Examining the Relative Competitiveness of Milk Production: An Irish Case Study (1996 – 2004)

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Abstract

This paper examines the competitiveness of Irish milk production compared to that of other EU and non-EU countries. The analysis was based on two main data sources – the Farm Accountancy Data Network (FADN) for years 1996-2003 and the International Farm Comparisons Network (IFCN) for 2004. Results showed that the Irish competitive position for milk production compared to other EU and non-EU countries was very positive when total cash costs were considered indicating a positive outlook for Irish milk production in the short to medium term. However, as the opportunity costs of owned resources are not included in 'cash cost' calculations, total economic costs which include imputed charges for owned resources were considered to examine the longer term outlook for the competitiveness of the sector. Using this measure, the competitive ranking for the Irish dairy sector slipped relative to the other countries. It was found that the main reason for the relatively high economic costs on Irish dairy farms was the high imputed land and labour costs. These findings could be considered as a warning signal for the future competitive performance for the average sized Irish dairy farm. However, based on FADN data the 'larger' Irish dairy farms (in the 50-99 dairy cow size category) did manage to maintain their competitive position within Europe even when total economic costs were considered. Hence, it could be concluded that part of the explanation of the deterioration of competitive ranking for the average Irish dairy farm when total economic costs are considered relates to the relatively low scale of primary agricultural activity in Ireland. This result is indicative of the small scale farming that predominates in the Irish dairy industry relative to competing industries. But, it could be concluded that as Irish dairy farming transforms to larger scale production, the competitive position will be strengthened and better able to cope with a cost/price squeeze, given current projections for a decline in farm milk prices.

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Introduction

The competitiveness of the European and International market for agricultural commodities, including dairy products, has been at the forefront of much debate in recent times in the context of recent reforms to the Common Agricultural Policy (CAP), increasing trade liberalisation brought about as a result of World Trade Organisation (WTO) negotiations, and increasing globalisation of the world economy (Newman and Matthews, 2004). Consequently, the objective of this research was to examine the relative competitiveness of Irish specialist milk producers vis-a-vis selected EU and international countries for a baseline period, 1996 to 2004, to provide an insight into the ability of Irish producers to react to the aforementioned influences.

The EU countries chosen for comparison, within the European Commission's Farm Accountancy Data Network (FADN), included: Belgium, Denmark, France, Germany, Italy, the Netherlands, the UK, and Ireland. Country specific information on the extent of intra-EU trade in milk products is not available but over 85% of the EU production of butter and cheese is accounted for by the countries specified (Eurostat, 2003). Furthermore, additional analysis was conducted on 'representative' farm types from the International Farm Comparisons Network (IFCN), based on a number of major international milk producing countries, to determine the relative international competitiveness of 'representative' Irish specialist milk producers.

The data sources used and methodology involved in the computation of the various indicators of competitiveness employed in the analysis are outlined in the following section. The results of the various indicators of competitiveness are then outlined and the conclusions from the research identified.

Measurement and Methods

Farm Accountancy Data Network (FADN)

The EU FADN, was the main source of the data used for this analysis. Data analysis was confined to specialist dairy farms as defined by FADN (Farm Type 411), on which the standard gross margin from dairying accounts for at least two-thirds of the farm total gross margin. This allows a greater degree of accuracy in the allocation of costs (which are presented on a whole farm basis from FADN) to the dairy enterprise than would be the case if all farms with a milk enterprise were selected for analysis (Fingleton, 1995)[i].

Two measures of cost comparison were used for specialist dairy farms (farm type 411):

- Total costs as a per cent of dairy output, and
- Total costs per unit volume of milk production.

The value of dairy output was calculated as milk receipts plus dairy calf sales. Fingleton (1995) found that the omission of calf output values effected dairy enterprise comparisons between countries. Subsequently, it was decided for this analysis to include the value of calf output. Whole farm calf sales were apportioned to the dairy enterprise based on the ratio of dairy cows to other cows on the farm. Due to data constraints it was only possible to include a value for dairy calf sales and not possible to impute a charge for calves born from the dairy and transferred to a beef enterprise.

Most studies which examine the costs of milk production are made on a raw milk volume basis which does not account for possible variation in milk constituents between different countries (Fingleton, 1995). Results from these studies using this approach are biased in favour of countries where the levels of milk constituents are relatively low. To overcome this bias Fingleton (1995) measured unit costs per kilogramme of milksolids (i.e. butterfat plus protein). Average fat and protein percentages for each country were used to convert the milk volumes obtained from the FADN data into the equivalent quantities of milksolids. This approach was also adopted in this study. However, a higher weighting was applied to the protein content of milksolids than to the fat

content which reflects the higher market value of milk protein.[ii] The average fat and protein percentages used for the analysis were obtained from Eurostat (Eurostat, 2005).

For the purpose of examining costs of production, costs were defined as:

(i) Total cash costs, which include all specific costs, directly incurred in the production of a given commodity, for example fertiliser, feedstuffs, seeds etc. plus external costs such as wages, rent and interest paid, plus depreciation charges.

(ii) Total economic costs, which includes all of the cash costs identified above, except interest charges, plus imputed resource costs for family labour, equity capital and owned land[1].

The calculation of total economic costs for each of the countries was one of the most problematic exercises in this analysis. The estimation of opportunity costs must be considered carefully because the potential income of farm owned factors of production in alternative uses is difficult to determine. In the short run, the use of own production factors on a family farm can provide flexibility in the case of low returns when the family can choose to forgo income. However, in the long run opportunity costs must be considered because the potential successors of the farmer will, in most cases, make a decision to continue or exit the business after assessing the best alternative returns from own production factors, in particular for their own labour input[iii].

Another important issue in measuring competitiveness is the distinction between the different levels of competitiveness. All too often research on the topic of competitiveness tends to focus on indicators of competitive performance and indicators of competitive potential are ignored (Harrison and Kennedy, 1997). Consequently, the indicators presented in this research go some way towards identifying the sources of competitiveness in addition to presenting results of competitive performance. The individual measures (i) costs as a per cent of output and (ii) costs per kg of milksolids provides an insight into the competitive performance of the countries examined, over the time period 1996 to 2004. However, they do not provide an insight into the sources of competitive advantage or disadvantage. Hence, partial productivity measures were considered as indicators of competitive potential.

The partial productivity measures used in this analysis for the dairy sector were defined by Fingleton (1995). The measures relate to animal, land and labour productivities. They are:

- Milk yield per cow (kg)
- Milksolids per cow (kg)
- Stocking rate (LU/ha)
- Milk production per hectare (kg)[iv]
- Milksolids per hectare (kg)[iv]
- Milk production per labour unit (tonne).

International Farm Comparisons Network (IFCN)

In addition to the comparison of costs within Europe using data from the FADN, international cost competitiveness was examined using data from the IFCN (Hemme *et al.,* 2004). The IFCN is a world-wide partnership that links agricultural researchers, advisors and farmers to create a better understanding of milk production and the costs and returns of production world wide. The cost calculations within the IFCN network are based on individual representative farms, rather than on the results from stratified random samples of the population as is the case with FADN data. None the less IFCN data provides a source of data which can be used to examine the relative international competitiveness of 'representative' Irish milk producers. Like the methods outlined above, IFCN data also presents costs as total 'cash' costs and total 'economic' costs with opportunity costs calculated for farm-owned factors of production.

[1] Borrowed interest has been excluded from the calculation of total economic costs given that an interest charge for owned resources is included in total economic cost calculations. A double counting of interest charges would be incurred if borrowed interest was again included in total economic costs, as in the case of cash cost calculations.

Results

FADN Results

The results for the dairy enterprise based on data from the FADN are presented in two sections: (i) partial productivity measures and (ii) comparative costs of production.

Comparison of partial productivity measures on EU specialist dairy farms

In Figures 1 and 2 below the partial productivity measures identified above are shown for the eight EU countries compared in this analysis. The results presented here for each of the countries is the average for the years 1996 to 2003 and indexed relative to Ireland.

Figure 1 ***Partial Productivity Measures for selected EU countries***

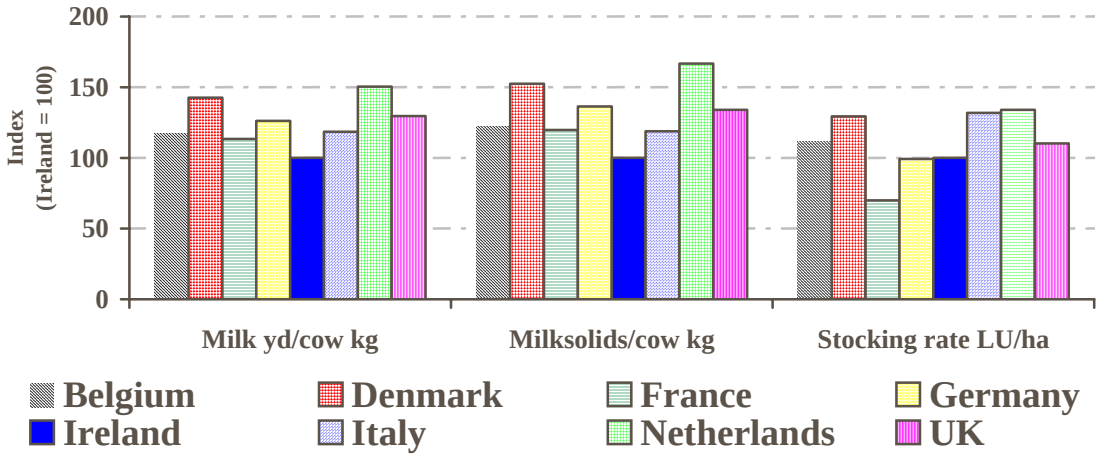
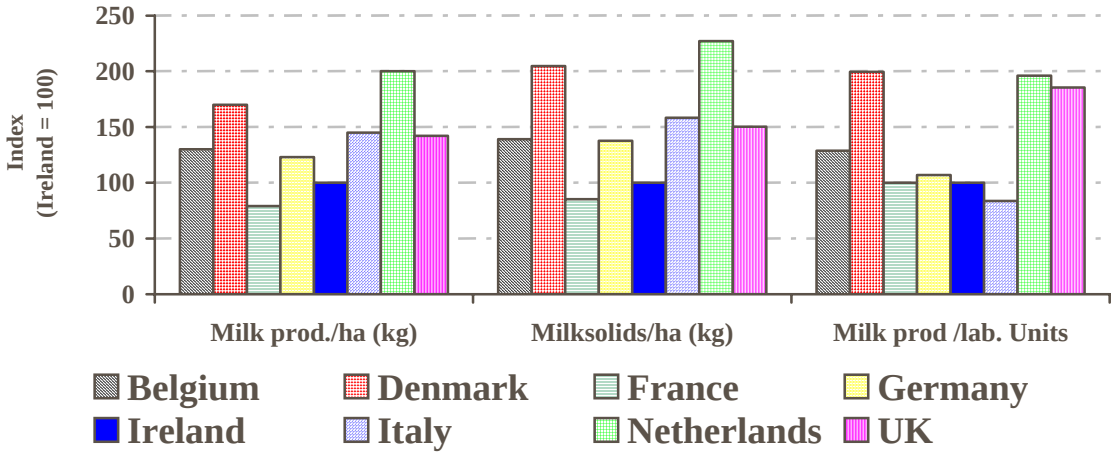


Figure 1 shows that average milk yields per cow were much lower in Ireland relative to the other countries in the analysis. Average yields were highest in the Netherlands and Denmark. Comparisons of milksolids per cow showed an even greater disparity between Ireland and the other countries. In particular, milksolids per cow in the Netherlands and Denmark were 66 per cent and 52 per cent higher respectively than in Ireland.

The levels of land productivity in the Netherlands and Denmark were 34 per cent and 30 per cent higher respectively than in Ireland. Only France and Germany had stocking densities equivalent to or lower than Ireland.

Figure 2 ***Partial Productivity Measures for selected EU countries***



The combination of the generally lower stocking densities and lower milk yields for Ireland are aggregated in the next two measures of productivity. Milk production and milksolids per hectare were lower in Ireland than all other countries except France. The Netherlands and Denmark again exhibited productivity well in excess of the other countries examined, with milk production per hectare 70 per cent higher in Denmark and 100 per cent higher in the Netherlands compared to Ireland. Differences in milksolids per hectare were even more pronounced in other countries relative to Ireland, with levels in Denmark more than double those for Ireland.

The final partial productivity measure – milk production per labour unit was again highest in the Netherlands and Denmark, with levels in the UK also relatively high. Italy was the only country with lower labour productivity than Ireland, but levels in France and Germany were very similar to that for Ireland.

The results presented in Figures 1 and 2 are based on estimates of all specialist dairy farms in the respective countries. However, the results are influenced by distribution differences in the sample of farms included in the FADN survey for the different countries (Fingleton, 1995). For this reason the productivity measures for farms with 50-99 cows were also examined in each country. However, despite the variations in sampling procedures adopted in the FADN survey there was no evidence of pronounced differences in average productivity levels between the sub sample and the whole sample. In general, the productivity rankings between the countries were similar in the two samples but the relative differences tended to be reduced in the more homogeneous sample of the 50-99 cow farms. This case was particularly evident in the land and labour productivity measures, where the large disparities between the countries in the average sample of farms were reduced in the sub sample of 50-99 dairy cow farms size category.

The results presented in Figure 1 and 2 above show the average indicators of partial productivity over the period 1996 to 2003. However, the results for the individual years were examined using a linear regression model which was fitted to these results to measure the trend over time for Irish dairy farms in relation to the average for all countries examined. The average sample of all specialist dairy farms did show a significant trend over time for three of the six partial productivity measures, namely: milksolids per cow, stocking rate per hectare and milksolids per hectare. Of these indicators, milksolids per cow for Irish dairy farms did increase significantly relative to the average of all countries examined; by on average 0.012 kgs per cow per year. In contrast, stocking rate (cows per hectare) and milksolids per hectare decreased relative to the average of all countries examined; by on average 0.01 cows per hectare and 0.09kgs of milksolids per hectare respectively, relative to the average, over the time period examined.

However, the sub sample of specialist dairy farms, with 50-99 dairy cows, did not show a significant relationship between any of the relative productivity measures in Ireland vis-a- vis European competitors.

Comparison of costs and returns in selected EU dairy farms

The first measure of comparative costs of production used in this analysis was costs as a per cent of total dairy output. Fingleton (1995) citing *Boyle et al., (1992)*, outlined the relevance of this measure, whereby '…*it reflects the resilience with which a sector of production could cope with a cost/price squeeze. If, for example, there was a substantial fall in milk prices, producers locked into a high cost structure would have much lower chances of survival, other things been equal'* (p.11). Given the current projections that Irish farm milk prices will be 15 per cent lower in 2012 from the average of 2000 to 2002 (Binfield *et al.,* 2003), this approach to measuring competitiveness seems appropriate.

Figure 3 below shows the cost/output results for the eight year average, for each of the selected countries, for all specialist dairy farms in the FADN sample.

Figure 3 Cash and Economic Costs for all Specialist Dairy Farms in selected EU countries (1996-2003)

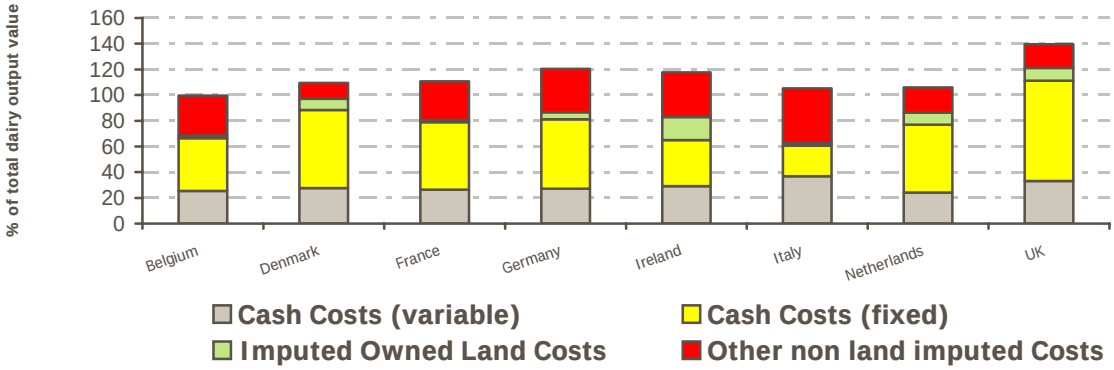


Figure 3 shows that total cash costs (variable and fixed components) as a per cent of output were relatively low in Ireland over the period 1996 to 2003. Italy had the lowest total cash costs as a per cent of output at 61 per cent, but the cost structure in Ireland and Belgium was only slightly higher at 65 and 66 per cent respectively. The low total cash cost to output ratio evident in Italy could be attributed to the high milk price paid in Italy relative to other EU countries rather than low costs of production. The highest total cash costs as a per cent of output were in Denmark where cash costs were 88 per cent of total output, which was due largely to the high level of borrowing in Danish agriculture. Overall, the variations in the fixed cost component of cash costs appeared to be more variable between the individual countries than the variable cost component of total cash costs.

Further analysis of the specialist dairy farms in the 50-99 dairy cow size category did not show substantial deviation from these results.

When total economic costs are considered the competitive position of the countries changes. The competitive advantage experienced by 'average' Irish producers worsens when all imputed charges for owned resources are taken into consideration. Total economic costs as a per cent of output were highest in Germany where costs were 120 per cent of the dairy enterprise output followed by Ireland with economic costs at 118 per cent of output. The main imputed cost that contributed to the relatively high total economic costs in Ireland was that for owned land. This was

due to the relatively high imputed rental charge coupled with high levels of land ownership in Irish dairy production. The relatively low stocking rates and milk yields per hectare on Irish dairy farms over the period also must be considered as a contributing factor. The high costs associated with owned land in Irish dairy farming will inevitably become a impediment to future competitiveness as competing countries have already borne the cost associated with land in the current system, whereby land costs, in the form of land rent, are already included in their cash costs.

The lowest total economic costs were in Belgium, where nearly 1 per cent of dairy output remained as profit for dairy producers on average over the eight year period (i.e. total economic costs were 99 per cent of total dairy output).

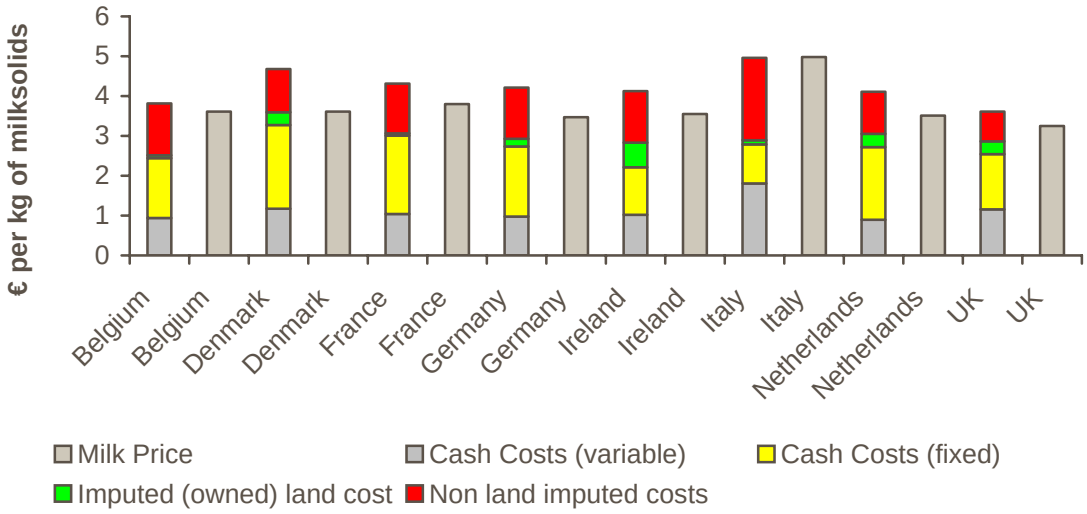
When total economic costs were considered as a per cent of output for specialist dairy farms in the 50-99 dairy cow size category, the ranking changed from that shown in Figure 3. Total economic costs for this sample of farms were generally substantially lower then the average for all specialist farms. Total economic costs were reduced by 13 per cent for Italian farms, which resulted in Italy replacing Belgium as the lowest economic cost producer. In addition, these larger Irish dairy producers (with 50-99 dairy cows) also substantially improved their competitive position relative to competing countries, compared to the average Irish producers; total economic costs as a per cent of output were reduced by 15 per cent on these farms relative to the average producer in Ireland, which ranked these larger Irish producers as the third lowest total economic cost producer relative to all countries examined.

Based on the costs presented in Figure 3 a 'competitiveness index' (following Boyle *et al*., 1992; Fingleton, 1995) was developed, whereby the cost:output ratio for Ireland was expressed as a per cent of the simple average of the cost:output ratios for all countries examined[v]. This index presents conflicting results depending on whether or not the imputed charges for owned land are included in the analysis. Ireland was at a competitive disadvantage relative to the average for all the countries studied, when total economic costs are taken into consideration. Over the period 1996 to 2003, 'average' Irish dairy farms had on average 7 per cent higher total economic costs relative to other competing countries in the EU, while total economic costs for the sub sample of dairy farms with 50-99 dairy cows were equal to the average of all countries examined. These results indicate that the opportunity cost of land will have a major impact on the competitive position of Irish milk producers in the longer term.

The second measure of comparative costs and returns used in this analysis was costs per kg of milksolids produced. The average cash and economic costs per kg of milksolids produced, over the period 1996 to 2003, for each of the countries in the analysis is presented in Figure 4. Further detail on the cost components of the cash and economic costs are presented for all specialist dairy farms and for the sub sample of farms in the 50-99 dairy cow size category can be obtained in Thorne (2004).

Figure 4 shows that level of milksolids production, has a considerable influence on the competitive position of the countries examined. Based on total cash costs per kg of milksolids, Denmark had the highest cost structure, significantly higher than Ireland. On a total economic cost basis, the UK and Belgium had the lowest costs per kg of milksolids, Ireland was ranked in fifth position and Italy had the highest costs. Furthermore, when the sub sample of farms with 50-99 dairy cows were examined cash costs did not change noticeably but economic costs were reduced significantly for these farms. The magnitude of the differences was much less between the countries. The ranking between countries also changed with Ireland now having the second lowest total economic costs per kg of milksolids.

Figure 4 Cash and Economic Costs per kg milksolids for all specialist dairy farms – 8 year average (1996 – 2003)



Based on the competitive index of total economic costs, it appears that Ireland was struggling to maintain its competitive position over the time period. When the average sample was examined total economic costs per kg of milksolids were on a par with the average. However in the specialist sub sample average costs for Ireland were 5 per cent lower than the average for the competing countries. Furthermore, when imputed charges for owned land were excluded, the competitive position of the average sample and the sub sample for Ireland improved somewhat. In both cases costs were approximately 17 per cent lower than the average of the countries examined.

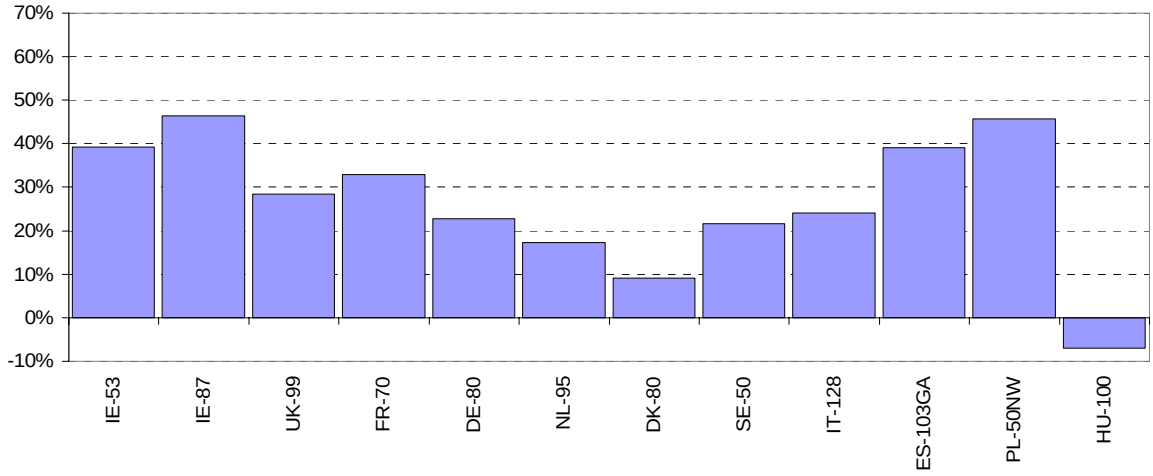
While the cost and return indicators presented in Figures 3 and 4 above represent average performance over the period 1996 to 2003 it is also important to determine whether or not the competitive position of Irish dairy producers has shifted over this time period. Hence, a linear regression model was fitted to the data to observe trends within the data. For the average sample there was no apparent significant trend over the period, whereas with the sub sample of larger producers there was a significant improvement in cash and economic costs per kg milksolids for Irish producers relative to the average. Cash costs improved at rate of 2 cent per kg of milksolids per year and economic costs at a rate of 3 cent per year relative to the average of all countries.

IFCN Results

The comparisons from the IFCN data are presented on a 'two-tiered' basis. One group of comparisons include results from typical Irish specialist dairy farms of 'average' and 'larger' sizes with results from typical dairy farms in ten other EU countries, including two new member states.

Figure 5 shows the profit margin on the whole farm as a per cent of total returns (output). This measure indicates how well placed typical farms would be if prices or costs moved adversely, especially in the short to medium term. This measure shows that typical Irish dairy farms appear to have a relatively good position compared to all other countries except for Spain and Portugal, which show similar results, i.e. from 40 per cent to 46 per cent of output was retained as farm income in 2004. In contrast farms in Germany, Netherlands, Denmark and Sweden are more exposed to income pressures if milk prices fall and/or costs rise. Typical farms in the UK and France were retaining around 30 per cent of output with Italy at a lower level.

Figure 5 Whole Farm Profit Margin (farm income as per cent of total returns): Ireland v other EU countries (2004)



In Figure 6 the same measure (profit margin) shows how 'typical' Irish dairy farms compare with important non-EU milk producing countries.

Figure 6 Whole Farm Profit Margin (farm income as per cent of total returns): Ireland v other non-EU countries (2004)

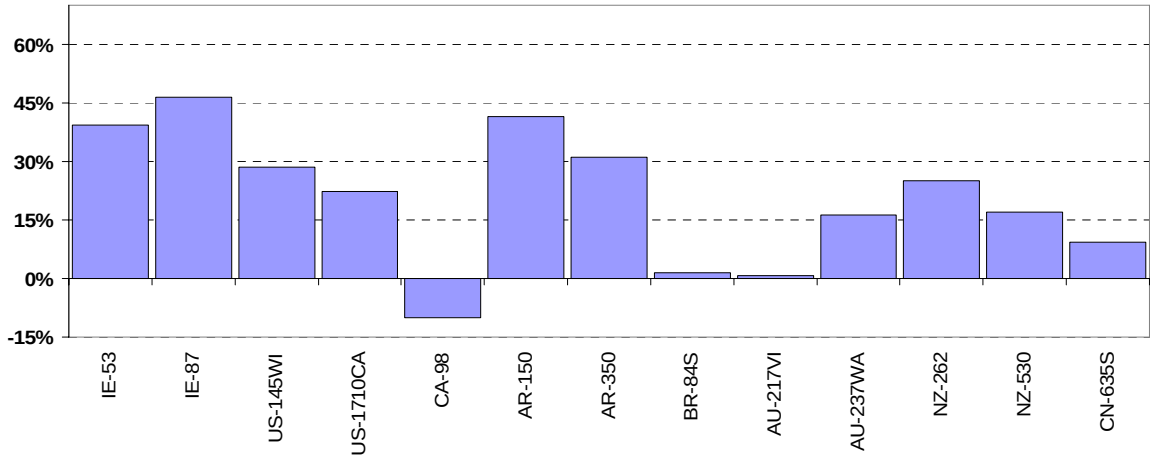


Figure 6 shows that in 2004, typical Irish farms were in a relatively strong position compared to most other non-EU dairy countries with only Argentina showing a comparable profit margin. The typical farms in the US and in New Zealand were in intermediate positions with 22 per cent and 28 per cent profit margins respectively. But the results from typical farms in Australia, Brazil, the larger typical farm in New Zealand and China show profit margins ranging from less than 20 per cent with some even below 10 per cent. Therefore, these farms would be more vulnerable to a cost/price squeeze.

The set of comparative results includes measures of total cash costs, depreciation and imputed charges. Also shown are milk prices and other non-milk returns for the dairy enterprise such as calf values and replacement costs. Hence, the following inter-country comparisons in Figure 7 and Figure 8 should provide further evidence as to the relative competitive strength of Irish dairying both within the EU and on a broader world wide front. The US dollar was chosen as the

common currency measure for all countries and in both Figures 7 and 8 the y-axis shows measures expressed on US$ per 100kg milk (ECM)[vi].

Figure 7 shows that in 2004 Irish farms had relatively low cash costs per 100kg compared to all other EU countries, apart from Poland. Spain, the UK, France, Germany, and the Netherlands had more 'intermediate' unit cash costs, with values at the higher end for farms in Italy, Hungary, Sweden and Denmark. The addition of depreciation charges did not significantly alter the ranking between countries. However, when total economic costs were measured, the addition of imputed charges tended to push the Irish results closer to several other countries, in particular the UK and Spain. Total economic costs per unit of milk were lowest in Poland, which also showed a substantial economic margin even with the relatively low milk prices received in Poland. In all other EU countries, except Spain, total economic costs exceeded milk prices and only in Ireland, the UK and in France was the addition of other dairy enterprise returns sufficient to bring returns equivalent to or slightly greater than total economic costs. There were notable shortfalls between total returns and economic costs for typical farms in Germany, The Netherlands, Sweden and Italy.

Figure 7 Total Costs and Returns of the Dairy Enterprise: Ireland v other EU countries (2004)

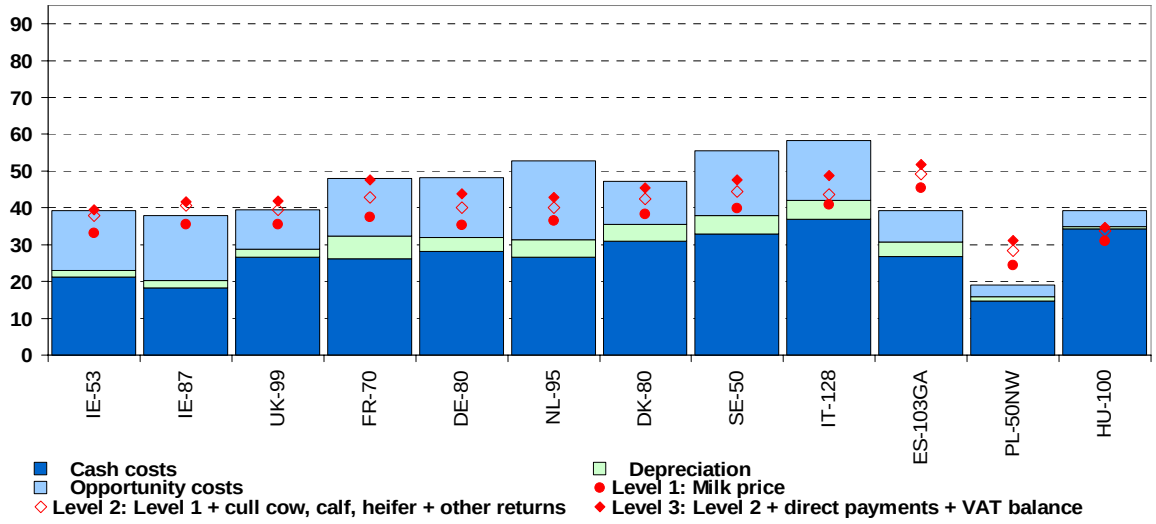


Figure 8 compares Irish and non-EU typical dairy farms. The comparisons are made in US$ and exchange rate differences and movements in a particular year may unduly effect results.

Figure 8 Total Costs and Returns of the Dairy Enterprise: Ireland v other non-EU countries (2004)

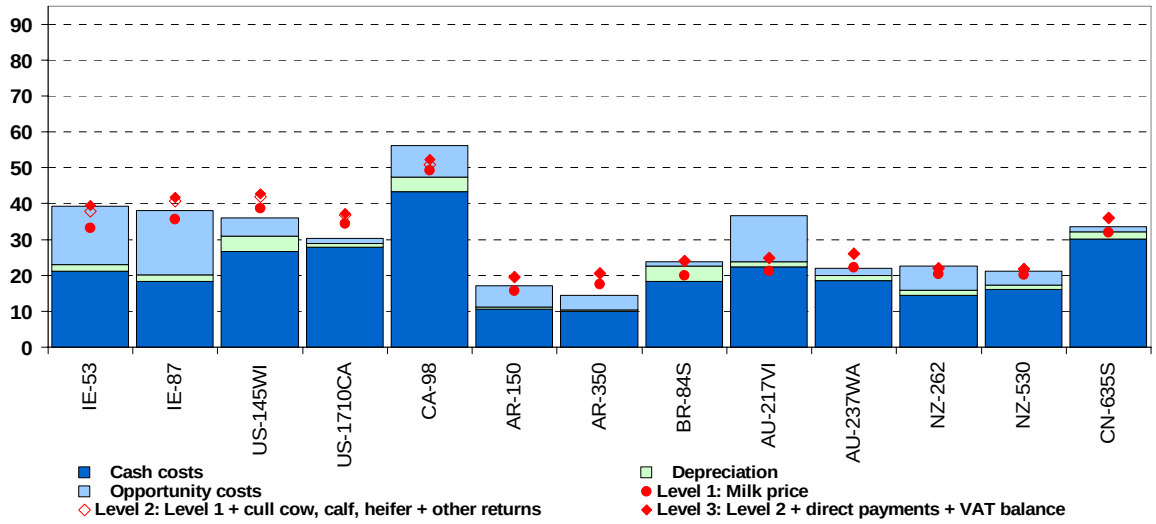


Figure 8 shows that cash costs per unit of milk production are reasonably positive for Irish farms. Canadian dairying had by far the highest cash costs (and also the highest total economic costs). Farms in the US also had relatively high cash costs, with cash costs being somewhat lower for Australian, Brazilian and Irish farms. Unit cash costs were lower again on New Zealand farms, but Argentinean farms had the lowest cash costs. However, Ireland's comparative position deteriorated very substantially when total economic costs were compared. Canada had the highest economic costs followed by Ireland, with the Australian-Victoria and the US-Wisconsin typical farms at a slightly lower level. Typical farms in Argentina, New Zealand, Brazil and Western Australia exhibited the strongest long term competitive position in 2004. Finally, there were only three countries (US, Argentina and Western Australia) where the price of milk was greater than total economic costs per unit. Perhaps surprisingly, given the size of the dairy farms in New Zealand, neither the 'average' or 'larger' typical farms showed a positive margin over total economic costs.

Discussion & Conclusions

In summary, for the period 1996 to 2004, the competitive position for Ireland, was positive when cash costs were considered and imputed charges for owned resources disregarded. Based on FADN data the only other EU country examined that had lower cash costs as a per cent of output was Italy, and Ireland actually appeared to have the lowest cash costs per unit of output during this period. Furthermore, based on data from the IFCN the competitive position for representative Irish dairy farms within Europe was again confirmed. Moreover, on a broader worldwide basis, representative farms in Argentina were the only farms that had higher profit margins than Irish dairy farms.

However, as the opportunity cost of owned resources are not included in the cash cost calculation this measure of future competitiveness can only be considered to be valid in the short to medium term. In the longer term adjustment within the sectors will be a reality which will be dependent on relative resource use and in this situation relative resource costs are needed to understand and analyse the adjustment process. Hence, total economic costs which include imputed charges for owned resources were considered to examine the longer term outlook for the competitiveness of the sector. In this situation, the competitive ranking for the Irish dairy sector slipped relative to the other countries. These findings could be considered as warning signals for the future competitive

performance for the average sized Irish dairy farm. However, based on FADN data the larger Irish dairy farms (in the 50-99 dairy cow size category) did manage to remain competitive within Europe when total economic costs were considered.

Boyle (2002) concluded that part of the explanation of the deterioration of competitive ranking for the average Irish dairy farm when total economic costs are considered relates to '*the relatively low scale of primary agricultural activity in Ireland*' (p.177). This result is indicative of the small scale farming that is predominant in the Irish dairy industry relative to competing industries. Furthermore, it could be concluded that larger scale producers in Ireland will be in a superior competitive position relative to the smaller scale producers in the long run, due to their ability to cope with a cost/price squeeze, given current projections for a decline in farm milk prices. Further work on the ability of marginal cost producers to compete in an increasing global market place is planned to complement this research, when additional variables and access to data is obtained from the FADN.

In conclusion, the results of this study provide a baseline position against which the change in competitiveness of Irish dairy farming can be measured. EU enlargement, trade liberalisation in the context of WTO negotiations and reform of the CAP will all have major influences on the competitive position of the Irish dairy sector, which can be monitored against the baseline position outlined by this research, given access to additional farm level data from the sample of farms in the FADN database.

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End Notes

[i] It was necessary to devise a method whereby the costs were apportioned to the dairy activity. This allocation method was based on that used by Fingleton (1995) and further developed in a similar study carried out by the FADN (Vard, 2001). Further details on these allocation methods can be obtained in Thorne (2004).

[ii] A 60% : 40% weighting factor was applied in favour of protein content.

[iii] The valuation methods adopted for the research in this study are outlined in further detail in Thorne (2004).

[iv] By definition this partial productivity measure will be heavily influenced by relative stocking rates.

[v] This competitiveness index was constructed following the methodology outlined by Boyle *et al*., (1992); Boyle (2002); and Fingleton (1995). Alternative denominators to a simple average of all countries were investigated but were rejected due to the problems associated with selecting an appropriate measure that would be relevant for all enterprise analysis.

[vi] ECM shows that each countries milk prices have been standardised for fat and protein.