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The 2003 Mid Term Review of the Common  
Agricultural Policy: A Computable General  
Equilibrium Analysis for Ireland

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**Poster paper prepared for presentation at the  
International Association of Agricultural Economists Conference,  
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# **The 2003 Mid Term Review of the Common Agricultural Policy: A Computable General Equilibrium Analysis for Ireland**

## **1 Introduction**

The Common Agricultural Policy (CAP) has been the subject of recent major reforms. This paper presents an analysis for Ireland of the economic and environmental effects of the Mid-Term Review (MTR) reform of the CAP agreed in June 2003 (CEU<sup>1</sup> 2003), using a Computable General Equilibrium (CGE) model of the Irish economy.

Several factors provide the motivation for this analysis of the effects of the MTR on the Irish economy, and in particular the agri-food sector. The aim is to forecast the effects on output, income, prices, land use, and employment in Ireland. The MTR can be expected to have the most significant effects on the agricultural sector. By using a CGE model, the knock-on effects on upstream and downstream industries, and for the economy as a whole, can also be examined. In particular, the MTR has ramifications for the food processing sector, which along with the agricultural sector, comprised 9.5% of GDP and 9.2% of total employment in 2003 (DAF<sup>2</sup> 2005). Widespread interest in the MTR has spawned numerous studies of its anticipated effects (for example, Binfield *et al* 2003 or Frandsen *et al* 2003). Economists have employed a variety of modelling approaches, encompassing single and multi-country general and partial equilibrium models. The results in this paper represent the most dedicated single country CGE modelling analysis of the MTR for Ireland so far.

This paper begins with some background on the MTR and the agricultural sector in Ireland. An overview of the model is then followed by results and conclusions.

## 2 Background information

Significant pressure for reform of the CAP has come from two sources. First, the recent enlargement of the EU has brought budgetary and administrative concerns to the fore. Second, the distortionary aspects of the CAP are a contentious issue in the current WTO Doha Development round of trade negotiations. Therefore, the MTR, agreed in Luxembourg in June 2003, has been hailed as the most radical reform to the CAP since its inception. The key changes contained in the MTR are:

- a “single farm payment” for EU farmers, to replace the various “direct payments” that existed under Agenda 2000, the previous system,
- “cross-compliance” measures, or standards of environmental protection, food safety, and animal welfare, which must be met in order to qualify for the single farm payment,
- “modulation”, a gradual reduction in payments to larger farms, which will be used to finance rural development measures,
- financial discipline, an undertaking to keep the CAP budget fixed in real terms until 2013, and
- revisions to market policy. Of particular relevance to Irish producers are the cuts to the intervention prices for butter and skimmed milk powder.

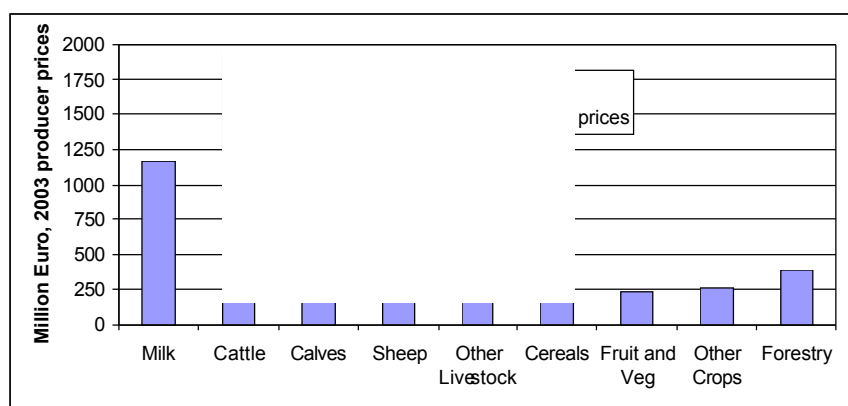
Because it is *decoupled*, or not linked to production, the single farm payment is intended to reorient EU farmers towards market based decision-making. It is also a major negotiating point for the EU at the WTO Doha round, because it reclassifies a large proportion of agricultural support from the trade-distorting “Amber Box” to the non-distortionary “Green Box”. Of the various options for implementing the MTR

(CEU 2003<sup>3</sup>) which were left to the individual EU states to decide, Ireland showed full commitment to the spirit of reform by implementing full decoupling on January 1, 2005.

Along with the economic impact of the MTR, there is also potential for significant environmental effects. Agriculture in Ireland was the source of an estimated 28% of national greenhouse gas (GHG) emissions in 2003 (EEA<sup>4</sup> 2003). Under the Kyoto Protocol and the EU Burden Sharing Agreement (CEC<sup>5</sup> 2002a) Ireland is committed to limiting GHG emissions to an increase of not more than 13% of 1990 levels. As a significant source of GHG emissions, reform of the agricultural sector has a potentially important impact on Ireland's achievement of its GHG reduction target. Ireland's National Climate Change Strategy (DELG 2000) proposed a reduction target of 10% for agricultural emissions.

The Irish agricultural sector is very reliant on EU subsidisation. Almost half of the 2003 agricultural operating surplus of €2174 million consisted of direct payments coupled to production (CSO<sup>6</sup> 2004b), leading to distortions in farm output decisions. Figure 2.1 shows the composition of agricultural output at basic prices, defined as the producer or farm-gate price plus direct subsidy payments. Figure 2.1 illustrates the uneven distribution of direct payments, showing that the majority of direct payments are applied to Cattle production. The Suckler Cow, Special Beef, and New Slaughter premia comprise around two-thirds of direct payments, although Cattle output, valued at producer prices, comprises less than one-third of Agricultural output. Cereals receive the highest rate of subsidy, with the direct payment adding an extra 78% to the value of output. Sheep production is also heavily subsidised, while other agricultural activities received no direct support under Agenda 2000.

**Figure 2.1 Composition of Agricultural Output at Producers' Prices**



### **3 The model and database**

The IMAGE2<sup>7</sup> model is a comparative static, general equilibrium, single region model of the Irish economy. It is part of the ORANI-G family of economic models, which originated in Australia (Dixon et al 1982, Horridge 2003) and are now used in many countries, including China, the USA, South Africa, Denmark, and Vietnam.

Characteristic of CGE models, IMAGE2 assumes rational economic agents, including profit-maximising producers and utility-maximising consumers. There is a high level of disaggregation, particularly in the agricultural and food processing sectors. There are 66 commodities and 65 industries identified in the model, of which 14 commodities and 13 industries relate to the agriculture and land use sector, and 7 commodities and industries relate to food processing. Further, multiple types of households, export destinations, soil types and labour occupations are identified, making IMAGE2 the most detailed CGE model of Ireland.

The database for the model is based on various statistics produced by the Irish Central Statistics Office (CSO) and Department of Agriculture and Food. It provides a

detailed and comprehensive picture of the Irish economy in 2003, the year that the MTR was agreed.

## **4 Results**

Changes in output, prices, income, land use, and other economic variables are presented for the agricultural and food processing sectors, along with results for macroeconomic variables and greenhouse gas emissions.

The key aspects of the MTR are simulated. These are:

- full decoupling of support in the cattle, sheep, and cereals sectors,
- reduction in the intervention price for dairy products, and compensatory payment, and
- changes in export conditions faced by Ireland, due to the implementation of the MTR in the rest of the EU.

One feature of the MTR which was not modelled was modulation, or the gradual reduction in subsidy payments. The study did not incorporate the effects of other policy changes, such as the Nitrates Directive due to come into force in 2006, or the likely changes in tariffs emanating from the WTO reforms. It is important to note that the results from the simulations are comparative static. That is, the simulations show how the economy would have been different from its initial position (its position in 2003), if the policy measures in the MTR had been in existence at that time.

The simulation is run twice, using short run and long run closures. The main differences between the closures concern the allocation of resources. In the short run, the total capital stock in the sectors agriculture, manufacturing, and services is fixed.

Changes in land use are also constrained, by the imposition of sluggish land mobility, which relaxes the requirement that the return to land from all activities is equalised. Therefore, the main driver of changes in sectoral resource allocation is movements in labour. In the long run, the economy wide capital stock is fixed but sectoral capital is endogenous. Time is also presumed sufficient for the return to land to equalise across all activities. Therefore, the impacts are generally larger.

#### **4.1 Economy Wide Results**

The MTR leads to the reallocation of resources, across the economy and in the agricultural sector in particular. Economy wide effects of reform in the agricultural sector are minimal. The primary agricultural sector contributes only 2.7% to Irish GDP (CSO 2004a), and there is no change in the factors of production available to the economy, although the level of employment can vary. Hence the change in real GDP is negligible. Several aspects of the MTR exert a positive influence on GDP. The increase in EU prices for Beef and Sheepmeat has a positive effect on Ireland's terms of trade. The compensation package in the dairy reform exceeds the loss in value added in the short run, so there is a further gain from the substitution of market price support (which is partly funded by Irish consumers) by the decoupled compensation payment (which is fully funded by the EU taxpayer). Decoupling also has a positive impact by improving allocative efficiency within the agricultural sector. However, decoupling also decreases the return to labour in the agricultural sector, which discourages labour supply, particularly amongst immobile agricultural workers. The losses are mainly in the agricultural sector, and translate to a small reduction in the national workforce of 0.05%. This exerts a negative influence on GDP. The net effect in both the short run and the long run is an increase in real GDP of 0.03%.

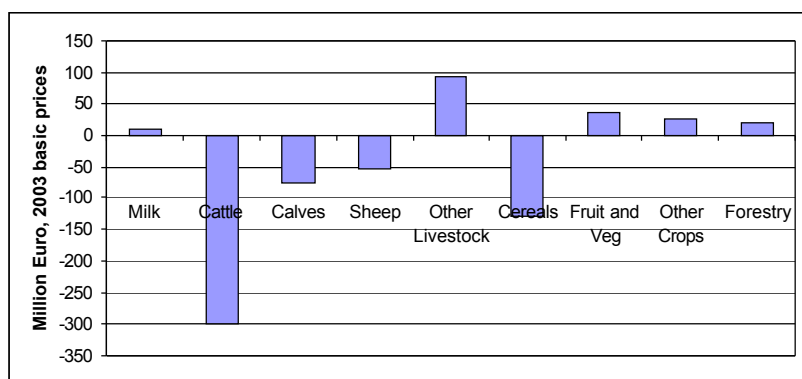


## **4.2 Results for the Agriculture, Land Use and Food Processing Sectors**

The removal of production-based subsidies reduces the incentive to employ resources in the agricultural sector, diverting the mobile factor, labour, away from agriculture and into other uses. In the short run, aggregate agricultural output falls by 5.6%, with a fall in labour input of 11.8%. Decoupling alone accounts for a fall in agricultural output of 6.1%, which is slightly offset by a small increase in output as a result of the improved terms of trade for agricultural products. In the long run, when the capital stock in the agricultural sector also has time to adjust, agricultural output falls by 9.5%. Capital used in agriculture falls by 9.4%, and labour falls by 12.9%. In the land use sector (agriculture and forestry), the fall in agricultural output is offset by a small increase in the output of forestry. Output in the land use sector falls by 4.7% in the short run, and 7.9% in the long run.

Changes in the composition of output in the land use sector are also dominated by the decoupling shock, with relatively small effects occurring as a result of dairy reform and the implementation of the MTR in the rest of the EU. As a result of decoupling, there is a fall in the output of products which initially received direct payments. The short run effect on output can be seen in Figure 4.1, where the output of cattle falls by 15.4%, calves by 16.8%, sheep by 15.5%, and cereals by 41.8%. There is an increase in the output of all other agricultural commodities.

**Figure 4.1 Change in volume of output**

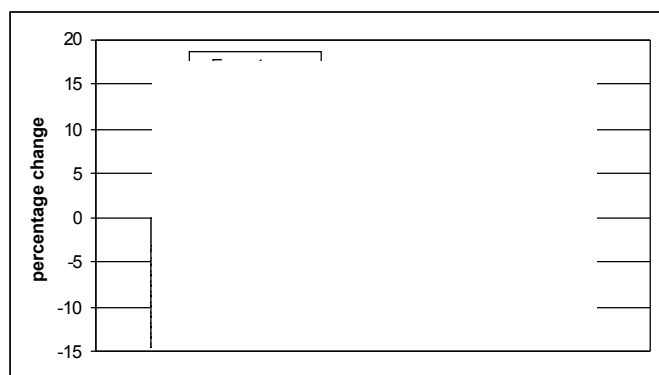


Resources released from the previously subsidised activities underpin the expansion of output of Other Livestock, Fruit and Vegetables, Other Crops and Forestry. A similar effect would be seen in Milk production, except that the quota system remains in place.

The reduction in agricultural output, and cattle output in particular, stimulates a drop in agricultural greenhouse gas emissions of 11.9% in the short run, and 14.9% in the long run. This exceeds the target proposed in the National Climate Change Strategy.

According to the Fan Decomposition (Horridge *et al* 2003), change in demand for a commodity may be divided into three effects: change in the local market for the commodity, change in import penetration, and change in demand for exports. Because most agricultural produce is consumed by the local food processing sectors, it is more informative to look at these effects on the demand for processed food. Figure 4.2 shows the Fan decomposition for Beef, Sheepmeat, and Pork and Poultry. It is clear that the change in demand for exports is the largest component of the change in total output of these commodities. Approximately half of Irish Beef, Sheepmeat, and Pork and Poultry is exported. The large magnitude of the changes occurs as a result of the high elasticity of export demand.

**Figure 4.2 Change in Output of Processed Food (%): Fan decomposition**



Given that most factors of production used in agriculture are owned by farm households, Gross Value Added at factor cost (GVAF) is used as a proxy for farm income. Table 4.1 shows that in the short run, there is a clear increase of 3.5% in GVAF in the land use sectors, whereas in the long run GVAF only increases by 0.29%. These increases occur despite the reductions in output.

**Table 4.1 Decomposition of the change in Gross Value Added at Factor Cost in Land Use Sectors (% Change)**

Cause	SHORT RUN				LONG RUN			
	Primary factor price index (a)	Output (b)	(c) = (a)+(b) <sup>8</sup>	GVAF (d)	Primary factor price index (e)	Output (f)	(g) = (e)+(f)	GVAF (h)
<i>Dairy Market Reform</i>	2.34	0.01	2.35	2.30	-2.66	0.04	-2.62	-2.55
<i>Decoupling</i>	4.10	-5.11	-1.00	-1.00	9.14	-8.64	0.50	0.84
<i>Rest of EU implements MTR</i>	1.79	0.38	2.17	2.18	1.38	0.66	2.03	2.00
<b>Total</b>	<b>8.24</b>	<b>-4.72</b>	<b>3.52</b>	<b>3.48</b>	<b>7.85</b>	<b>-7.94</b>	<b>-0.09</b>	<b>0.29</b>

The main reason for the difference in the short and long run results is that dairy market reform has a positive effect on GVAF in the short run, but a negative effect in the long run. This is because in the short run, the fall in the intervention price is

smaller, although the compensatory payment is exactly the same. In the short run, the compensatory payment outweighs the negative effect of the fall in the intervention price, for a clear increase in the profitability of dairy farming. In the long run, the opposite is true.

In both the short and long run, the positive impact of the implementation of the MTR in the rest of the EU is not surprising, given the terms of trade improvement. However, the exact magnitude of this result depends on the exogenous shocks imposed on export prices, which were based on the forecasts from the DG-Agri (CEC 2003a and 2003b), unlike the decoupling and dairy market reform scenarios which were based on actual policy announcements.

The effect of decoupling on aggregate agricultural incomes is almost negligible, with fewer resources remaining in agricultural production, but commanding a higher return. There is a small negative effect in the short run, and a small positive effect in the long run.

## **5 Conclusion**

In the first year of the MTR, significant changes have already occurred in the Irish agricultural sector (CSO 2005). In line with the broad indications from this study, agricultural output has fallen and there has been a significant shift in the composition of output, against cereals and cattle in particular. A strong tendency for farmers to find off-farm employment has already been noted by Teagasc (2003) for many years, and the MTR is expected to continue to encourage farmers in this direction. However, the decoupled payment and the compensation for dairy farmers ensures that farm incomes are safe for the time being.

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## **Poster Proposal**

The poster will follow the structure of the accompanying background paper, with a larger proportion of space devoted to results. Along with the brief results given in the background paper, detailed results for the individual agricultural and food processing commodities will be presented. The nature of the results is such that a poster is a good dissemination tool, beginning with economy wide results, and “drilling down” to sectoral results and finally to results for individual industries and commodities.

The approximate layout of the poster will be as follows overleaf. Detailed results have been computed and are available in <name omitted> (2006).

<b>Title, author</b>	
<b>Introduction and background</b>	<b>Methodology and data</b>
<b>Results</b>	
<p>Economy wide effects, including decomposition by agriculture/manufacturing/services effects and welfare decomposition</p> <p>Effects on agricultural and land use sector, including changes in aggregate output, prices, and farm incomes.</p> <p>Decomposition of effects by Fan (see background paper), and by the components of the MTR (see background paper)</p> <p>Effects on labour and land use in agriculture, including sensitivity to modelling approaches.</p> <p>Effects on Greenhouse Gas emissions</p>	<p>Results for individual land use activities:</p> <p>Dairy</p> <p>Cattle</p> <p>Sheep</p> <p>Other Livestock</p> <p>Cereals</p> <p>Fruits and Vegetables</p> <p>Other Crops</p> <p>Forestry</p> <p>See example of results chart for the agricultural activity “Cattle” and the food processing industry “Beef” (next page).</p>
<b>Conclusions</b>	



**Results chart: Example for Cattle and Beef.** (This chart uses the Fan decomposition, used in the accompanying background paper.)



## References

<name omitted> (2006), “The 2003 Mid Term Review of the Common Agricultural Policy: A Computable General Equilibrium Analysis for Ireland”, Ph. D. Thesis, Trinity College Dublin.

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<sup>1</sup> Council of the European Union.

<sup>2</sup> Department of Agriculture and Food.

<sup>3</sup> Council Regulation (EC) No 1782/2003, Title III Chapter 5, Section 2.

<sup>4</sup> European Environment Agency.

<sup>5</sup> Commission of the European Communities.

<sup>6</sup> Central Statistics Office, Ireland.

<sup>7</sup> Irish Model of Agriculture, General Equilibrium (Version 2).

<sup>8</sup> This gives a good approximation to GVAF.