while farm operators are concentrated in low-skilled and craft related jobs, working primarily as tradesmen, labourers, drivers or machine operators, a significant number of spouses are employed in professional, associate professional and clerical jobs, working as nurses, teachers and administrative staff.

Figure 7.7 presents employment by broad occupational groupings for the farm operators by region. The figure demonstrates that the largest proportion of off-farm employment for operators across all regions is in low-skilled jobs. The diagram shows some variation in the occupational classification of farm operators across the regions. In the Midlands region, 75 percent of farm operators are in low skilled occupations, in comparison to 56 percent in the Mid East region. The South East has the largest proportion of farm operators employed in high skilled occupations at 14 percent, these include occupations as: engineers, accountants, vets/AI, teachers, pharmacists, garda, in comparison to none in the Mid East. The Mid East region has the largest percentage of farm operators engaged in craft related occupations, such as: building tradesmen, mechanics, fitters and electrical maintenance and repair, in comparison to 4 percent of farm operators in the Border region.

Our analysis suggests that farmers tend to work in low skilled jobs when working off the farm. Therefore, for the majority of farmers, work experience is unlikely to significantly improve their skill profile. As a result, using off-farm experience as a sole determinate of employability, our results imply that a significant share of farmers, particularly those in the West and Midlands regions, are likely to encounter difficulty in transferring their skills across sectors and occupations.

7.2.3 Key points

- Farmers have lower education profiles than the national employment stock
- Farmers are typically employed in traditional sectors including construction, agriculture and manufacturing
- Farmers are predominantly employed in low skilled and craft related occupations
- While there is some level of regional variation, farmers' skill profiles do not vary significantly between regions
- Farmers in the West region appear to have the poorest skill profiles as measured by education attainment and off farm work experience
- Low skill profile of farmers implies issues with employability for farmers who are likely to become new labour market entrants
- Low skill profile of farmers implies issues with skill transferability across sectors and occupations for those already in off-farm employment
- Farmers aged 25-59 are particularly vulnerable given their propensity to seek employment off farm

7.3: Estimation of the probability of different skill profiles securing off-farm employment

In this section we assess the principal economic status of the working age population (15-64 year olds) given their skills profiles, age and educational attainment levels and calculate the probability of individuals with different characteristics attaining employment. The skills profile, which is proxied by educational attainment levels and work experience, enables us to identify the skills and competencies of individuals, and thereby allows us to assess the prospects of these individuals finding employment. Examining data on the full working age population will enable us to make inferences on the probability of farm operators obtaining off-farm employment given certain age, geographic and educational characteristics.

The econometric technique employed in this analysis is the Multinomial Logit Model (MNL), whereby we model the probability that an individual being in a certain principal economic status as a function of observed characteristics of that individual.

In addition, we will estimate an individual's probability of obtaining employment in different regions by calculating regional unemployment rates.

7.3.1 Conceptual and Empirical Model

The simple idea behind the multinomial logit model (MNL) is that we directly model the probability that an individual is in a certain labour force status as a function of observed characteristics (see Greene, 1993). We consider three possible outcomes, and hence, three probabilities:

p_i1 = Pr (Individual i is full-time employed)

p_i2 = Pr (Individual i is unemployed)

p_i3 = Pr (Individual i is unavailable for work)

Each of these probabilities is expressed as a function of independent variables x and parameter vectors^E . The MNL ensures that the probabilities are between 0 and 1 for all possible values of x and E , and that the probabilities sum to one.

The model estimates a set of co-efficients $\beta_1, \beta_2, \beta_3$ corresponding to the economic status for each category. Where 1 is equalled to those at work, 2 is equal to those unemployed and 3 is equal to those not available for employment.

$$\Pr(y=1) = \frac{e^{X\beta_1}}{e^{X\beta_1} + e^{X\beta_2} + e^{X\beta_3}} \quad (7.1)$$

$$\Pr(y=2) = \frac{e^{X\beta_2}}{e^{X\beta_1} + e^{X\beta_2} + e^{X\beta_3}} \quad (7.2)$$

$$\Pr(y=3) = \frac{e^{X\beta_3}}{e^{X\beta_1} + e^{X\beta_2} + e^{X\beta_3}} \quad (7.3)$$

To identify the model, one of β_1, β_2 or β_3 is arbitrarily set to 0, for example β_1 is set to 0, the remaining co-efficient β_2 & β_3 would measure the change relative to the y=1 group (i.e. the full-time employed).

Setting β_1 =0, the equation becomes

$$\Pr(y=1) = \frac{1}{1 + e^{X\beta_2} + e^{X\beta_3}} \quad (7.4)$$

$$\Pr(y=2) = \frac{e^{X\beta_2}}{1 + e^{X\beta_2} + e^{X\beta_3}} \quad (7.5)$$

$$\Pr(y=3) = \frac{e^{X\beta_3}}{1 + e^{X\beta_2} + e^{X\beta_3}} \quad (7.6)$$

The relative probability of y = 2 to the base category is

$$\frac{\Pr(y=2)}{\Pr(y=1)} = e^{X\beta_2} \quad (7.7)$$

In order to interpret the estimation results, we exclusively make use of the concept of predicted probabilities. Recall the standard regression model, where Y $= X\beta + u$. Once the model is estimated, we can predict Y_0 as X_0b, where b is the ordinary least squares (OLS) estimate and X_0 is a set of particular independent variables for which we want to find the predicted outcome. The situation is identical in the multinomial logit model, the only difference being that the dependent variable is now a probability.

To give a hypothetical example, consider the labour force status model with two independent variables, region and age. We can use the model to predict the probability that a 40-year-old residing in Dublin is in full-time employment. Likewise, we can predict the probability that a 40-year-old person not living in Dublin is in full-time employment. The marginal effect of region is the difference between the two probabilities

5ˆ (full - time|region, age = 40)- 5ˆ (full - time|not region, age = 40)

7.3.2 Factors determining principal economic status

When persons make choices about their labour force status, they weigh potential benefits against potential costs. Consider, for instance, the choice between full-time employment and non-participation. The wage received is a part of the benefit of working, whereas the cost comprises the fact that the time spent working cannot be used for other alternative activities that might be valued highly. Factors that increase the wage a person receives, and factors that decrease the value attributed to these other activities, will both increase the probability that an individual wants to work. This simple framework immediately points towards the important role that variables such as education level play in the determination of principal economic status. For, more educated individuals in general receive higher wages, and hence are more likely to participate in the labour force.

In the following analysis, we test the proposition that those employed; unemployed and unavailable for work differ in those factors which determine labour force status, such as education, and that it is for these reasons that we observe different outcomes. In particular, the following personal characteristics (and independent variables in the regression analysis that follows) were selected on the basis of economic relevance and availability: education, age, gender and region.

Principal economic status

The dependent variable is the principal economic status (PES). In the QNHS, the PES classification is based on a single question in which respondents are asked what their usual situation with regard to employment is and given the following response categories: at work, unemployed, student, engaged in home duties, retired and other.

We group these categories as follows:

- At work
- Unemployed
- Unavailable for work (includes: students, home duties, retired and other).

Education

Education is considered a principal indicator of a person's skills and their capacity to secure employment. As such, an increase in educational attainment is expected to increase the probability of employment and decrease the probability of unemployment and non-participation. We distinguish between the following education categories: less than upper secondary education; upper secondary or PLC qualification; and third level.

Age

Typically, the principal economic status of an individual varies over the life cycle. As the working-age population is defined as those persons aged 15 to 64 years, we expect that individual schooling and retirement decisions lead to lower participation rates in the initial and final years, and to higher participation rates for middle-aged persons (although not necessarily for women). Age may also affect the division between employment and unemployment, as the increased experience of older workers might make them more valuable to firms and hence less likely to be unemployed.

Gender

The likelihood of being a particular economic status differs between genders. Data from quarter 4 of the 2006 QNHS show that males had a labour force participation rate of 73 percent, in comparison to 53 percent for females. Therefore, males are more likely to be in employment than females.

Region

In our model, we account for the possibility that employment opportunities differ between urban and rural areas, and that this difference affects observed labour force status. Region is included as an explanatory variable in the model. The regional classifications in the QNHS are based on the NUTS (Nomenclature of Territorial Units) classification used by Eurostat. The NUTS3 regions correspond to the eight Regional Authorities established under the Local Government Act, 1991 (Regional Authorities) (Establishment) Order, 1993, which came into operation on 1 January 1994.

7.3.3 Data

The data used in the model refers to the working age population (i.e. those aged between 15 and 64) in the 2006 quarter 2 QNHS which has a sample of 65,879 observations.

Principal Economic Status

Table 7.1 shows the labour status of the individuals included in Quarter 2 of the 2006 QNHS. The table demonstrates that 55 percent of the population are employed, 41 percent are unavailable for work and 3 percent are unemployed[24].

Table 7.1: Principal Economic Status of the working age population sampled in the 2006 QNHS Qtr2

PES	Frequency	Percent (%)
At work	36,469	55
Unemployed	2,112	3
Unavailable for work	27,298	41
Total	65,879	100

Source: *'analysis done by Teagasc/FÁS using the CSO QNHS 2006 data"*

Education

The educational attainment levels of the population are described in table 7.2. It shows that a significant share (24%) of the sampled population have no formal/primary only education. Approximately 69 percent of the population have less than upper secondary education, while the remainder of the population have a PLC or third level qualification.

Table 7.2: Educational attainment levels of the working age population sampled in the 2006 QNHS Qtr 2

Level of Education	Frequency	Percent (%)
No formal/primary only	15,860	24
Lower secondary	13,126	20
Upper secondary	16,176	25
PLC	5.666	9
3rd level – non degree	5,553	8
3rd level – degree or>	9,498	14
Total	65,879	100

Source: *'analysis done by Teagasc/FÁS using the CSO QNHS 2006 data"*

24 PES unemployment rate differs from the officially published unemployment rate which is based on the ILO classification of the economic status.

Age

Table 7.3 profiles the age of the population encompassed in the data. The table shows that 60 percent of the 65,879 observations are between 25 and 59 years of age, 22 percent of the population are 60+ years of age and the remainder are aged between 15 and 24.

Table 7.3: Age groups of population sampled in the 2006 QNHS Quarter2

Age Group	Frequency	Percent (%)
15-24	12,229	18
25-44	23,009	35
45-59	16,383	25
60+	14,258	22
Total	65,879	100

Source: *'analysis done by Teagasc/FÁS using the CSO QNHS 2006 data"*

Region

Table 7.4 outlines the sample population according to the region in which they reside. We can see that Dublin accounts for the largest proportion of the QNHS sample, with 25 percent of individuals residing in this region. The South-West accounts for 17 percent of the population, while the remainder of the population is somewhat uniformly distributed across the remaining six regions.

Table 7.4: Geographical location of the population sampled in the 2006 QNHSQtr2

Region	Frequency	Percent (%)
Border	8,064	12
Midlands	4,395	7
West	5,235	8
Dublin	16,418	25
Mid-East	6,322	10
Mid-West	5,978	9
South-East	8,137	12
South-West	11,330	17
Total	65,879	100

Source: *'analysis done by Teagasc/FÁS using the CSO QNHS 2006 data"*

The variables included in the model are presented in Table 7.5.

Table 7.5: Data for Labour Allocation Models

Variable	Definition	Sample Mean (N=65,879)	Standard Deviation (N=65,879)
Dependent Variable			
Status – 3 categories. 1 = individuals employed 2 = individuals unemployed 3 = individuals unavailable for work		1.86	0.974
Independent Variables			
Gender	Dummy variable=1 if male, 0 = otherwise	0.49	0.50
Age1	Dummy variable=1 if individual is aged 15-24, 0 = otherwise	0.19	.39
Age2	Dummy variable=1 if individual is aged 25-44, 0 = otherwise	0.35	0.48
Age3	Dummy variable=1 if individual is aged 45-59, 0 = otherwise	0.25	0.43
Age4	Dummy variable=1 if individual is aged 60+, 0 = otherwise	0.22	0.41
Edua	Dummy variable=1 if individual has less than lower secondary education, 0 = otherwise	0.44	0.50
Edub	Dummy variable=1 if individual has upper secondary education or PLC , 0 = otherwise	0.33	0.47
Educ	Dummy variable=1 if individual has 3rd level-non degree or above, 0 = otherwise	0.23	0.42
Border	Dummy variable=1 if household is located in the Border region, 0 = otherwise	0.12	0.33
Midlands	Dummy variable=1 if household is located in the Midlands region, 0 = otherwise	0.07	0.25
West	Dummy variable=1 if household is located in the West region, 0 = otherwise	0.08	0.27
Dublin	Dummy variable=1 if household is located in the Dublin region, 0 = otherwise	0.25	0.43
MidEast	Dummy variable=1 if household is located in the Mid-East region, 0 = otherwise	0.10	0.29
Mid West	Dummy variable=1 if household is located in the Mid-West region, 0 = otherwise	0.09	0.29
SthEast	Dummy variable=1 if household is located in the South-East region, 0 = otherwise	0.12	0.33
Sth West	Dummy variable=1 if household is located in the South-West region, 0 = otherwise	0.17	0.38

7.3.4 Results

An important feature of the multinomial logit model is that it estimates the k-1 models, where k is the number of levels of the dependent variables (in this case 3). Our response variables (principal economic status) is going to be treated as categorical under the assumption that the levels of labour status have no natural ordering and we are going to set unemployed as the reference group and therefore estimate a model for employment relative to unemployment and unavailability for work relative to unemployment.

Therefore, since the parameter estimates are relevant to the reference group, the standard interpretation of the multinomial logit is that for a unit change in the predictor variable, the logit of outcome *m* relative to the referent group is expected to change by its respective parameter estimate given the variables in the model are held constant. The results obtained from the multinomial logit (MNL) model are presented in Table 7.6 showing the estimated coefficients, the z-ratios (in parentheses) and the relevant goodness-of-fit measures.

Table 7.6: Results of the Multinomial Logit Model

Variable	Employed	Unavailable
Gender	-0.297	-1.713
	*(-5.99)****	*(-33.58)****
Age1	-0.756	1.199
	(-13. *10)****	*(20.21)****
Age3	0.196	0.506
	*(3.47)****	*(8.47)****
Age4	0.789	3.611
	*(6.72)****	*(30.74)****
Educa	-0.908	0.136
	*(-17.48)****	*(2.55)****
Educc	0.479	-0.195
	*(6. 74)****	*(-2.61)****
Border	-0.26	-0.214
	(-3.1 *1)****	*(-2.44)****
Midlands	0.22	(0.276)
	*(1. 91)**	*(2.33)****
West	0.066	0.199
	(0.62)	*(1.82)**
Dublin	-0.19	-0.113
	*(-2.49)****	*(-1.43)*
MidEast	0.31	0.413
	*(2. 99)****	*(3.84)****
MidWest	0.092	0.017
	(0.93)	*(0.16)*
Sth West	0.11	0.26
	(1.27)	*(2.90)****
Intercept	3.36	2.226
	*(41.28)****	*(26.40)****

* *p* d 0.10   ** *p* d 0.05   *** *p* d 0.0 1

Number of Obs.	65879
LR Chi-Squared(68)	28151.53
Prob>Chi-Sq	0.000
Pseudo R2	0.2662

Gender

In relation to gender, the multinomial logit model compares males versus females for those employed relative to the base category, unemployed, given the other variables in the model are held constant. The results show that males are more likely to be unemployed than females.

In relation to those unavailable for work relative to the base category, the results show that being male has a strong negative and significant effect on the odds of falling into the unavailable for work category versus the unemployed category.

Therefore being male increases the probability of being unemployed than unavailable for work relative to females.

Age

In relation to age, the reference category for comparison is those aged between 25 and 44 years of age. Therefore the multinomial logit model compares those employed relative to being unemployed for each age group relative to the reference age group. The results show that those aged between 45 and 59 and 60+ are more likely to be employed than unemployed relative to the reference group. As stated previously, the difference may be attributed to the increased experience of older workers which might make them more valuable to firms and hence less likely to be unemployed. In contrast, the results show that those individuals aged between 15 and 24 are significantly more likely to be unemployed than employed relative to those aged between 25 and 44.

In relation to those unavailable for work relative to the base category, the results show that all age categories have a significant positive effect on the probability of being unavailable for work than being unemployed. Therefore, all age groups relative to the reference group (i.e. 25-44 year olds) are more likely to be unavailable for work than being unemployed. The labour force participation rates from quarter 4 of the 2006 QNHS supports these findings, the statistics show that the participation rate for the 25-44 age group is an average of approximately 83 percent, in comparison to 26 percent for the 60+ age category, 52 percent for the 15-24 age cohort and 70 percent for those between 45-59 years of age.

Education

In relation to educational attainment levels, the reference group for comparison is those with upper secondary qualification or PLC, i.e. education category b. The results show that a higher level of education than upper secondary qualification or PLC only, increases the likelihood of an individual being employed than unemployed relative to the reference group. As expected, increased educational attainment increases the probability of being employed than unemployed.

In relation to those unavailable for work relative to the base category, the results show that having a level of education greater than upper secondary decreases the likelihood of an individual being in the unavailable for work category relative to being unemployed. While those individuals with less than an upper secondary qualification are more likely to be unavailable for work than unemployed relative to those with upper secondary or PLC qualification.

Region

An individual's geographical location also has a significant effect on their labour status. The reference group in the MNL model was the South East region. The results show that being located in the Midlands and the Mid East increases the probability of employment relative to those individuals residing in the South East. While individuals located in the Border and Dublin regions have a reduced probability of employment relative to individuals in the South East region. Therefore residing in Dublin decreases the probability of an individual being employed, which was a surprising result in itself.

The results also show that relative to the South East, residing in the following regions: Midlands, West, Mid East and South West increases an individuals probability of being unavailable for work relative to being unemployed. This finding was substantiated when we calculated the participation rates of individuals for various regions using the 2006 QNHS; we found that Dublin and the South East had the highest participation rate of 65 percent, while the Border, South West, West and Midland regions had lower participation rates than the South East region. The results also showed that individuals located in the Border region are more likely to be unemployed than unavailable for work relative to those located in the South East.

To investigate the validity of the models results, we calculated the unemployment rates for regions. The results of our calculations are presented in Table 7.7. We found that the Mid East, Mid West and South West regions have the lowest unemployment rates of less than 4 percent. When we accounted for gender, males from the Mid East and females from the Midlands had the lowest unemployment rates of 3.1 percent.

The Border and South East have the highest unemployment rate of approximately 5 percent. Males residing in Dublin and females living in the West region have the highest unemployment rate of 5.6%. In relation to education, males residing in Dublin with less than secondary education have an unemployment rate of 9.9 percent. With regard to the age profile of an individual, the highest unemployment rate is attributed to the 15-44 age group from Dublin.

Table 7.7: Unemployment Rates across Regions

		Border	Midlands	West	Dublin	Mid East	Mid West	South East	South West	Ireland
	Males	5.0%	4.7%	3.2%	5.6%	3.1%	3.9%	5.4%	3.7%	4.5%
	Females	5.1%	3.1%	5.6%	3.7%	3.7%	4.0%	4.4%	3.6%	4.1%
	All	5.0%	4.0%	4.2%	4.8%	3.3%	3.9%	5.0%	3.7%	4.3%
Males	**15-44**	5.6%	5.8%	3.9%	6.4%	3.6%	4.8%	5.9%	4.3%	5.3%
Males	**45-55**	4.9%	2.7%	3.2%	4%	2.8%	2.1%	5.4%	3.5%	3.7%
Males	**55+**	2.2%	1.9%	1%	3.2%	0.8%	2.3%	3.1%	1.7%	2.2%
Males	**Less than secondary**	6.9%	6.6%	3.4%	9.9%	5%	6.6%	7.7%	5.4%	6.8%
Males	**Secondary or PLC**	3.4%	3.5%	3.3%	5.7%	2.6%	2.2%	3.8%	3.2%	3.9%
Males	**Third Level**	3.2%	3.0%	2.7%	2.7%	1.2%	3.2%	2.9%	2.5%	2.6%

Source: *'analysis done by Teagasc/FÁS using the CSO QNHS data for the years 1998 and 2006"*

In order to identify the unemployment trends across regions, we compared the unemployment rates for individuals included in the 1999 QNHS with those in the 2006 sample. We found that the Border region had the highest decline in unemployment rates across the regions with a 4 percent reduction since 1999. Males located in the Border region and females in the South East region saw their unemployment rate reduce by 4 and 5 percentage points respectively since 1999. The unemployment rate for males with less than secondary education has declined across all regions, with the largest reduction in the Border and South East regions. While the unemployment rate for individuals aged between 45 and 54 residing in the Border region has reduced by 5 percent since 1999.

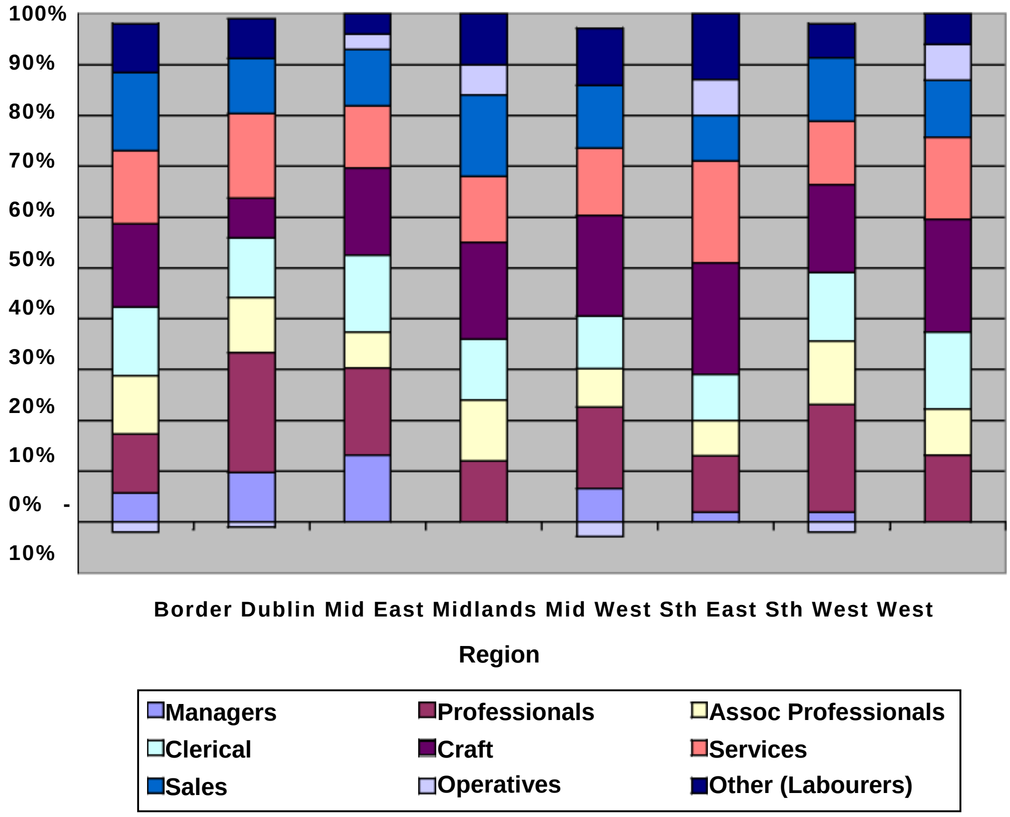
According to the QNHS, across all categories, unemployment rates in Dublin remained almost unchanged since 1999.

The regional labour market statistics outlined above verify the result obtained by the multinomial logit model that residing in Dublin increases the likelihood of an individual being unemployed. The results calculated in Table 7.7 demonstrate that Dublin has one of the highest unemployment rates. This is due to the large pockets of unemployment in some Dublin areas which have persisted during the years of economic boom.

Overall, unemployment statistics would suggest that, in terms of employment growth, rural Ireland benefited greatly from the Celtic Tiger era. However, the analysis below shows that there was a significant difference in the quality of jobs created in Dublin region and outside.

According to the QNHS, in excess of 500,000 additional jobs were created in the Irish economy since 1998. However, employment growth within broad occupational groupings has been unevenly distributed across regions. Figure 7.8 shows the regional distribution of the total employment growth over the period 1998-2006 per broad occupational group.

Figure 7.8 Regional distribution of employment growth over the period 1998-2006 by broad occupational group (% share)



Source: *'analysis done by Teagasc/FÁS using the CSO QNHS 2006 data"*

Figure 7.8 shows that of the jobs created between 1998 and 2006; those created in the Dublin region are at the higher end of the occupational scale. The figure shows that Managerial, professional and associate professional occupations accounted for 45 percent of employment growth in Dublin since 1998 in comparison to 22 percent of employment growth in the West region.

In relation to craft and lower skilled occupations, the results show that 30 percent of the jobs created since 1998 were in occupations such as craft, operatives and other (labourers). When we examine the distribution of these jobs across regions, we find that these occupations accounted for 42 percent of the new jobs created in the South East region and 35 percent of the new jobs created in the Midlands and West regions, while these occupations represented 15 percent of the employment growth in Dublin since 1998. The results show that the proportion of operative jobs in the Border, Dublin, Mid West and South West regions have declined since 1998.

Therefore while unemployment rates are lower in regions outside Dublin, the jobs created in these regions since 1998 have been at the low end of the occupational scale.

Marginal Effects

The marginal effect of each variable on each of the principal economic status is presented in table 7.8. The marginal effects show the change in the probability of choice j given a change in x_i. For example, a one unit change in the education variable means that going from having secondary education only to having third level education increases the probability of employment by 0.15.

In relation to age, those aged less than 25 are 0.43 less likely to be employed than those in the 25 to 44 age category.

In relation to geographical location, those located in the Mid West region are 2 percent more likely to be employed relative to the South East region. Those individuals located in all other region are approximately 2 percent less likely to be employed relative to the South East region.

Table 7.8: Marginal Effects of Various Explanatory Variables

Independent Variables	Employed Status =1	Unemployed Status=2	Unavailable for Work Status =3
Gender	0.303	0.024	-0.33
Age1	-0.435	-0.008	0.44
Age3	-0.068	-0.008	0.08
Age4	-0.563	-0.038	0.60
Edua	-0.249	0.013	0.24
Educ	0.153	-0.006	-0.15
Border	-0.016	0.075	0.008
Midlands	-0.009	-0.006	0.016
West	-0.029	-0.003	0.033
Dublin	-0.02 1	0.004	0.016
MidEast	-0.0 18	-0.009	0.027
Mid West	0.018	-0.002	-0.017
Sth West	-0.032	-0.005	0.037

Incorporating the results of the econometric model, we calculated the probabilities of individuals being employed, unemployed or unavailable for work given their educational attainment levels, age and geographical location. Table 7.9 shows the probability of employment for individuals with different age and educational profiles.

Table 7.9: Probability of employment for different individual profiles

	Age	Education	Border	Midlands	West	Dublin	Mid East	Mid West	Sth West	Sth East
Males	15-24	Less than secondary	11	7	8	10	6	8	8	9
	15-24	Third Level	6	4	4	5	3	4	5	5
Males	25-44	Less than secondary	10	7	8	10	6	8	8	9
	25-44	Third Level	4	2	2	3	2	2	2	3
Males	44-59	Less than secondary	9	6	6	8	5	6	6	7
	44-59	Third level	3	2	2	3	2	2	2	2

Source: *'analysis done by Teagasc/FÁS using the CSO QNHS 2006 data"*

The table illustrates the significant effect educational attainment has on an individual's probability of securing employment across all regions. In relation to all age groups; having a third level education decreases the probability of an individual being unemployed.

The effect of educational attainment on an individuals' probability of being unemployed is more pronounced in the 25-44 age cohort, given that this grouping have the highest labour market participation rates (83% in 2006). The results show that an individual residing in the Border or Dublin region with less than secondary education has a 10 percent probability of being unemployed. The results show that increased educational attainment increases the probability of a 25-44 year old attaining employment, with the unemployment rate averaging 2 percent across all regions for an individual with a third level qualification.

A hypothetical example

Incorporating the results outlined above, we analysed the effect education has on the probability of a farmer aged between 25 and 44 securing employment.

Farmer A is male, aged between 25 and 44, resides in the Border region and has no formal or primary only education.
While Farmer B is male, aged between 25 and 44, resides in the Border region and has a third level qualification or greater.

When we compared the unemployment rates of Farmer A and Farmer B, our calculations showed that farmer B would have a 10 percent probability of being unemployed, in comparison to an unemployment rate of 4 percent for Farmer B. Therefore, given the educational attainment levels of both farmers, Farmer A is 6 percentage points more likely than farmer B to be unemployed in the Border region.

In is worth noting that the empirical data used in the model refer to 2006 which was a year of virtual full employment for Ireland. The gap in terms of employability would increase for any situation in the labour market which would represent a move away from the state of full employment.

7.3.5 Key points

- The results of the MNL model show that as educational attainment levels increase, so does the probability of being employed relative to being unemployed
- Improving skill profile of farmers by increasing their educational attainment or additional training would increase the probability of securing off-farm work for a significant number of working age farmers
- Regional labour market statistics support the findings of the MNL model and show that the largest decline in unemployment rates over the period 1998-2006 have been in regions outside of Dublin
- While the unemployment rates in regions outside Dublin declined significantly over the period 1998-2006, the quality of the jobs created has been at the lower end of the occupational scale compared to Dublin

7.4: To provide an off-farm employment outlook for the existing farmer profiles.

The ability of farm households to attain and maintain off-farm employment opportunities is dependent on the vitality of the sectors in which they are employed and the farmers' skills profile. In this section we will draw on work conducted by the Economic Social Research Institute (ESRI) and the Expert Group on Future Skills Needs (EGFSN) to assess the long term outlook for the sectors synonymous with off-farm employment provision and to provide an indication of the difficulties farm operators may encounter when job seeking in the future. We also examine the current situation in the Irish labour market and highlight existing job opportunities.

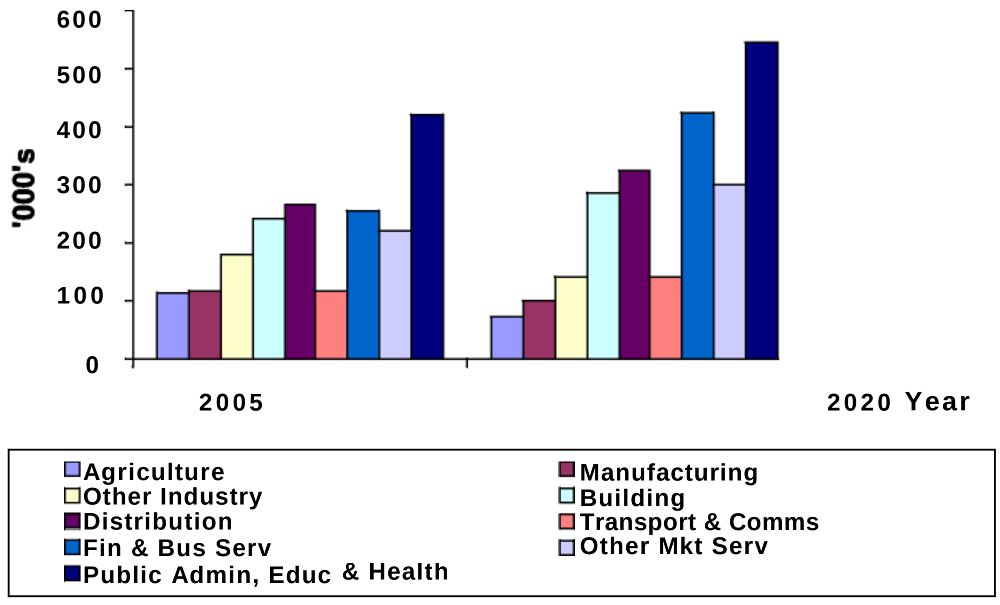
7.4.1 Sectoral outlook

As set out in *The Current Trends in Occupational Employment and Forecasts for 2010 and 2020* report of the ESRI[25], the structure of the labour market is expected to be markedly transformed by 2020. In 2005, traditional industries such as agriculture, manufacturing and other production industries accounted for in excess of 400,000 jobs in Ireland (Figure 7.9); by 2020 these sectors are expected to provide 315,000 jobs, a reduction of approximately 85,000 jobs, with the actual loss of 40,000 jobs in the agricultural industry. These are the sectors historically associated with off-farm employment provision; therefore the forecasted contraction is expected to result in decreasing employment opportunities for farmers.

In contrast, the sectors associated with high education attainment are expected to account for a significantly greater share of total employment. According to the research conducted by the ESRI, between 2005 and 2020, the financial and business services, other market services and public administration, education and health sectors are expected to employ an additional 375,000 people.

25 Based on Low growth scenario which assumes that the US economy begins a gradual adjustment process to a more sustainable growth path prior to 2010 (possibly as early as 2007), resulting in slower growth, with knock on effects on world economies.

Figure 7.9: Percentage of total employment for each sector in 2005 and 2020



Source: *ESRI, 2006*

In the short and medium run, the most significant development in relation to the farmers' off-farm labour market outlook is the expected sharp contraction of the construction sector. Research by FÁS (2008) predicts an average annual completion rate of 57,500 houses between 2006 and 2013 which represents a major reduction on the peak figure of over 88,000 units completed in 2006. Inevitably, a contraction of this magnitude will give rise to significant job losses in the new residential sub-sector. FÁS forecast that in 2008 alone, in excess of 40,000 workers could lose their jobs in this sub-sector. This decline will somewhat be off set by the expected job creation in other construction sub-sectors: civil engineering (driven by the National Development Plan), general contracting and residential repair and improvements. On balance, however, these positive developments will not be sufficient to compensate for the dramatic loss of jobs expected in the new residential sub-sector. Beyond 2009, employment in all sub-sectors is expected to increase; however, total employment in the construction industry is not expected to reach the level recorded in 2006 by 2013.

In the long run, construction sector is expected to revert to a more sustainable employment growth path and to converge to other EU countries in terms of its contribution to the national employment (FÁS 2008).

In addition, it is expected that the sector will undergo a change in terms of its skill mix: the share of professionals in the workforce will increase and the share of crafts-persons will decrease. The building process itself is predicted to more closely resemble a manufacturing activity with a widespread use of panelised building, pre-fabricated structures and other new construction technologies (FÁS 2008)

New regulation in relation to the energy saving and environmentally sustainable building will create demand for persons who have knowledge in the installation of sustainable technologies and insulation materials. (FÁS 2008)

Another development relevant for the farmers' off-farm labour market outlook is the increasingly occurring re-location of manufacturing activities from Ireland to lower cost economies. In recent years, low-cost Asian and Eastern European countries have become increasingly successful in competing for the foreign direct investment. This has resulted in re-location in a significant number of manufacturing jobs out of Ireland. The intensification of competition from low cost economies has been compounded by the erosion of Ireland's competitiveness by a rising cost base, as pay costs have accelerated over the last number of years and are now higher than the EU average (National Competitiveness Council 2005). In addition, government policy has actively pursued the development of a knowledge-based economy and has sought to attract hi-tech and high valued adding industry. This combined with increased global competition is expected to result in the absolute and relative decline of job creation in the labour intensive manufacturing industries.

7.4.2 Occupational outlook

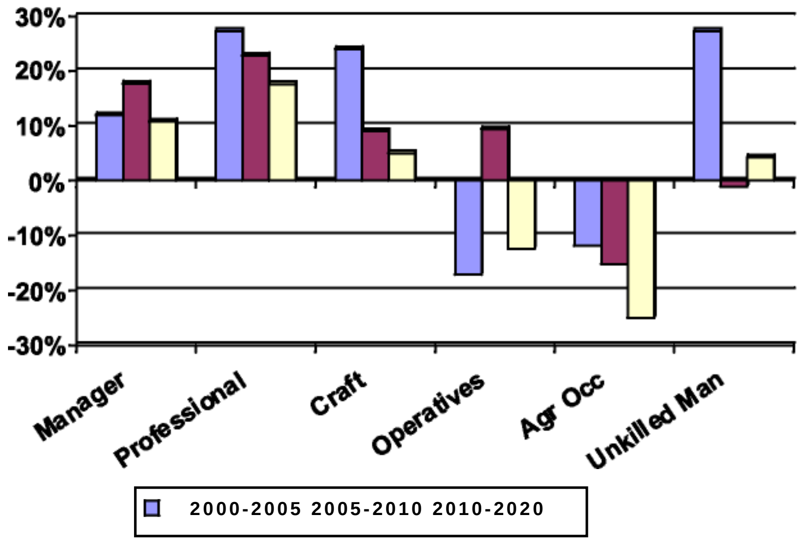
According to the 'new economy' theory, advanced countries are experiencing a remarkable growth in 'knowledge jobs' and standardised manual labour is being increasingly displaced by knowledge-rich employment. In relation to Ireland, this theory was substantiated by Turner and D'Art (2005), who found on analysis of CSO data that between 1997 and 2004, job growth at the high end of the skills continuum exceeded growth in middle level occupations, with much of the job growth at the high skill level in managerial and administrative functions. Similarly, the *Tomorrow's Skills: Towards a national Skills Strategy* report by the Expert Group on Future Skills Needs found that 'high skilled' employment increased between 1991 and 2001 while 'low skilled' employment declined.

According to the QNHS, between 1998 and 2006 just over 50,000 additional jobs were created in low skilled occupations such as operatives and labourers, with the latter accounting for 84 percent of these additional jobs. In contrast, there were 170,000 additional managerial, professional and associate professional jobs created since 1998. Therefore, these occupations accounted for 32 percent of the additional jobs in the Irish economy since 1998, thereby illustrating a shift in the Irish labour market to knowledge based jobs.

Figure 7.10 outlines the previous and projected occupational profiles of the Irish workforce according to the report by the ESRI. The graph illustrates a significant shift in the structure of the Irish labour market with an increased emphasis on knowledge based jobs. According to the ESRI, between 2000 and 2020, 81,700 people engaged in occupations such as operatives and agriculture will be redundant, however, they predict that unskilled manual occupations will increase by 30,400. This projection may have serious implications for the farm operators employed off the farm. According to the 2002 NFS, approximately 61 percent of the farm operators participating in the off farm labour market are employed in low skilled occupations.

In contrast, the ESRI forecast that between 2000 and 2020 there will be 364,500 additional jobs in managerial, professional and associate professional occupations.

Figure 7.10: Employment Growth by Occupational Group 2000-2020 (ILO Basis)



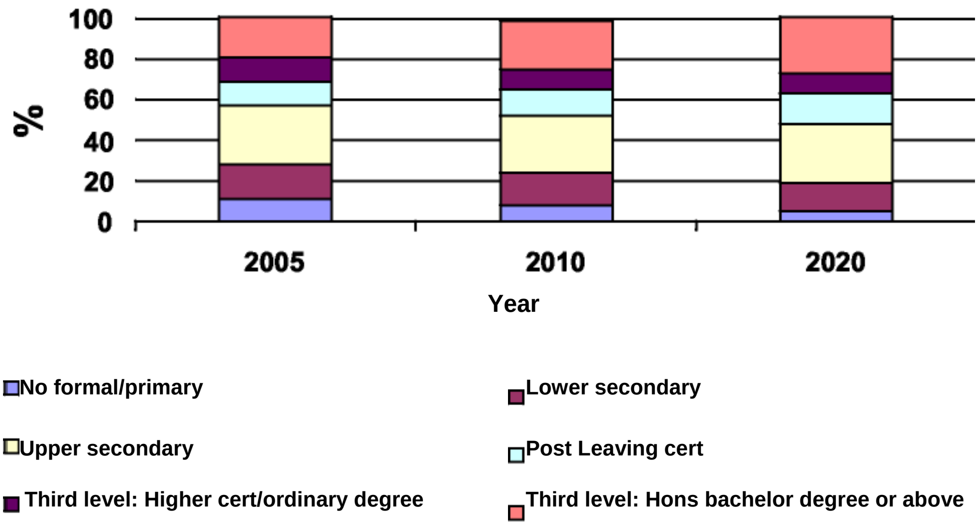
Source: *ESRI, 2006*

7.4.3 Education outlook

According to the labour force projections by educational levels of the EGFSN, by 2020 without policy change, there are expected to be labour force surpluses at the lower educational levels, with a large number of low-skilled individuals unemployed or inactive.

On the supply side, the EGFSN estimates that by 2020, 5 percent of the labour force will have no formal/primary level qualification and 19 percent will have below upper secondary education (Figure 7.11). This represents a stark contrast to the educational attainment levels of the working population in Ireland in 2005: 11 percent of the labour force with no formal/primary only education and 28 percent with less than upper secondary education.

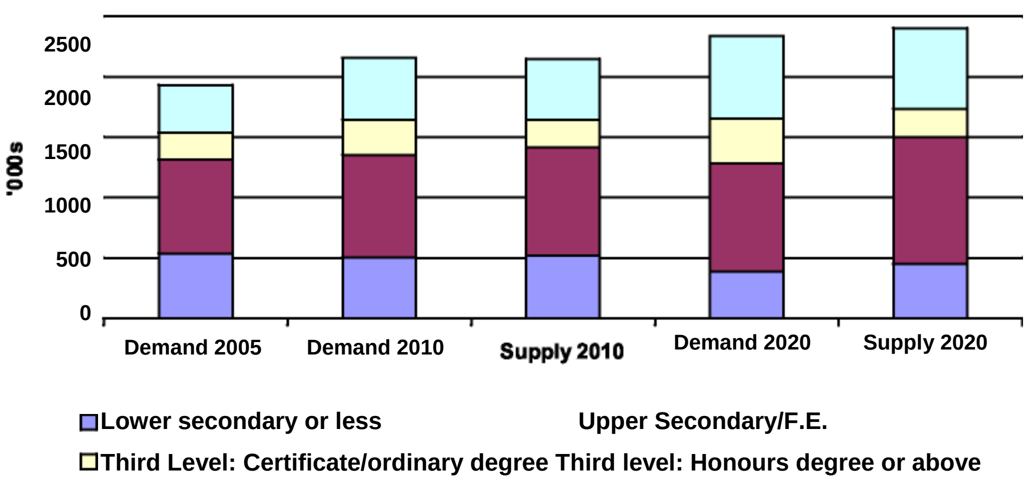
Figure 7.11: Labour Force Projections by Education Levels



Source: *EGFSN, 2007*

On the demand side, by 2020, the EGFSN predict that there will be demand for 390,000 individuals with lower secondary education or less, but that there will be a supply of 450,000 such people. In 2020, according to the comparison, there will be a gap at third level and above. A large deficit of approximately 139,000 at third level higher certificate/ordinary degree is also projected as employment demand will far outstrip labour supply. This suggests that there will be a shift in demand from low to high skilled individuals and that low skilled individuals could be unemployed or inactive in Ireland in 2020 (Figure 7.12).

Figure 7.12: Supply and Demand for Skills in 2010 and 2020



Source: *EGFSN, 2007*

Results from previous sections show that a significant number of farmers have low skills profiles as measured by their educational attainment levels and work experience. Given the demand projections by the ESRI and EGSFN, farm operators will require up-skilling in order to increase their probability of securing off-farm employment.

7.4.4 Key points

- Employment opportunities in agriculture and traditional manufacturing are expected to continue to diminish
- In the short run, construction industry is expected to contract with significant job losses
- In the long run, construction industry is expected to recover, however its contribution to the national employment growth as seen in recent years is not expected to be repeated in the foreseeable future
- Demand for low skilled occupations is expected to grow significantly slower than the demand for skilled occupations
- By 2020, it is expected that Ireland will have a surplus of labour force at lower educational levels
- The analysis implies that a number of off-farm jobs held by farmers will be lost due to contraction in the construction sector and the re-location of some manufacturing activities out of Ireland
- The analysis implies that the gap between farmers' skills and the labour demand is likely to increase in the coming years
- In order to improve farmers' prospects in meeting future labour demand up-skilling of a significant number of farmers will be required

7.5: The effect of Policies on the employability of farmers seeking off-farm employment

The previous section outlined the problems which farm operators seeking off-farm employment may encounter given their skills profiles and the forecasted downturn in the sectors historically associated with the provision of off-farm employment. Given these difficulties, this section of the paper evaluates policies that have been implemented to assist and enable farm operators to overcome the aforementioned obstacles by enhancing their employability and increasing their probabilities of securing off-farm employment.

7.5. 1 Options Programme

We have identified one initiative which seeks to assist farmers' improve their labour market prospects through career and training guidance: The Opportunities for Farm Families Programme. The programme was introduced in 2001, in collaboration between Teagasc and FÁS. Its primary objective is to help farm families generate additional household income and improve their quality of life by providing advice on future options both on and off the farm.

The original programme was free to families with less than 100 farming income units[26]. The programme was divided into three stages. Stage 1 involved viability appraisal leading to the identification of a 'Way Forward Guide'. In Stage 2 specific measures to generate additional income and/or improve quality of life were identified by the family in conjunction with an adviser. It also identified the specific advice and training needs of the family and made appropriate referrals to other agencies, such as FÁS. While in stage three, the farm family implemented the actions specified in the 'Way Forward Action Plan' and would often involve both training for off-farm jobs and placement in employment, suited to their skills.

The programme was modified and re-launched as the Planning Post Fischler Programme in January 2004 and is currently referred to as the Options for Farm Families Programme. One of the most notable changes is that the programme is now available to all farm families and free to those with less than 150 income units. To date there have been 15,000 participants in the programme.

[26] 180,000 litres if milk quota; 100 beef cattle; 600 sheep; 100 hectares cereals or equivalent. The first €19,046 of a farmer's off farm income is excluded in this calculation, as is all the partner's off farm income

7.5.2 Evaluation of Options Programme

In order to assess the usefulness of the Options Programme, one would need to have data tracing an individual farmer from the skill assessment and referral to training up-take and the outcomes from the training undertaken. Currently, there is no comprehensive data recording system that captures the process covered under the Options Programme.

At the initial stage of the process, Teagasc advisers implementing the Options Programme record data on off-farm employment appraisal worksheets. The worksheet asks the farm household members to state the employment areas in which they would like to work. If on completion of the appraisal worksheet, the operator decides that off-farm employment is worth pursuing, the advisor refers the farm operator to the training (almost exclusively FÁS) representative for that particular county.

FÁS through its nationally integrated database encompassing all FÁS training centres, have an established mechanism by which to record detailed information pertaining to the characteristics of individuals enrolled in FÁS courses. The database records information regarding the characteristics of the individuals who are undertaking a particular course such as their gender, date of birth, residential addresses, educational attainment levels, working skills and whether they have any prior FÁS or other qualifications, work experience etc.

In theory, FÁS course records database can provide information necessary to ascertain the skill levels/profiles of the farmers undertaking training and also providing us with an indication of how proactive farm households are in relation to increasing their employability. However, while there is a field in the database which can be used to identify farmers on FÁS courses, filling this field is not mandatory and in most cases the field is unpopulated. The number of farmers identified in the FÁS database is too small and this information cannot be used to make inferences about the entire farmer population undertaking training. From the limited data recovered from the FÁS database it was possible to ascertain that farmers tend to seek training in fields of transport (e.g. warehousing, driving) and engineering (e.g. welding).

In summary, there is a lack of data following individual farmers through the Options Programme and beyond which would enable the programme's evaluation. While there was a large number of farm families agreeing to seek alternative sources of employment and engage in up-skilling has been identified, there is limited information provided on:

1. the type of courses farmers enrol in
2. the completion rate of training undertaken by farmers
3. how successful the farm operator and/or spouse has been in attaining off-farm employment on completion of the training
4. how off-farm employment has affected the farm household.

7.5.3 Key points

Teagasc runs the Option Programme which provides the career and training guidance to farmers seeking off-farm employment

There is a lack of data on tracing an individual farmer through the Options Programme and beyond, which could assist in policy formulation and enable programme evaluation

The Options Programme is run in co-operation with FÁS and currently does not include formal co-operation with other education and training providers

7.6 Summary of findings

- Farmers have lower education profiles than the national employment stock
- Farmers are typically employed in traditional sectors including construction, agriculture and manufacturing
- Farmers are predominantly employed in low skilled and craft related occupations
- While there is some level of regional variation, farmers' skill profiles do not vary significantly between regions
- Farmers in the West region appear to have the poorest skill profiles as measured by education attainment and off-farm work experience
- Low skill profile of farmers implies issues with employability for farmers who are likely to become new labour market entrants
- Low skill profile of farmers implies issues with skill transferability across sectors and occupations for those already in off-farm employment
- Farmers aged 25-59 are particularly vulnerable given their propensity to seek employment off farm
- The results of the multinomial logit model (MNL) show that as educational attainment levels increase, so does the probability of being employed relative to being unemployed
- Improving the skill profile of farmers by increasing their educational attainment or additional training would increase the probability of securing off farm work for a significant number of working age farmers
- Regional labour market statistics support the findings of the MNL model and show that the largest decline in unemployment rates over the period 1998-2006 have been in regions outside of Dublin
- While the unemployment rates in regions outside Dublin declined significantly over the period 1998-2006, the quality of the jobs created has been at the lower end of the occupational scale compared to Dublin
- Employment opportunities in agriculture and traditional manufacturing are expected to continue to diminish
- In the short run, construction industry is expected to contract with significant job losses
- In the long run, construction industry is expected to recover, however its contribution to the national employment growth as seen in recent years is not expected to be repeated in the foreseeable future

- Demand for low skilled occupations is expected to grow significantly slower than the demand for skilled occupations
- By 2020, it is expected that Ireland will have a surplus of labour force at lower educational levels
- The analysis implies that a number of off-farm jobs held by farmers will be lost due to contraction in the construction sector and the re-location of some manufacturing activities out of Ireland
- The analysis implies that the gap between farmers' skills and the labour demand is likely to increase in the coming years
- In order to improve farmers' prospects in meeting future labour demand, up-skilling of a significant number of farmers will be required
- Teagasc runs the Option Programme which provides the career and training guidance to farmers seeking off-farm employment
- There is a lack of data on tracing an individual farmer through the Options Programme and beyond, which could assist in policy formulation and enable programme evaluation
- The Options Programme is run in co-operation with FÁS and currently does not include formal co-operation with other education and training providers

7.7 Conclusion

There have been an increasing number of farm households participating in the off-farm labour market. In 2006, according to the national farm Survey over 54 percent of farm households had off-farm employment. Furthermore, off-farm income has assumed an integral role in insulating farm households from poverty.

The ability of a farm operator to secure off-farm employment depends not only on the buoyancy of the labour market but also the aptitude of the operators. The first section of this chapter analyses the skill profiles of farm operators as proxied by their level of education and work experience. The analysis shows that approximately 70 percent of farm operators had less than lower secondary education. Furthermore, farm operators' work experience typically tends to be in traditional sectors such as agriculture and manufacturing and also in the construction sector. The jobs occupied by farm operators are generally at the lower end of the occupation / skill scale. Given the low levels of educational attainment and the accumulated work experience, farm operators tend to have poorer skill profiles than the general population; however the research shows that farmers' skill profiles vary across regions, with the West region having the lowest skills profile of all those examined.

This paper also quantifies the effect of education, age and geographical location on the probability employment. The results from the Multinomial logit model show that education has a positive and significant effect on the probability of an individual securing employment. Therefore, the results enable us to quantify the effect that farmers' lower than average educational attainment has on their probability of securing off-farm employment. The results also show that geographical location can be significant. The analysis demonstrated a regional variation in unemployment rates, arriving at the somewhat unexpected result that regions outside of Dublin have lower rates of unemployment. This suggests that rural regions have benefited from the Celtic Tiger and are now areas of strong employment provision. However, while the unemployment rates have been in decline in rural regions, the data presented also shows that the quality of the jobs created outside of Dublin has been at the lower end of the occupational scale than those created in Dublin.

In 2004, more than 50 percent of the farmers that worked off farm were employed in traditional industries such as agriculture and manufacturing and the construction sector. These sectors are forecasted to decline. According to research conducted by the ESRI traditional industries such as agriculture, manufacturing and other production industries share of total employment will decrease from 27 percent in 2000 to 13 percent of the total employment in 2020. Increased competition from low cost economies is resulting in manufacturing jobs being re-located out of Ireland. While significant job losses are expected in the construction sector in the short run.

This paper also summarises research that suggests that demand for low skilled workers will decline significantly in the coming years while demand for higher skilled workers will increase. Our results show that farm operators have low levels of education attainment. This implies that farm operators, without enhancing their skill profiles, will struggle to secure off-farm employment opportunities in the future. However, the report by the Skills Labour Market Research Unit (2007) suggests that with the requisite training and up-skilling, there are alternative occupations such as heavy goods vehicles (HGV) drivers, clerks, sales representatives and areas of metal machining, fitting and instrument making which may facilitate the off-farm employment need of farm operators.

This paper shows that the existing skill profiles of farmers do not coincide with the projected demand for skills in the future. The Options Programme, run by Teagasc in co-operation with FÁS, aims to assist farm families in confronting economic challenges and capitalising on the opportunities that will be presented in the coming years. In particular, it assists those farm households interested in participating in the off-farm labour market by providing career and up-skilling guidance. However, we found that problems exist with regards to the data collection, whereby, the under-utilised recording systems create difficulties in assessing the scale of up-skilling and its outcomes.

CHAPTER 8
SUMMARY AND CONCLUSIONS

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8.1. Summary of Main Findings

The Celtic Tiger was the moniker attributed to the period of unprecedented economic growth experienced in Ireland between the late 1990s and early 2000s. This growth led to the transformation of Ireland's labour market from a position of labour surplus as evidenced by the high unemployment rates of the late 1980s to one of excess demand, skill shortages and net immigration by the time this study got underway in 2006. This excess demand provided opportunities for farm operators and family members to take advantage of the buoyant labour market and readily obtain employment off the farm. Together, the pull of greater financial gains in terms of paid remuneration and the push of declining farm incomes were significant factors in the rising numbers of farm household members employed off the farm. Figures from the National Farm Survey confirm this growing trend, showing that in the last decade, the number of farm households (farmer and/or spouse) participating in the off-farm labour market has increased significantly, climaxing at 58 per cent in 2008.

The objective of this project was to investigate and provide policy recommendations on issues pertaining to farm viability, off-farm employment and the implications for the productivity of the farming sector. In relation to farm viability, our results showed that there has been an increasing reliance by farm households on off-farm incomes to ensure their economic sustainability. Our figures show that 40 percent of the farm households encompassed in the 2006 NFS were sustainable only due to the presence of an off-farm income source.

We have also seen that off-farm income significantly affects the farmer's decision-making process in a business context. Data for Ireland shows that in the ten-year period from 1995 to 2005, average farm incomes declined by 17 per cent in real terms while net new investment increased by almost 30 per cent in the same period. This suggested that off-farm income was being reinvested in the farm business either directly or through the availability of credit. Thus, suggesting theoretically, that farm households that depend only on farm income were required to use a larger proportion of farm profit merely to satisfy the consumption demands of the household. Contrastingly, in households where additional income is present, the budgetary constraints are relaxed thereby making more of the farm profit available for reinvestment. However empirical research conducted during the course of this project showed that when farm size, system and profit are controlled for, the presence of off-farm income earned by the farmer reduces the probability of farm investment. This suggests that off-farm income is not driving on-farm investment. The results in relation to income earned by farmers' spouses were less clear. The results showed that farms where the farm operator does not work off the farm and the off-farm income is earned only by the spouse are the most profitable group of farms and have the highest frequency of farm investment. This suggests that farms that operated on a full-time capacity but where the spouse works off-farm are the most likely to invest. Our results confirm that the presence of off-farm income earned by the spouse increases the probability of on-farm investment.

Given the increasing numbers of farm households working off-farm, we investigated what effect, if any, will off-farm employment had on productivity levels. Theory suggests that, on one hand, larger off-farm incomes could imply less time on the farm and possibly less efficient use of resources (Kumbhakar, Biswas and Bailey, 1989). Alternatively, the very existence of spare time to work off the farm may in itself demonstrate a degree of efficiency in farm operations (i.e. only very efficient farmers would have the spare time to work off-farm). The results showed that the average farm in each system can be operated efficiently while conjointly participating in the off-farm labour market. The results indicated that part-time farmers are likely to be no less efficient than full-time farms. It is possible that the labour-saving technologies may be in place on part-time farms and that part-time farmers may manage their time more effectively. This result highlights the need for full-time farmers to critically assess their on-farm time management in an effort to explore the possibility of substituting a proportion of their off-farm labour with part-time off-farm employment.

Agricultural policy changes continue to play a significant role for the incomes of farm households and subsequently on their labour allocation decision. The introduction of decoupling in 2005 severed the link between agricultural production and direct payments. One of the objectives of this research was to examine the effect of decoupling on the incidence of part-time farming. In terms of the off-farm labour allocation decision of farm operators, our results support the hypothesis advocated by, among others, Hennessy et al (2005) that all things being equal decoupled payments increase the probability of participation and the time allocated by farmers to the off farm labour market. Therefore, the implementation of decoupled payments should result in an increased number of farmers seeking off-farm employment.

The research published in this report revealed that the income situation of Irish rural households generally has become less dependent on farming and more dependent on the non-farm economy. Furthermore, while there has been an improvement in the distribution of incomes accruing to farm households, non-farm income sources are having the most significant effect on lowering the risk of income poverty in rural areas. According to the 2007 NFS, on 80 percent of farms, the farmer and/or spouse had some source of off-farm income be it from employment, pension or social assistance. Results presented here have shown that farm households relying solely on the returns from farming are at a significantly higher risk of experiencing relative income poverty. On the other hand, by resorting to additional income sources (which may include an old-age pension or any source of social welfare including Farm Assist payments); the income risk was diversified, reducing the income volatility effect of variations in farm household income. It also follows that any other household member with an independent income source outside of farming will significantly decrease the likelihood of the entire household being defined as consistently poor compared with all households nationally. The main risk of exposure, as defined by consistent poverty, originates from having all household income derived from less diversified sources, which is further compounded if the sole income source is a volatile one such as farm income. Reducing dependence on farm returns for household income contributes to a statistically significant improvement in the household's income situation with implications for structural change in terms of the reallocation of land and labour resources towards more efficient usage (in income generation terms).

Farm operator's ability to secure off-farm employment has tended to be further hindered by low levels of educational attainment. Our analysis shows that approximately 70 percent of farm operators have less than lower secondary education. Research by the Economic and Social Research Institute (ESRI) and the Expert Group on Future Skills Needs suggests that demand for low skilled workers will decline significantly in the coming years while demand for higher skilled workers will increase. This implies that farm operators, without enhancing their skill profiles, will struggle to secure off-farm employment opportunities in the future.

In composite, the results of this research project have highlighted the reliance of farm households on non-farm income, the important role of non-farm income in insulating farmers from relative income poverty and the "push effect" of agricultural policy reform, i.e. decoupling is likely to push more farmers to seek off-farm employment. Against the backdrop of strong economic growth in Ireland in the 1990s and early 2000s, farmers found it relatively easy to secure employment off the farm, most commonly in the construction and traditional manufacturing sectors. While unemployment was low in Ireland, government policy in recent years tended to support the knowledge-based economy concept and as a result the majority of job creation has tended to be at the higher skilled end of the employment spectrum. The contribution of traditional industries such as manufacturing and agriculture to both GDP and total employment has declined and been supplanted by higher skilled sectors such as electronics, pharmaceuticals, and medical instrumentation. This transformation has significant implications for farm operators. According to the 2006, approximately 50 percent of farm operators were employed in traditional manufacturing, construction or agricultural occupations. Competition from low cost economies has resulted in significant job losses in the manufacturing sector as Ireland's competitiveness has been eroded by a rising cost base. There has been a significant contraction in the construction sector from a high of approximately 90,000 units in 2006; the ESRI (and others) predict housing completions to fall to below

30,000 units in 2009. Figures from the Central Statistics Office have shown that in the first quarter of 2008, employment in construction was 10.9 per cent lower than a year earlier. Therefore, the employment opportunities for farm operators will be significantly hindered given that they are historically employed in sectors that are contracting.

The report by the FÁS Skills Labour Market Research Unit (2007) suggests that with the requisite training and up-skilling farm-based labour can enjoy alternative occupations to facilitate the off-farm employment needs of farm operators. In addition, the Options Programme, run by Teagasc in co-operation with FÁS, is a mechanism by which farm families may obtain assistance in confronting economic challenges and capitalize on the opportunities that will be presented in the coming years. Furthermore, the economic outlook provided by the aforementioned research institutes is positive for the sectors synonymous with off-farm employment for farm spouses.

8.2 Recommendations arising from the research

During the course of this project a number of potentially interesting areas for further research emerged and a number of policy gaps were also identified. The following section outlines the main recommendations arising from this research.

8.2.1. Data Colection

Data on total farm household income are still limited. The NFS provides thorough annual and detailed information on farm income and in more recent years data is also collected on earnings from off-farm employment. However, in the absence of information on income flows from pensions, state transfers and private investments, it is not possible to estimate total household income. The EU- SILC dataset does collect this additional information but the data on farm income is not comprehensively assessed and is interpolated based on farm characteristics. Nonetheless, new research published in this report has highlighted the important contribution of off-farm earnings and other income sources to total farm household income. It would be beneficial to have an annual data source providing detailed and accurate information on total farm household income in order to gain a better understanding of the welfare and viability of farm households. This is especially true in the case of income support policies. Many agricultural policies are designed to support the income of farm households but it is now clear that farm income contributes a small and declining proportion of total income for many farm households and furthermore is declining in importance in terms of all incomes accruing to rural residents.

8.2.2. Supporting productivity improvements on farms

The farm productivity analysis presented in this report suggested that when the size and system of the farm are controlled for, part-time farmers are no less efficient than full-time farmers other things being equal. This result raises questions about the labour efficiency of full-time farms and is a likely indicator of underemployment on some farms. As stated earlier, this highlights the need for many full-time farmers to critically assess their on-farm time-management in an effort to explore the possibility of substituting a proportion of their on-farm labour with part-time off-farm employment. The productivity analysis also revealed that efficiency levels are positively correlated with extension use. Clearly, there is a role for extension officers to help farmers evaluate their time management and improve their labour efficiency. It also raises the possible situation of a return to farm activity becoming a 'soak' for excess labour capacity in the economy generally as it experiences increasing unemployment in the short- to medium-term. The question arises whether there are sufficient additional income-generating opportunities in the sector for a sudden influx of (returning) labour resources.

In relation to further research, the productivity analysis presented in this report analysed the impact of off-farm employment by including an indicator of whether the farmer had an off-farm job or not. Further research with more detailed variables on the part-time farming activity would explore further interesting avenues for policy research. For example one could include information on the number of hours worked off farm and the type of off-farm employment. This would provide us with key information on the effect of time-allocation decisions on the productivity levels of part-time farms.

8.2.3. Protecting Farm Households from poverty

As outlined previously the main risk of exposure, as defined by consistent poverty, originates from having all household income derived from less diversified sources that is compounded if the sole income source is a variable one such as farm income. A motivating factor behind income diversification strategies has been as a mechanism to reduce risk or as a reaction to crisis or liquidity constraints etc. The introduction of decoupled payments has mitigated some of the risk associated with farm income as the value of the payment is now known well in advance and is not exposed to unforeseen variability. However, recent policy developments have supported freer world trade and removed many of the price supports for traditional agricultural commodities. This has already led to more volatile commodity markets and it is expected that this will become the norm in the future. Consequently, farm income is likely to become more open to world market risk in the future, therefore intensifying the need for alternative more certain income flows. Given the increased difficulty that farmers are likely to face in trying to secure an off-farm job, interest in and subscription for support schemes targeted at low-income farmers, such as the Farm Assist programme, are likely to become more important in the future.

8.2.4 Improving the employability of farmers

The results of this research show that the typical skill profiles of farmers do not coincide with projected demand for skills in the future. The Options Programme, run by Teagasc in co-operation with FÁS, aims to assist farm families in confronting economic challenges and capitalising on the opportunities that will be presented in the coming years. In particular, it assists those farm households interested in participating in the off-farm labour market by providing career and up-skilling guidance. However, we found that problems exist with regards to data collection, whereby, the under-utilised recording systems create difficulties in assessing the scale of up-skilling and its outcomes. Therefore we provide the following recommendations:

- The Options Programme should be retained but re- evaluated and modified (see below)
- The Options Programme should provide guidance in relation to the existing job opportunities for farmers' seeking off-farm employment, particularly in the areas where their skill profile meets the demand; this would require that advisers on the programme have detailed up-to-date information on the labour market conditions at occupational level
- The Options Programme should provide guidance in relation to future job outlook; advisers on the programme should be equipped to educate

farmers on general trends and future outlook regarding the demand for labour at sectoral and occupational level; this would require that advisers on the programme have detailed up-to-date information on the expected labour market conditions as forecasted by the relevant research bodies

- The Options Programme should provide guidance in relation to up-skilling; advisers should inform farmers of the spectrum of up-skilling routes on offer, covering formal education (particularly relevant for early school leavers in the younger age cohorts of the farmer population) and training
- The links with education and training providers should be expanded beyond FÁS to include other providers in further and higher education and training
- Recording system on the existing Options Programme should be improved to provide data necessary for policy formulation and programme evaluation

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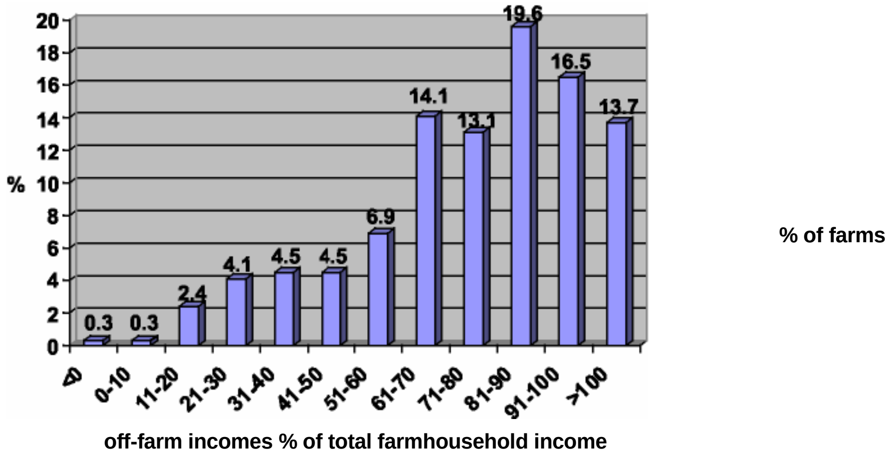
APPENDICES

Appendix 2A

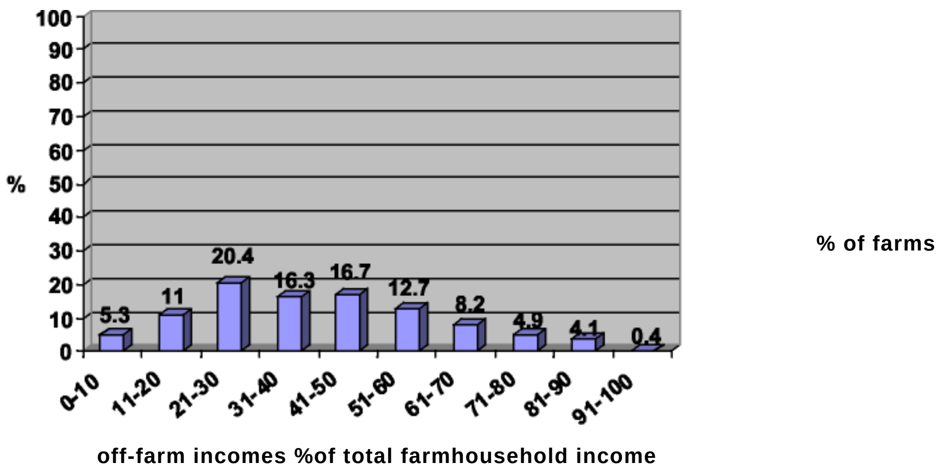
NFS Occupation	Source	Earnings per hour
Agricultural Contractor	CSO (NACE 45)	18.79
Farm Manager	CSO (NACE 45)	20.89
Other Agricultural Worker	CSO (NACE 1-4)	14.02
Forestry Worker/Fisherman	CSO (NACE 1-4)	14.02
Builders/Contractors	CSO (NACE 45)	20.89
Building Tradesman	CSO (NACE 45)	16.51
Building Manager/Foreman	CSO (NACE 45)	18.79
Building Labourers	CSO (NACE 45)	14.93
Motor Mechanic/Fitter	CSO (NACE 50)	13.80
Electrical Maintenance/Repair	CPL	18
Drivers	CSO (NACE 60)	15.92
Production Line Workers	CSO (NACE 15-37)	16.14
Line Manager	CSO (NACE 15-37)	24.83
Other Factory Workers	CSO (NACE 15-37)	17.28
Clerical/Office Workers	Ann O' Brien Recruitment	13
Administration/Office Manager	Ann O' Brien Recruitment	15
Sales Representative	CSO (NACE 51)	15.97
Sales/Shop Assistant	ESRI Publication	12.95
Company Business Manager	CSO (NACE 74)	16.75
Other Service Company/Organisation Worker	CSO	15.79
Proprietor of Catering/ Lodging services	CSO (NACE 55)	10.09
Hotel/B&B/Restaurant worker	Multiflex Recruitment	8.93
Domestic Services	Minimum Wage 2004	7
Postman	CSO (NACE 64)	19.93
Solicitors	ESRI Publication	18.43
Accountant	CSO (NACE 74)	16.76
Vet/A.I	ESRI Publication	21.78
Pharmacist	ESRI Publication	16.81
Engineers (Civil, Mechanical, industrial, etc)	ESRI Publication	15.23
Computer/ I.T Specialist	CSO (NACE 72-73)	17.27
Teaching (all levels)	CSO (NACE 80)	20.86
Nurse	INO	14.55
Doctor	GMS	34.93
Auctioneer	CSO (NACE 70-71)	18.11
Gardai	CSO	24.15
Army	CSO	17.4
Other	CSO	16.76

Off-farm income percentage of total farm household income for Sustainable Farms



Source: Based on Authors calculations using NFS 2004 data

Off-farm income percentage of total farm household income for Viable Farms



Source: Based on Authors calculations using NFS 2004 data

Appendix 3

The investment decision model used is binary, and estimates the probability of each farmer investing in farming activities given the farm and demographic characteristics. It is a binary choice model where the dependent variable investment is equal to one if the farmer invests in farming activities and equals zero otherwise. We assume;

$$Prob\ (O_i=1 | x_i) = F\ (x_i\beta)$$

where F is some normal distribution function bound by the [0,1] interval, i.e. 0~ $F(x_i\beta)$ ~ 1 to satisfy the probability properties. If we assume F to be a probability distribution then equation 1 can be estimated using a probit model. The probit model is estimated using the maximum likelihood procedure. Where the effect (β) of a vector of explanatory variables, x, on the probability of investment (p_i) is estimated. The estimated coefficient corresponding to an explanatory variable measures its influence on the probability of investment. Thus the effect of non-farm income on the probability of investing in farming can be tested.

Table 4.2: Weighted Descriptive Statistics for Variables Employed (Standard Error in Parenthesis) [27]

	Specialised Dairy	Cattle Rearing	Cattle 'Other'	Mainly Sheep	Tillage
No. Observations	3221	2135	1692	1019	907
---------- Production Variables ----------					
Output	60425.90	9680.49	44834.70	8966.69	33395.80
	(47338.20)	(7601.52)	(51398.40)	(12681.20)	(49935.30)
Herd	42.53	-	33712.90	-	-
	(26.93)	-	(42486.50)	-	-
Capital	45857.10	30601.10	19286.30	20817.80	42136.90
	(45134.10)	(23493.30)	(22122.70)	(21999.20)	(68007.10)
Labour	283.05	97.48	100.69	97.88	201.59
	(156.03)	(65.35)	(113.17)	(89.38)	(286.29)
Land	55.19	59.62	56.71	68.13	78.64
	(31.13)	(46.90)	(43.96)	(111.70)	(87.08)
Direct Costs	17135.50	5189.91	7097.80	5600.12	23573.10
	(13904.20)	(5087.82)	(7414.21)	(9319.24)	(29725.10)
---------- Efficiency Variables ----------					
Off-farm (D)	0.12	0.51	0.43	0.39	0.28
	(0.32)	(0.50)	(0.50)	(0.49)	(0.45)
Extension (D)	0.56	0.27	0.32	0.42	0.56
	(0.50)	(0.45)	(0.46)	(0.49)	(0.50)
Farm Size	103.93	70.03	76.77	97.98	153.57
	(63.32)	(60.04)	(60.84)	(116.69)	(142.70)
Specialisation	0.76	0.95	0.89	0.62	0.70
	(0.11)	(0.10)	(0.14)	(0.25)	(0.24)
Soil 1 (D)	0.47	0.21	0.58	0.41	0.87
	(0.50)	(0.41)	(0.49)	(0.49)	(0.34)
Soil 2 (D)	0.44	0.66	0.35	0.31	0.13
	(0.50)	(0.47)	(0.48)	(0.46)	(0.33)
Soil 3 (D)	0.08	0.13	0.06	0.28	0.00
	(0.28)	(0.33)	(0.24)	(0.45)	(0.03)
Age	48.05	52.52	56.33	55.27	50.81
	(11.23)	(12.25)	(12.85)	(912.17)	(13.78)

[27] Where 'D' signifies dummy variable

Table 4.3: Dairy System Results[28]

	Coefficient	Standard Error	P-value
Constant	***0.148	0.008	0.000
Herd	*** 0.647	0.015	0.000
Direct Costs	*** 0.265	0.008	0.000
Capital	*** 0.077	0.005	0.000
Labour	*** 0.072	0.014	0.000
Herd*Herd	0.064	0.047	0.170
Herd*Direct Costs	-0.053	0.035	0.136
Herd*Capital	***-0.064	0.018	0.000
Herd*Labour	*-0.110	0.062	0.074
Direct Costs*Direct Costs	0.006	0.011	0.595
Direct Costs*Capital	0.016	0.010	0.128
Direct Costs*Labour	*** 0.112	0.031	0.000
Capital*Capital	*** 0.009	0.003	0.001
Capital*Labour	*** 0.045	0.015	0.003
Labour*Labour	***-0.090	0.024	0.000
1998 (D)	***-0.027	0.010	0.009
1999 (D)	-0.007	0.010	0.491
2000 (D)	*** 0.036	0.009	0.000
2001 (D)	*** 0.076	0.009	0.000
2002 (D)	*** 0.047	0.009	0.000
2003 (D)	*** 0.082	0.009	0.000
2004(D)	***0.110	0.009	0.000
2005 (D)	*** 0.094	0.010	0.000
2006 (D)	*** 0.080	0.009	0.000
Lambda	*** 1.876	0.119	0.000
Sigma(u)	*** 0.171	0.002	0.000
------------------------	Efficiency Variables	----------------------------	
Off-farm (D)	0.047	0.032	0.145
Soil 2 (D)	** 0.129	0.064	0.044
Soil3(D)	0.208	0.133	0.118
Farm Size	***-0.143	0.037	0.000
Extension (D)	*-0.034	0.019	0.072
Specialisation	***-0.675	0.054	0.000

[28] All continuous production and efficiency inputs have been converted into logs. All production inputs have been divided by their means. ***, ** and * signify 1%, 5% and 10% significance levels respectively and 'D' indicates variable is a dummy variable.

Age	*** 0.226	0.061	0.000

Table 4.4: Cattle Rearing System Results

	Coefficient	Standard Error	P-value
Constant	*** 0.297	0.034	0.000
Labour	*** 0.381	0.027	0.000
Capital	*** 0.332	0.022	0.000
Land	*** 0.093	0.033	0.005
Direct	*** 0.168	0.024	0.000
Labour*Labour	0.020	0.022	0.367
Labour*Capital	*** 0.179	0.056	0.001
Labour*Land	0.010	0.065	0.876
Labour*Direct Costs	***-0.160	0.049	0.001
Capital*Capital	-0.005	0.032	0.866
Ca pita l* La nd	0.005	0.053	0.928
Capital*Direct Costs	-0.072	0.055	0.195
La nd * La nd	-0.066	0.048	0.166
Land*Direct Costs	0.062	0.049	0.209
Direct Costs*Di rect Costs	* 0.058	0.033	0.080
1998 (D)	***-0.278	0.038	0.000
1999 (D)	*-0.067	0.039	0.087
2000 (D)	* 0.079	0.042	0.061
2001 (D)	0.025	0.041	0.540
2002 (D)	-0.016	0.037	0.659
2003 (D)	-0.041	0.039	0.298
2004 (D)	-0.010	0.036	0.778
2005 (D)	0.041	0.037	0.271
2006 (D)	0.044	0.038	0.247
Lambda	*** 1.386	0.361	0.000
Sigma(u)	*** 0.444	0.102	0.000
---------------------------Efficiency Inputs --			
Off-farm (D)	-0.001	0.064	0.982
Soil 2 (D)	*** 0.373	0.104	0.000
Soil 3 (D)	*** 0.487	0.175	0.005
Farm Size	-0.120	0.080	0.131
Extension (D)	-0.066	0.060	0.277
Specialisation	* 0.292	0.170	0.085
Age	0.030	0.182	0.869

Table 4.5: Cattle 'Other' System Results

	Coefficient	Standard Error	P-value
Constant	0.001	0.011	0.896
Herd	*** 0.721	0.009	0.000
Labour	*** 0.108	0.010	0.000
Capital	** 0.016	0.008	0.054
Land	*** 0.046	0.015	0.003
Direct Costs	***0.121	0.011	0.000
H erd * H erd	*** 0.078	0.008	0.000
Herd*Labour	***-0.057	0.011	0.000
Herd*Capital	-0.002	0.008	0.757
H erd * La nd	-0.026	0.017	0.124
Herd*Direct Costs	***-0.045	0.012	0.000
Labour*Labour	** 0.010	0.004	0.012
Labour*Capital	0.006	0.008	0.444
Labour*Land	0.014	0.018	0.417
Labour*Direct Costs	0.012	0.014	0.391
Capital*Capital	0.004	0.003	0.165
Ca pita l* La nd	0.011	0.011	0.305
Capital*Direct Costs	-0.013	0.009	0.131
La nd * La nd	0.009	0.019	0.645
Land*Direct Costs	-0.023	0.019	0.216
Direct Costs*Direct Costs	*** 0.037	0.009	0.000
1999 (D)	*** 0.103	0.013	0.000
2000 (D)	*** 0.141	0.011	0.000
2001 (D)	*** 0.101	0.012	0.000
2002 (D)	*** 0.088	0.013	0.000
2003 (D)	*** 0.087	0.013	0.000
2004 (D)	*** 0.093	0.012	0.000
2005 (D)	*** 0.093	0.013	0.000
2006 (D)	*** 0.112	0.013	0.000
Lambda	*** 2.403	0.262	0.000
Sigma(u)	*** 0.226	0.010	0.000
	----------------------Efficiency Variables ------------------------		
Off-farm (D)	-0.006	0.075	0.941
Soil 2 (D)	*** 0.302	0.086	0.000
Soil 3 (D)	*** 0.632	0.128	0.000
Farm Size	-0.020	0.088	0.820

Extension (D)	0.007	0.075	0.928
Specialisation	-0.164	0.160	0.306
Age	-0.162	0.144	0.262

Table 4.6: 'Mainly Sheep' System Results

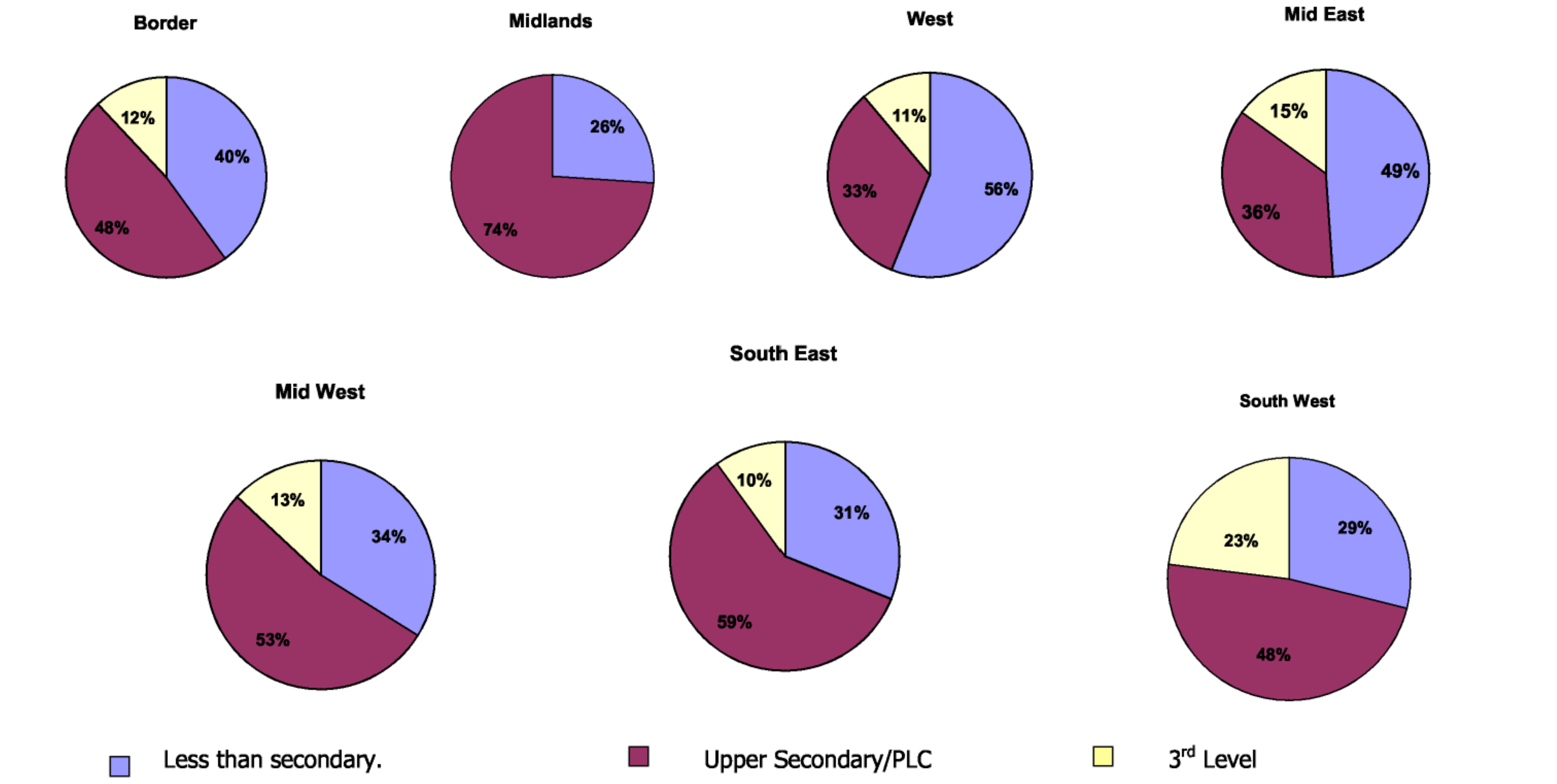
	Coefficient	Standard Error	P-value
Constant	* 0.084	0.044	0.053
Direct Costs	*** 0.424	0.031	0.000
Capital	*** 0.112	0.041	0.007
Labour	*** 0.449	0.043	0.000
Direct Costs*Direct Costs	*** 0.105	0.015	0.000
Direct Costs*Capital	-0.027	0.050	0.590
Direct Costs*Labour	** -0.143	0.057	0.012
Capital*Capital	-0.046	0.047	0.334
Capital*Labour	0.087	0.068	0.199
Labour*Labour	0.033	0.041	0.417
2000 (D)	*** 0.252	0.042	0.000
2001 (D)	*** 0.300	0.050	0.000
2002 (D)	*** 0.224	0.053	0.000
2003 (D)	*** 0.253	0.042	0.000
2004 (D)	*** 0.232	0.046	0.000
2005 (D)	*** 0.387	0.058	0.000
2006 (D)	*** 0.372	0.058	0.000
Hill-Land (D)	***-0. 190	0.037	0.000
Lambda	0.143	0.173	0.410
Sigma(u)	*** 0.045	0.007	0.000
------------------------- Efficiency Variables -----------------------------			
Off-farm (D)	0.207	0.143	0.146
Soil 2 (D)	** 0.413	0.191	0.031
Soil 3 (D)	*** 0.840	0.225	0.000
Farm Size	0.075	0.084	0.369
Extension (D)	**-0.115	0.059	0.051
Specialisation	*** 0.337	0.125	0.007
Age	* 0.421	0.238	0.076

Table 4.7: Tillage System Results

	Coefficient	Standard Error	P-value
Constant	*** 0.107	0.028	0.000
Land	*** 0.157	0.027	0.000
Direct Costs	*** 0.339	0.041	0.000
Capital	** 0.038	0.019	0.050
Labour	*** 0.514	0.035	0.000
La nd * La nd	-0.005	0.037	0.887
Land*Direct Costs	*** 0.364	0.084	0.000
Land*Capital	0.053	0.033	0.112
Land*Labour	***-0.423	0.065	0.000
Direct Costs*Direct Costs	*-0.123	0.070	0.077
Direct Costs*Capital	-0.032	0.036	0.374
Direct Costs*Labour	-0.028	0.090	0.759
Capital*Capital	** 0.017	0.009	0.056
Capital*Labour	-0.026	0.027	0.339
Labour*Labour	*** 0.199	0.038	0.000
1998 (D)	***-0.071	0.026	0.007
1999 (D)	-0.030	0.029	0.296
2000 (D)	*** 0.122	0.034	0.000
2001 (D)	0.017	0.031	0.571
2002 (D)	***-0.085	0.030	0.004
2003 (D)	0.006	0.037	0.861
2004 (D)	*** 0.122	0.028	0.000
2005 (D)	*** 0.103	0.033	0.002
2006 (D)	** 0.066	0.032	0.041
Lambda	*** 2.129	0.345	0.000
Sigma(u)	*** 0.332	0.040	0.000
--------------------------- Efficiency Inputs ------------------------------			
Off-farm (D)	0.017	0.104	0.873
Farm Size	***-0.331	0.111	0.003
Extension (D)	0.033	0.077	0.671
Specialisation	***-0.368	0.119	0.002
Age	**0.356	0.173	0.040

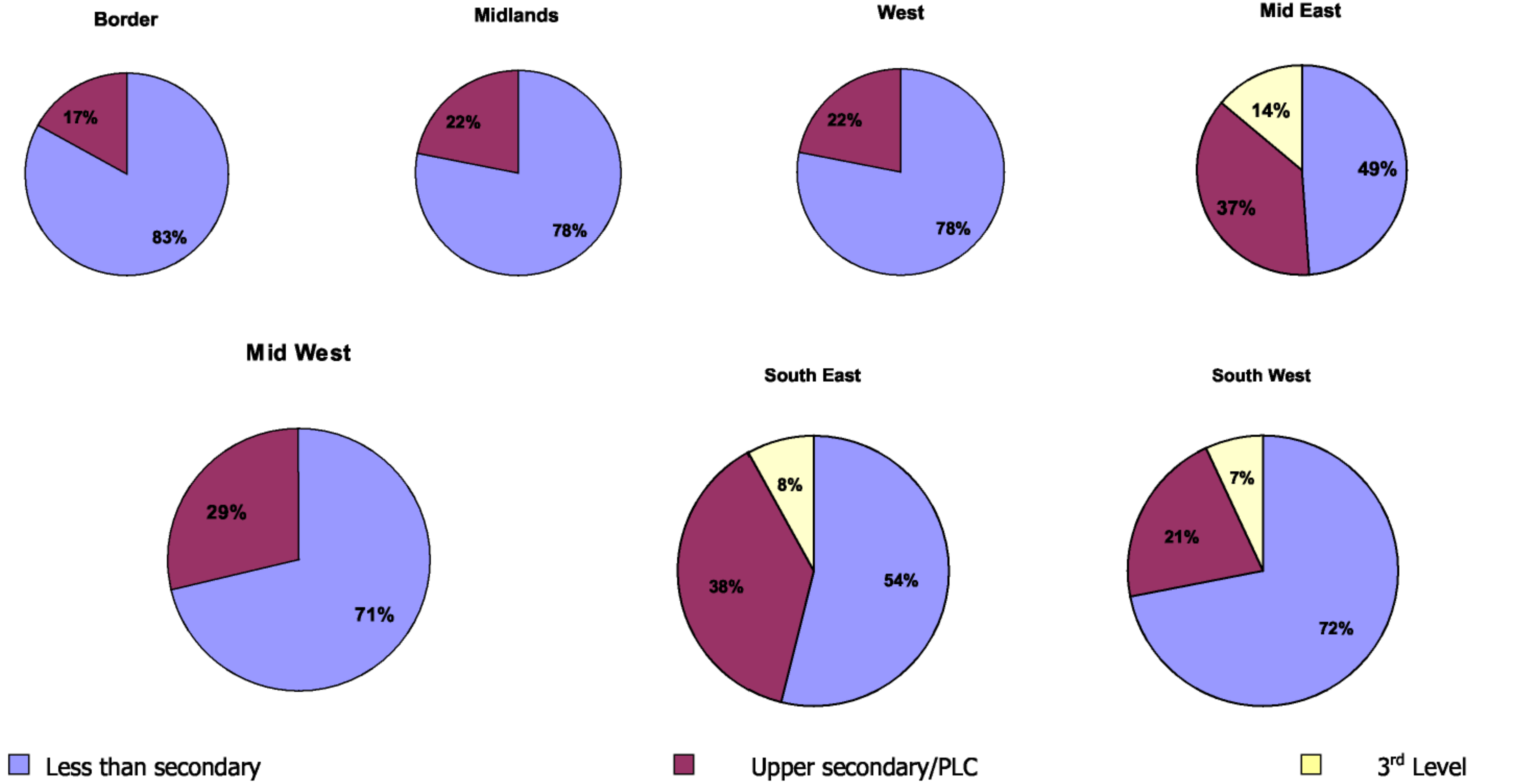
APPENDIX 7

Figure 7.2: Educational attainment levels of 25-44 year old in particular regions



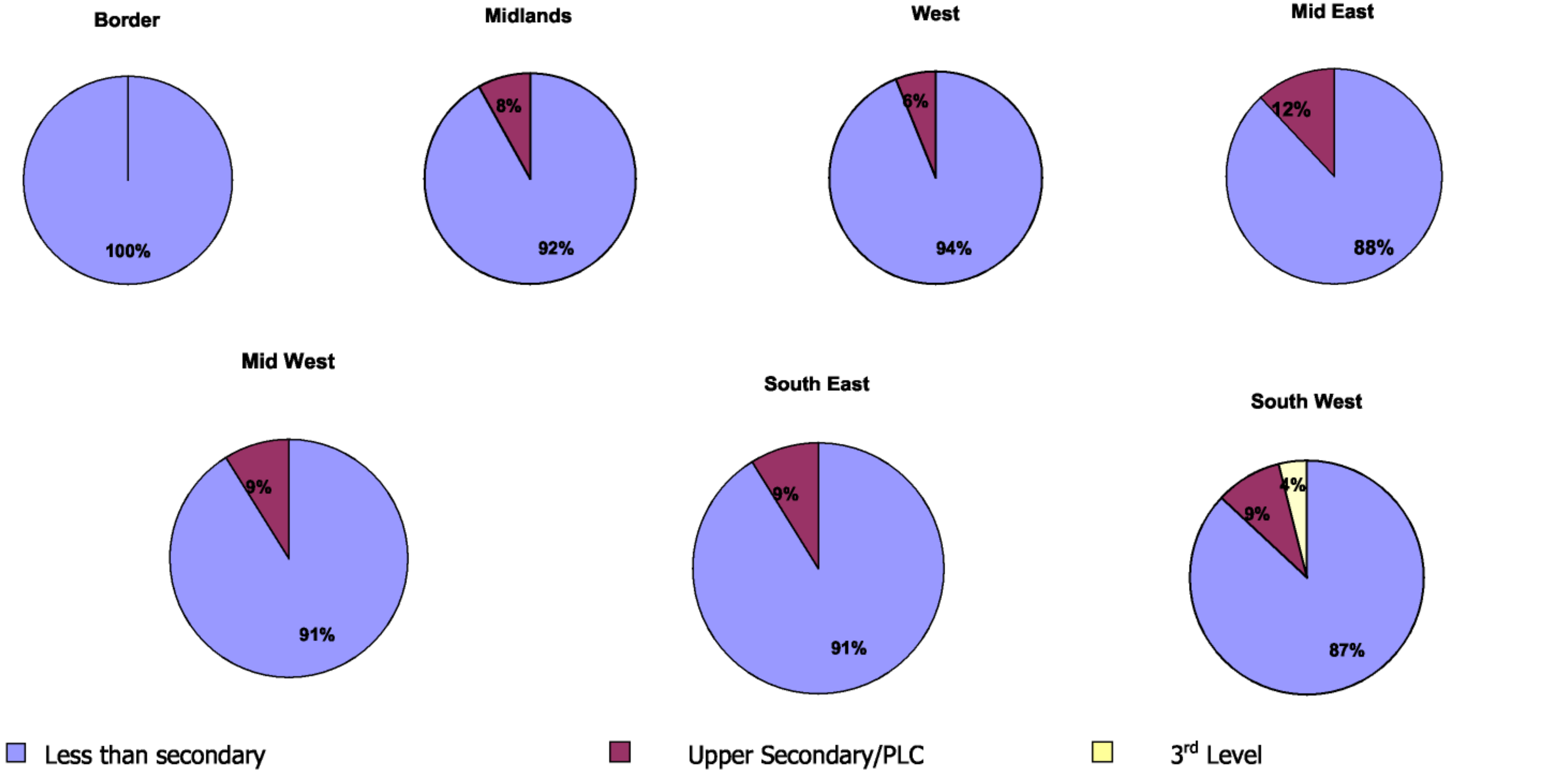
Source: *'analysis done by Teagasc/FÁS using the CSO QNHS 2006 data"*

Figure 7.3: Educational attainment levels of 45-59 year olds in particular regions



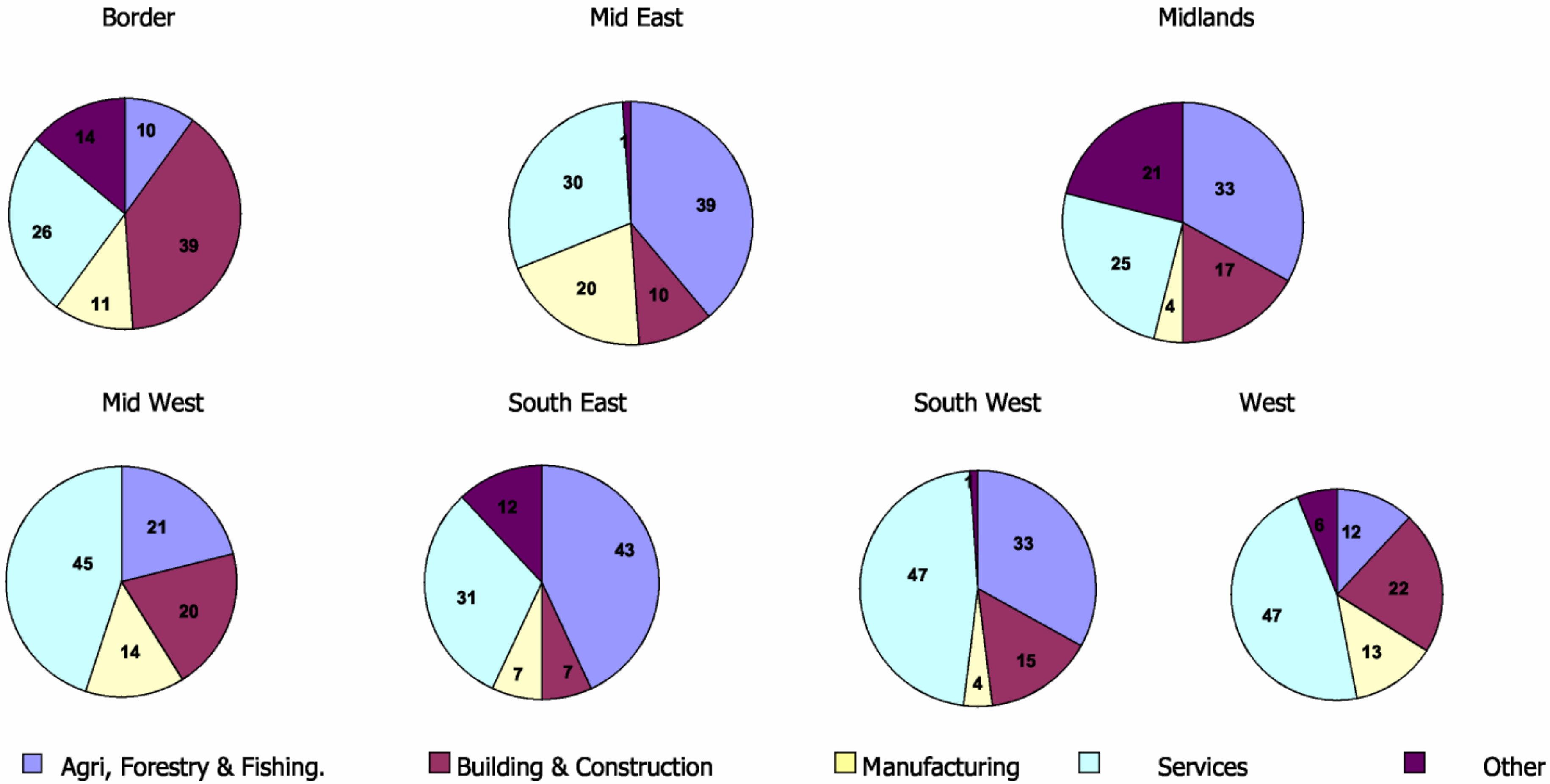
Source: *`analysis done by Teagasc/FÁS using the CSO 2006 QNHS data"*

Figure 7.4: Educational attainment levels of 60+ year olds in particular regions



Source: *'analysis done by Teagasc/FÁS using the CSO 2006 QNHS data"*

Figure 7.6: Sectors of employment in particular regions in 2002.



Source: *'analysis done by Teagasc/FÁS using NFS 2002 data"*