IMPACT OF THE 2003 MID-TERM REVIEW OF THE COMMON AGRICULTURAL POLICY

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1. Introduction

The year 2005 saw an important change in the policy regime for Irish agriculture. The various direct payment schemes introduced under successive reforms of the EU's Common Agricultural Policy (CAP) were replaced by a Single Farm Payment (SFP). This change originated in July 2002 as part of the Mid-Term Review (MTR) of the Agenda 2000 CAP reform proposed by the then EU Commissioner for Agriculture and Rural Development, Dr Franz Fischler. Another important element of this reform was an additional reduction in dairy product intervention prices, with compensation to dairy farmers added to their SFP. These proposals were finalised in Luxembourg in June 2003 when the Council of Agricultural Ministers of the EU reached an agreement which passed into law in September of that year (Council of the European Union, 2003).

From the national point of view, the envelope available to finance the SFP is the sum of expenditure on the direct payment schemes which it replaced. These schemes were production-linked

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or coupled subsidies, i.e., farmers had to keep animals or plant land to arable crops in order to claim eligibility for the payments. The significance of the SFP is that it is a decoupled payment. Farmers have no obligation to produce in order to receive the payment; payments are linked to historical receipts and only require that the farmer complies with a range of statutory environmental, animal and plant health, animal welfare and food safety requirements and maintain the land in good condition. The returns to resources employed in agriculture will fall as a result of the shift from coupled to decoupled payments, even if the income of the owners of those resources is maintained by the decoupled payment. Thus, decoupling should lead to a fall in total agricultural output, and significant changes in its composition. There will be a shift away from the activities which previously enjoyed coupled support, Cattle, Sheep and Cereals, and an increase in other land use activities, including Forestry. A reduction in agricultural greenhouse gas emissions will occur as a result of this.

The objective of this article is to quantify the effects on output, income, prices, land use, employment, and greenhouse gas emissions arising from the implementation of the MTR in Ireland. For this purpose, a computable general equilibrium (CGE) model called IMAGE2 is employed. 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. Section 2 describes the policy changes introduced as part of the MTR in greater detail. Section 3 gives details of the simulations undertaken, and includes a brief description of the model and database. Section 4 presents the principal results for the changes in output and value added in agriculture as well as the impact on macro variables. In Section 5, impacts on greenhouse gas emissions are discussed, and Section 6 concludes.

2. Policy Background

The Single Farm Payment became effective in Ireland from January 1, 2005. Because it is decoupled and not linked to production, it is intended to reorient EU farmers towards market-based decision making.[1] Farmers' eligibility for the SFP depends solely on observing cross compliance measures in respect of Statutory Management Requirements for animal health and welfare, environmental management and food safety, and maintaining land in good agricultural and environmental condition. To qualify for payment, land must be maintained in agricultural usage, or used for forestry. The level of payment to individual farmers is calculated using the average number of animals (hectares in the case of the Arable Aid Scheme) on which payment was made under each of the schemes from which a farmer benefited in the reference years 2000 through 2002. These base quantities are then multiplied by the 2002

[1] Although the MTR introduced a significant change to the way EU agriculture is supported by direct payments, EU farmers continue to benefit from considerable market price support implemented through high import tariffs, export subsidies and minimum prices guaranteed through intervention buying.

payment rate for each scheme, from which certain deductions are made to establish a national reserve. An entitlement per hectare is established by dividing this amount by the average number of hectares declared during the reference period. Farmers may sell or lease out their entitlements under certain conditions.

Box 1: Key Elements of the Mid-Term Review Agreement in Luxembourg 2003

The key changes contained in the MTR are:

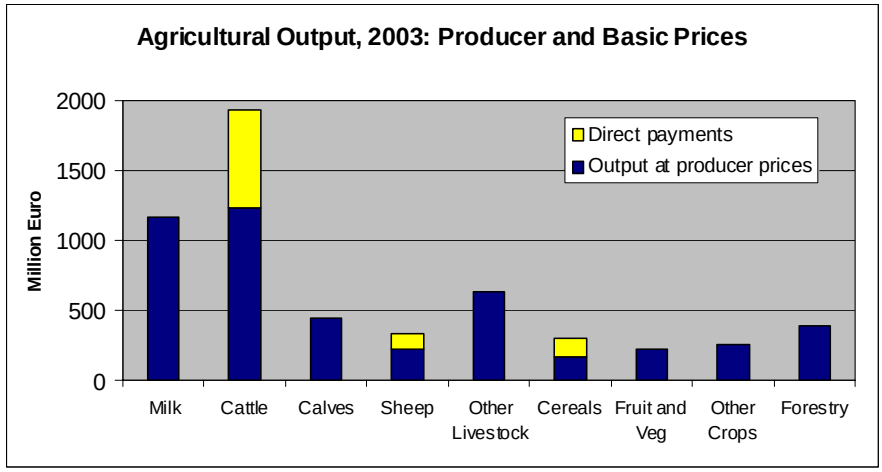
- A Single Farm Payment independent (i.e., 'decoupled') from production to replace the various product-linked payments that existed under Agenda 2000, with limited 'coupled' elements maintained where Member States consider this necessary to avoid the abandonment of production.
- The linking of the single payment to the respect of environmental protection, animal and plant health, food safety and animal welfare standards, as well as the requirement to keep all farmland in good agricultural and environment condition ('cross-compliance').
- A reduction in direct payments for bigger farms to finance new rural development measures to promote the environment, quality and animal welfare ('modulation').
- Revisions to market support policy. Of particular relevance to Irish producers are the cuts made to the intervention prices for butter and skim milk powder.
- Financial discipline, an undertaking to keep the CAP budget for market measures and income support fixed in real terms until 2013.

This change in the way farm incomes are supported through direct payments can be expected to have very significant effects for Irish agriculture, and possibly for the rest of the Irish economy, given its very high reliance on EU subsidisation. In 2003, the year in which the MTR was agreed,[2] almost half of the agricultural net value added of €2.0 billion consisted of direct payments coupled to production (CSO, 2004d), leading to distortions in farm output decisions. Figure 1 shows the composition of agricultural output at basic prices, defined as the producer or farmgate price plus direct subsidy payments. The figure illustrates the uneven distribution of direct payments, showing that the majority of direct payments in absolute terms were applied to Cattle production. The Suckler Cow, Special Beef and New Slaughter premia comprised around two-thirds of direct payments, although Cattle output, valued at producer prices, comprised less than one-third of agricultural output. In relative terms, however, Cereals received the highest rate of subsidy, with the direct payment adding an extra 78 per cent to the value of output. Sheep production was also heavily subsidised, while other agricultural activities received no direct payment

[2] 2003 is also the base period for the modelling results reported here.

support under Agenda 2000. Forestry does receive direct support but this is not part of the MTR reform.

Figure 1: Direct Payments and Output, Ireland 2003



Note: The producer price is the price received by the farmer, also called the farmgate price. The basic price includes in addition any subsidies less taxes directly linked to a product.

Decoupling is the most dramatic of the changes introduced by the MTR and (as we will see) the most important. But two other elements of the package are included in the simulations in this paper. One of these elements is simply to recognise that the MTR implementation in other Member States will affect (raise) market prices for affected commodities, altering both the import and export prices which Irish farmers and food processors face. Second, asymmetric price cuts were agreed in the milk sector. The intervention price for butter will be reduced by 25 per cent which is an additional price cut of 10 per cent to what had been agreed in Agenda 2000. The 15 per cent reduction in skimmed milk powder prices agreed in Agenda 2000 is maintained. Intervention purchases of butter will be suspended above a limit of 30,000 tonnes from 2007, and purchases above that limit may be carried out only under a tender procedure. The dairy quota regime was extended until the 2014/15 season.

One feature of the MTR which is not modelled explicitly in this paper is modulation, or the gradual reduction in subsidy payments to larger farmers to be used to finance rural development measures. Most rural development expenditure goes to benefit farmers and the presumption is made that modulation represents a transfer of resources between farmers in the agricultural sector, rather than a transfer between the agricultural and non-agricultural sectors. Nor does the study incorporate the effects of other policy changes, such as the introduction of the Nitrates Directive due to come into force in 2006, or the likely impact of changes in tariffs or export subsidies emanating from any agreement in the ongoing Doha Round of WTO trade negotiations. Thus the results in this paper must be interpreted as comparative static. That is, the simulations show how the economy would differ from its initial position (its position in

2003) if the policy measures in the MTR had been in existence at that time.

The MTR may also help in the achievement of Ireland's targets for reductions of greenhouse gas emissions (GHGs). In 2003, the agricultural sector was the source of approximately 29 per cent of GHG emissions in Ireland (CSO, 2004b). Agricultural emissions of GHGs are high relative to those in other developed countries, due to the predominance of pastoral systems in agricultural production. Ruminant digestion, manure management, and fertiliser usage on grassland and crop land are the major sources of emissions. As part of Ireland's efforts to meet its commitment under the Kyoto Protocol, the National Climate Change Strategy (DELG, 2000) has proposed a reduction target of 10 per cent for emissions from the agricultural sector. The contribution which the MTR can make to this target is evaluated in the paper.

3. MTR Simulations

The three key aspects of the MTR modelled in this paper are the decoupling of support, dairy market reform, and changes in export conditions faced by Ireland due to the implementation of the MTR in the rest of the EU. In this section, the methods used to represent these shocks in the model are described.

DECOUPLING

Direct payments are those that are linked to production, and therefore distort farm enterprise decision making. In the simulation, decoupling is modelled by removing the direct payments, to simulate farm decision making in an undistorted market. Following Frandsen *et al.* (2003) the decoupled payment is modelled as a subsidy to agricultural land, which may be used to produce any agricultural commodity, or forestry. The decoupled payment is linked to land to reflect the condition of cross-compliance, that land must be maintained in good agricultural condition. The subsidy is paid at a flat rate, to eliminate policy induced distortions in farm decision making. The rate at which the subsidy is paid is calculated such that the reallocation of the subsidy is budget neutral. The one exception to the flat rate decoupled payment is fruit and vegetable production, which is not eligible for the payment (CEU, 2003[3]).

DAIRY MARKET REFORM

The dairy market is subject to a decrease in the intervention price, compensated by direct payments. The EU medium-term forecasts are for the price of butter to fall by 11.2 per cent by 2006 and 23.4 per cent by 2009, and the price of skimmed milk powder to fall by 0.7 per cent by 2006 and 4.8 per cent by 2009 (CEC, 2003b). Using weighting coefficients for Irish dairy produce (IDB, 2006) and current intervention prices, the corresponding fall in the price of

[3] Council Regulation (EC) No 1782/2003, Title III, Chapter 4.

Irish milk products is 5.3 per cent by 2006 and 12.9 per cent by 2009.[4] These changes are modelled as exogenous shocks to export demand resulting in a fall of 5.3 per cent in the price for milk products in the short run, and 12.9 per cent in the long run. From 2006 onwards, compensation will be paid at 3.65 euro per litre. This amount is simply modelled as a transfer from the EU budget[5] to farm households.

Box 2: IMAGE2 – The Model and Database

IMAGE2[6] is a Computable General Equilibrium (CGE)[7] comparative static model of the Irish economy. Characteristic of CGE models, IMAGE2 assumes rational economic agents, that is, 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, along with multiple categories of investor, household, export destination, soil type and labour occupation, making IMAGE2 the most detailed CGE model of Ireland available to date.

The database for the model is based on statistics produced by the CSO and Department of Agriculture and Food and represents a snapshot of the Irish economy in the year 2003.

Agriculture and Food

The model has a number of characteristics designed to capture particular features of the agriculture and food processing sectors. These include:

- *Highly disaggregated commodity classifications in agriculture (14 commodities) and food processing (7 commodities).*
- *Three classes of land based on soil type or use capability.* This prevents unrealistic substitution possibilities between different agricultural outputs as relative profitability changes.
  - Good quality land can be used for any type of agricultural production.
  - Medium quality land can be used for grass or forestry, but not arable production.
  - Poor quality land can only be used for forestry.

[4] A fixed quantity of liquid milk produces 1 tonne of butter and 2.05 tonnes of SMP. Current intervention prices are 328.2 euro/kg for butter and 205.52 euro/kg for SMP. Therefore, percentage change in dairy price (2006) = (328.2*-11.2 per cent + 205.52*2.05*-0.7%)/(328.2 + 205.52*2.05) = -5.3%. Percentage change in dairy price (2009) = (328.2*-23.4% + 205.52*2.05*-4.8%)/(328.2 + 205.52*2.05) = -12.9%.

[5] The Rest of the World account in IMAGE2.

[6] IMAGE2 is based on IMAGE (Irish Model of Agriculture General Equilibrium), which was initially developed by O'Toole and Matthews (2002a, b) based on the 1990 Input-Output table for the Irish economy. The model was extended and the database updated using the 1998 Input-Output table (CSO 2004a) by Dixon (2006).

[7] This type of model is used in many countries, for example, Australia (Dixon *et al.,* 1982) and several other countries listed in Dixon and Rimmer (2002), and even for global trade analysis (Hertel, 1997).

- *Distinction between mobile and immobile labour in the agricultural sector.* This reflects the high average age of farmers and the likelihood that if returns to agricultural labour fall, elderly farmers are more likely to reduce their hours worked or withdraw from employment completely rather than seek alternative employment outside the farm sector.
- *Joint production between milk and cattle outputs.* The Dairy sector is modelled as producing both milk and calves. Calves and cull cows surplus to the requirements of milk production are transferred as inputs into Cattle (Beef) production.
- *Quota.* Rents created by the milk and sugar quotas are a component of farm household income. Rent on the sugar quota is not recorded explicitly.
- *Export subsidies financed by the EU paid on exports to non-EU destinations.* Subsidies on exports can be adjusted in order to maintain intervention prices.

Trade

In IMAGE2, the Irish economy and the rest of the world are linked via import demand and export supply functions, typical of many CGE models for small countries (for an overview and further references to CGE modelling, see Wing (2004). Therefore,

- *Import prices are assumed exogenous.* As a small country, changes in Irish demand for imports are assumed to have no impact on world market demand.
- *The Armington assumption governs preferences.* That is, imports are assumed to be imperfect substitutes for domestic products.
- *Exporters have a small degree of market power.* Export demand elasticities of -20 have been assumed for most commodities, indicating very little market power for Irish exports.

IMPLEMENTATION OF THE MTR OUTSIDE IRELAND

IMAGE2 is a single country model. However, Ireland does not implement the MTR in isolation. Competing producers in the EU will face similar policy changes. Given that around three-quarters of Irish exports of agri-food produce are destined for the EU, it would be inaccurate to assume that there is no change in export demand conditions.

The effect of the implementation of the MTR elsewhere in the EU is captured by exogenous changes to the prices received for Irish exports to the EU, based on the DG-Agri analysis of the MTR (CEC, 2003a and 2003b). The final DG-Agri analysis (CEC, 2003b) finds that the price of Beef will increase by 7.1 per cent following the MTR. The final analysis does not give results for Sheepmeat, but estimates in the earlier analysis (CEC, 2003a) show that the price will increase by between 8 per cent and 12 per cent. Taking a simple average, the price of Sheepmeat is assumed to increase by 10 per cent. IMAGE2 distinguishes between primary agricultural production and the food processing sector. Hence the increases in the export prices for beef and sheep meat are calculated by

weighting the contributions of live cattle and sheep to these commodities, for increases of 3.5 per cent in the price of Beef[8] and 4.5 per cent in the price of Sheepmeat.[9] Given that 89 per cent of Irish imports of Beef and Sheepmeat come from within the EU (CSO, 2005a), the average price of imports of these commodities is also assumed to increase, by 3.2 per cent for Beef[10] and 4.0 per cent for Sheepmeat.

A similar shock was not applied to the price of exports of Cereals to the EU. This is for two reasons. First, the DG-Agri studies do not predict large changes in prices for Barley and Wheat. Second, export demand is not as important to Cereals as it is to Beef and Sheepmeat. It might be argued that these assumed price changes on EU markets following the MTR are optimistic, in that the EU Commission might use its market management powers, and particularly its power to set export refund rates, in order to stabilise commodity prices. However, in the decomposition of the simulation results reported later, this trade effect is found to be relatively unimportant in determining the overall magnitude of the impacts.

OTHER FEATURES OF THE CLOSURE

"Closure" refers to the assumptions made about macro variables in the model. For the simulation of the MTR, closures are selected to represent both short-run and long-run environments. Many features of these two closures are the same. For both closures, the total capital stock and total land are fixed. Total labour supply is fixed but employment may vary in accordance with the unemployment specification in the model. As noted above, a component of the labour supply in agriculture is considered immobile, that is, unable to be employed outside the sector. In the long-run closure, there is full mobility of all land and capital, while in the short run, capital is fixed in sectors,[11] and there is sluggish transformation of land between uses.

In the comparative static setting of the model, a specific time period for short run and long run is not defined. However, the closures for short run and long run provide an approximation. The short run is defined as a period of time sufficient for the labour market to adjust, but insufficient for capital and land to be put to new uses. This may be a period of up to two years. In the long run, there is sufficient time for all factors of production to be moved into new uses. This could be a period of five years. Note that the

[8] Beef: Inputs of domestic live cattle comprise 49.8% of inputs to the beef processing industry. Increase in export price of beef = 49.8% * 7.1% = 3.54%.

[9] Sheep: Inputs of live sheep comprise 45.4% of inputs to the sheep meat processing industry. Increase in export price of sheep meat = 45.4% * 10% = 4.54%.

[10] 89% * 3.54% = 3.15%.

[11] The sectors are three groups of industries: land use (agriculture and forestry), manufacturing and services.

time frames for the shocks to the dairy market (discussed above) are chosen to reflect these closures.

For the types of aggregate expenditure which comprise GDP, both macro closures are the same. Consumption is determined according to household disposable income, investment according to the economy wide rate of return, government expenditure and accumulation of inventories are fixed, and the balance of trade is endogenous. The numeraire is the nominal exchange rate.

4. MTR Economic Impacts

This section presents the changes in output and value added in agriculture which are projected to arise from the implementation of the MTR, along with results for macroeconomic variables.

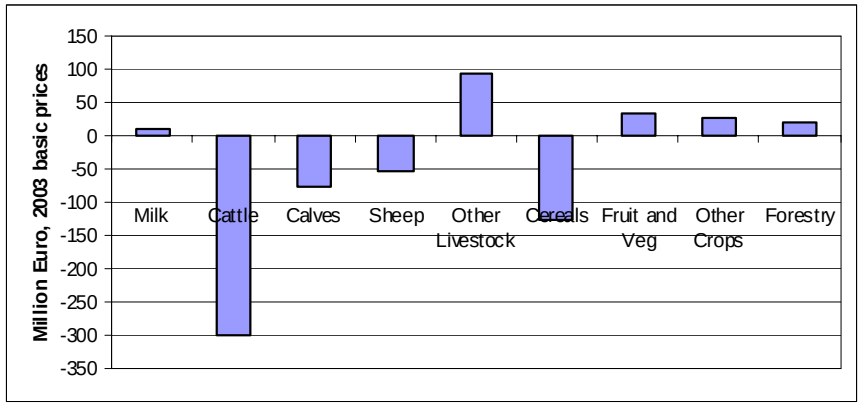
Economy wide effects of reform in the agricultural sector are minimal. The primary agricultural sector contributes only 2.7 per cent to Irish GDP (CSO 2004c), and there is no change in the availability of factors of production to the economy, although the level of labour employment can vary. Hence the 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, and 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 among immobile agricultural workers. The losses are mainly in the agricultural sector, translating to a small reduction in the national workforce of 0.05 per cent. 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 per cent. The impact on GDP is very slightly greater in the long run because of the greater mobility of land and capital. From the expenditure side, real consumption and investment decrease (by 0.33 per cent and 0.41 per cent, respectively, in the short run, and by 0.70 per cent and 0.16 per cent, respectively, in the long run) and the balance of trade moves towards surplus.

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 per cent, with a fall in labour input of 11.8 per cent. Decoupling is the main determinant of these results, accounting for a fall in agricultural output of 6.1 per cent, 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, with capital no longer fixed in the agricultural sector, agricultural output falls by 9.5 per cent. Capital used in agriculture falls by 9.4 per cent, and labour falls by 12.9 per cent. In the land use sector (agriculture and forestry together), 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 per cent in the short run, and 7.9 per cent in the long run.

Changes in the composition of agricultural output are also dominated by the decoupling shock, with relatively small effects as a result of the dairy and trade shocks. The effects on output in the long run can be seen in Figure 2, where the output of commodities which previously received coupled subsidies falls. For these commodities, output of cattle falls by 15.4 per cent, sheep by 15.5 per cent, and cereals by 41.8 per cent. There is an increase in the output of all other agricultural commodities, except calves.[12] The expected impact of decoupling is to increase the output of commodities which did not previously receive direct payments, enabled by taking up resources released from the activities which previously enjoyed coupled support. This underpins the expansion of output of Other Livestock and Fruit and Vegetables, Other Crops and Forestry. A similar increase in output would be seen in Milk production, but this is prevented by the quota system which remains in place.

Figure 2: Change in Volume of Output as a Result of the MTR in Long-Run Closure



Given that most factors of production used in agriculture are owned by farm households, Gross Value Added at factor cost (GVAF) in the land use sector is used as a proxy for aggregate farm income.[13] Table 1 shows that, in the short run, there is a clear increase of 3.5 per cent in GVAF in the land use sectors, whereas in the long run GVAF only increases by 0.3 per cent. These increases occur despite the reductions in agricultural output. Because of the forecast reduction in employment in the land use sectors, per capita farm income is projected to increase by 14.8 per cent in the short run, and by 12.5 per cent in the long run. Table 1 shows the

[12] This second round effect follows from the fall in the output of Cattle. Note that the original direct payments were modelled as coupled subsidies on Cattle, not Calves.

[13] Note that forestry is included here because some farm resources will enter forestry production.

decomposition of value added at factor cost into price and output effects, and by the components of the MTR.

Table 1: Decomposition of the Change in Gross Value Added at Factor Cost in Land Use Sectors (% Change)

	SHORT RUN				LONG RUN			
Cause	**Primary Factor Price Index (a)**	**Output (b)**	**(c) = (a)+(b)[14]**	**GVAF (d)**	**Primary Factor Price Index (e)**	**Output (f)**	**(g) = (e)+(f)**	**GVAF (h)**
Dairy Market Reform	2.34	0.01	2.35	2.30	-2.66	0.04	-2.62	-2.55
Decoupling	4.10	-5.11	-1.00	-1.00	9.14	-8.64	0.50	0.84
Rest of EU implements MTR	1.79	0.38	2.17	2.18	1.38	0.66	2.03	2.00
Total	**8.24**	**-4.72**	**3.52**	**3.48**	**7.85**	**-7.94**	**-0.09**	**0.29**

The results in Table 1 show that decoupling is the major determinant of both the price index change and the change in output, although the combined effect of these changes on GVAF is negligible. As discussed earlier, decoupling provides the major impetus for the reduction in agricultural output. This has a negative impact on gross value added. However, by reducing output, the resources remaining in agricultural production command a higher return. The positive impact of trade effects in both the long and short run is not surprising. However, the exact magnitude of this result depends on the exogenous shocks imposed on export prices, which were based on the DG-Agri simulation results, unlike the decoupling and dairy market reform scenarios which were based on actual policy announcements.

The main reason for the difference in the short-run 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.

The short and long run increases in GVAF are not evenly distributed between the various farming activities. The effects of the dairy market reform, positive in the short run and negative in the long run, are most relevant to GVAF from the production of milk, while the positive effects of the MTR in the rest of the EU are most relevant to GVAF from the production of cattle and sheep. Decoupling has a negative effect on GVAF for the previously subsidised activities of cattle, sheep, and cereal farming. The decoupled payment ensures a positive effect on GVAF from other agricultural activities except for production of pigs, poultry, and fruit and vegetables. Fruit and vegetable farming is not eligible for

[14] This gives a good approximation to GVAF.

the payment, while the unimportance of land use in the production of pigs and poultry ensures that these activities do not gain from the decoupled payment either. Therefore, the activities which gain from decoupling are milk, horses, sugar, potatoes, other crops and forestry.[15] In the long run, the effects of decoupling on GVAF are similar for most activities, except for pig and poultry farming where the effect is negligible. For dairy production, the net effect on GVAF in both the short and long run is positive, while the net effect on GVAF in cattle and sheep production is negative. For all other activities, the change in GVAF is dominated by the decoupling effect.

These results for GVAF by activity should not be interpreted as increases or decreases in the incomes of particular farmers. For example, although GVAF from cattle farming falls, many of the resources previously used in cattle farming will be reallocated to more profitable activities. Land and labour may be moved into other agricultural activities, and labour may even move into non-agricultural activities.[16] Therefore, it is most informative to look at GVAF in the land use sector as a whole, which increases by 3.5 per cent in the short run and 0.29 per cent in the long run.

5. MTR Impact on Greenhouse Gas Emissions

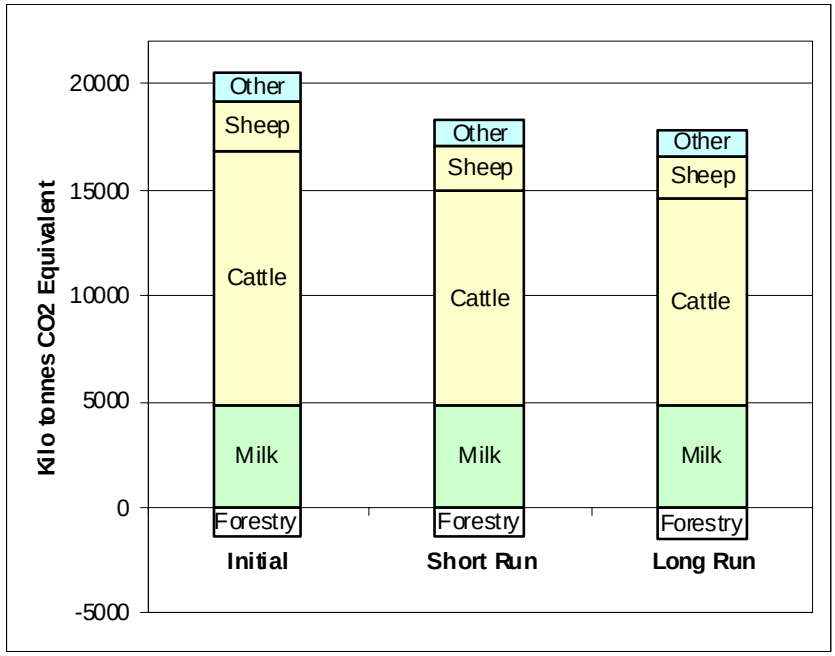
Total greenhouse gas emissions from land use activities will be reduced by 11.9 per cent in the short run and 14.9 per cent in the long run as a result of the MTR reforms in the agricultural sector. The most important contribution to the reduction in emissions is the change in the composition of agricultural output away from Cattle. As shown in Figure 3, there is very little difference in emissions from other agricultural sectors. With support no longer coupled to agricultural production, on-farm forestry becomes a viable alternative for grassland. The total area under forestry increases by 5.3 per cent, or approximately 37,000 hectares. Total output of Forestry expands by 5.4 per cent in the short run, increasing to 10.1 per cent in the long run. The increase in forestry contributes to the decrease in emissions, via sequestration of Carbon Dioxide. However, this makes only a small contribution to the total fall in greenhouse gas emissions from the land use sector because the sequestration potential of new planting is very limited in the time period considered here.

Decoupling is the major force behind the reduction in greenhouse gas emissions. Decoupling alone causes emissions to fall by 13.1 per cent in the short run and 16.5 per cent in the long run. This is offset by the change in export conditions, which stimulates a small increase in emissions. Reform in the dairy market has a negligible effect because the quota ensures there is no change in output.

[15] Attention is again drawn to the comparative static nature of these results. Since the completion of the MTR, a subsequent reform of the EU sugar regime was agreed in November 2005 which has led to the closure of the Irish sugar industry.

[16] Recall that labour is divided into mobile and immobile workers.

Figure 3: Change in Agricultural Greenhouse Gas Emissions



The reduction in agricultural emissions of greenhouse gases contributes to a short-run decrease of 3.7 per cent, and long-run decrease of 4.5 per cent, in national emissions. The MTR has a negligible effect on emissions from sources other than agriculture. The National Climate Change Strategy (DELG, 2000) sets a reduction target of 10 per cent for agricultural greenhouse gas emissions, as part of Ireland's commitment to limit the increase in emissions to no more than 13 per cent of 1990 levels, under the Kyoto Protocol. This target may be achieved under the MTR, simply through the reduction in livestock numbers. Measures set out in the NCCS to reduce emissions, such as improved manure management, fertiliser usage, and changes to feed, could secure reductions of more than the targeted 10 per cent. Thus it could be possible to relieve pressure on other sectors of the economy, given that emissions in 2002 were 29 per cent higher than 1990 levels (CSO, 2004b).

6. Conclusions

The MTR brought about a radical change to EU agricultural policy. The simulations described in this paper are based on the most detailed general equilibrium modelling of the MTR for Ireland. Like similar studies for other EU Member States and the EU as a whole, the results show that the MTR will have significant effects on agricultural activity. The simulations analyse the effects of decoupling, dairy market reform, and the implementation of the MTR in the rest of the EU. The most significant effects occur as a result of decoupling.

The economy wide effects are minimal, owing to the relative insignificance of agricultural production in the national context. The increase in EU funds for the compensatory dairy payment and the improvement in allocative efficiency following decoupling are factors which exert a small positive influence on GDP.

Change is driven by the reallocation of resources in the economy, and within the agricultural sector. Decoupling removes the incentive to produce to receive subsidies, reducing the profitability of the agricultural sector. In the short run, when there is insufficient time for sectoral capital stocks to adjust, labour which is employable outside agriculture can depart the agricultural sector. This underlies a decrease in agricultural production of 5.6 per cent. Despite the reduction in supply, the producer price index for agricultural products falls by 2.5 per cent as a result of decreased market support for milk. In the long run, when the capital stock can also adjust, the decrease in agricultural production is 9.5 per cent. Market support for dairy is further reduced in the long run, so the producer price index falls by 3.2 per cent.

Aggregate farm income, or Gross Value Added at factor cost in the agricultural sector, is subject to both negative and positive influences under the MTR. On the positive side, there is an increase in the aggregate level of subsidy support, with the old direct payments fully replaced by the decoupled payment, and the addition of the compensatory dairy payment. There is also assumed to be an improvement in export demand for Beef and Sheepmeat as a result of the implementation of the MTR in the rest of the EU. Further, the removal of the link between direct payments and the production of certain agricultural commodities eliminates a distortion in the allocation of agricultural resources, leading to an improvement in allocative efficiency in the sector. These positive effects on GVAF are counteracted by the reduction in market support for Milk, which is particularly large in the long run. The fall in agricultural production also has a negative effect, counteracted by an increase in producer prices which is determined by the elasticity of demand. Modulation, or the gradual reduction in subsidy payments, has not been considered in this analysis but it would also have a negative effect. The net effect on aggregate farm income is an increase in the short run of 3.5 per cent. In the long run, as market support for dairy falls, aggregate farm income is only 0.3 per cent greater than it otherwise would have been.

The simulations also trace the reallocation of resources within the agricultural sector following the removal of direct payments. Agricultural sectors competing for resources were influenced by subsidies linked to the production of particular commodities under Agenda 2000. In the MTR, these distortions are removed, altering the allocation of agricultural resources. At the same time, the implementation of the MTR in the EU increases the prices received for Irish exports of Beef and Sheepmeat, and there is a cut in market support for Milk.

Cattle, Sheep, and Cereals production were highly subsidised under Agenda 2000. With the removal of direct payments, output of these commodities decreases.[17] This is despite an increase in EU prices and, in the case of Cattle, an almost fixed supply of calves from the Dairy industry, where the milk quota remains binding. The resources released from the production of these commodities underlie an increase in the production of other livestock, forestry, and other crops, in particular Fruit and Vegetables.

There are numerous constraints on the reallocation of resources within agriculture. Significantly, changes in the Dairy sector are constrained by the national quota. The removal of subsidies in the Sheep and Cattle sectors reduces the cost of land for grazing, which is beneficial for the holders of dairy quota, and improves the profitability of the milk industry despite the cut in market support. If not for this restriction, the contraction in Sheep and Cattle output would have been much greater.

In the arable sector, Cereals production was very heavily subsidised under Agenda 2000. The elimination of the coupled payment would have had even larger repercussions if not for some policy limitations. First, Fruit and Vegetable production does not qualify for the decoupled payment under the MTR. Second, sugar production is subject to a quota. Therefore, two important alternative uses for resources released from cereals production have limits placed on their expansion.[18]

Impact studies carried out for the Commission for the EU as a whole (CEC, 2003a and 2003b), as well as impact studies of the decoupling proposal only for Irish agriculture using the FAPRI-Ireland model (Binfield *et al.,* 2003) and the CAPRI model (Garvey *et al*., 2004), also indicate that decoupling will result in a reduced level of agricultural production in aggregate, with particularly pronounced reductions in the production of Cattle and Cereals. The EU study found negligible change in agricultural factor income in the EU as a whole. The FAPRI-Ireland and CAPRI studies indicated a positive impact on factor income from farming in Ireland as a result of improvements in allocative efficiency as farmers no longer need to produce at a loss in order to be eligible for livestock premia or arable aid. Early estimates of Irish agricultural activity in 2005 (CSO, 2005b) support these projections. There was a clear reduction in agricultural output, of Cattle and Cereals in particular, and a small increase in factor income.[19]

The simulations capture the important features of the MTR. The response of the Irish agricultural sector depends on the extent

[17] The simulation results reported here may overestimate the expected reduction in output to the extent that we have not taken account of the stocking rate restrictions associated with the receipt of coupled payments pre-MTR.

[18] Sugar beet is a possible alternative crop because this is a comparative static simulation on the 2003 database which was undertaken before the announced ending of sugar beet processing in 2006.

[19] The published increase is 16.5 per cent, but this takes into account the double payment of subsidies due to the introduction of the SFP. Disregarding this double payment, the increase is 1.2 per cent.

to which resources are reallocated. The outflow of labour and capital from the agricultural sector leads to a reduction in agricultural output, and the removal of the link between subsidy payments and particular agricultural activities lead to a redistribution of output within the sector. The decoupled payment and the dairy payment ensure that aggregate farm income does not suffer a reduction and may increase in the short run.

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