Challenges of incorporating EU enlargement and CAP reform in the GOLD model framework

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Abstract

There cannot have been many circumstances that have challenged the modeller of agricultural markets to the extent that the developments in the EU in recent years have. The enlargement of the EU involving a large number of countries, with important agricultural sectors, many emerging from a volatile transition from centrally planning, raises many issues. Moreover this is occurring at a time of radical reform of the CAP, with the substantial decoupling of payments, an area that has attracted some research but provides little concrete guidance for sector level modellers. In this paper the challenges of each of these developments are outlined and their importance to the sector addressed. Some strategies in dealing with the issues and the impact on the model results are evaluated.

Keywords: Common Agricultural Policy, enlargement, policy reform, modeling.

In May 2004 the European Union (EU) expanded to 25 member states, a move that greatly increased its agricultural area and farming population. The enlargement necessitated that the model for the EU agricultural sector maintained at FAPRI-Missouri be expanded as well. The development provides challenges for the modeler in terms of the scale of the expansion, the collation of a data set, the economic transition ongoing in entrants, and the fact that the CAP has just undergone another reform.

From an agricultural standpoint, the NMS are dominated by the central European countries (CEC); Poland, Hungary, Czech Republic, Slovak Republic, Slovenia, Estonia, Latvia and Lithuania. At the onset of the enlargement process it was feared by many in the EU-15 that extending the level of support in the Common Agricultural Policy (CAP) to these countries would result in them increasing their output substantially and thereby putting pressure on the EU budget. Subsequent reforms of the CAP have lessened this possibility. Nonetheless, there remains much uncertainty regarding the evolution of the agricultural sectors in these countries.

The CEC present a number of challenges to the successful modeling of the agricultural sector. Until the 1990s the countries all ran centrally planned economies, with the importance of the private sector varying between countries. As the countries moved to market based systems there were prolonged periods of adjustment for the agricultural sector. During this period there were also a variety of support policies enacted, sometimes on a very *ad hoc* basis. Data for the countries is of variable quality and sometimes difficult to obtain. There is therefore a limit to the extent that history can assist in the calibration or validation of an economic model, and econometric estimation is not possible in most cases. In addition the introduction of the single farm payment (SFP) under the newly reformed CAP presents a departure in agricultural support from that which has been operated up to now in both the EU-15 and the CEC.

The GOLD (grains, oilseeds, livestock and dairy) model is a dynamic, partial equilibrium model of the EU agricultural sector that is maintained by FAPRI at the University of Missouri and has been used for the analysis of recent changes in EU policy (Binfield and Westhoff, 2003; Binfield et al, 2003). Earlier versions of the model disaggregated the EU-15 into France, Germany, Italy, Ireland, the UK and an “other EU” category. During 2003 and 2004 the model has been expanded to include the new member states (NMS). In this paper the changes that have been made are documented and

modeling issues that have arisen are highlighted through the use of specific examples. The model is used to generate a constant policy baseline projection, and this is used to highlight the impact of the modeling assumptions. Finally the impact of enlargement and CAP reform through the Luxembourg 2003 agreement are evaluated through the simulation of the GOLD model.

The GOLD Model

FAPRI uses dynamic partial equilibrium models to analyze agricultural markets and policy scenarios. The aim of these models is to provide timely and realistic analyses by using models that incorporate the important economic, biological and policy relationships for the sector. The model of the EU that is used as the basis of this paper is the GOLD (grains, oilseed, livestock and dairy) model (see Hanrahan, 2001 for more details).

The crop portion of the GOLD model covers wheat, barley, maize, rye, rice, oilseeds and oilseed products. The crops model interacts with the livestock sector through feed demand relationships. The number of sheep, pigs and cattle are tracked, and the production of pork, poultry, lamb and beef are modeled. Milk production is allocated through a fat and protein balance into butter, cheese, skimmed milk powder (SMP), whole milk powder (WMP) and an 'other' category.

In addition to the EU-15 disaggregation outlined above, the model has been expanded to include the ten NMS in the form of Poland, Hungary and "other NMS" components. The model used data from EUROSTAT, the European Commission, USDA and FAO. An important aspect of the model is that data sets are kept up to date and as the model relies on data from EUROSTAT, where country-level balance sheets are often not available for recent years, the demand side of the model is only carried out at an EU-15 and NMS-10 level.

The model is a system of single equations simulated in Excel. The equations have not been estimated; instead parameter selection has been guided by theory and expert feedback. In the case of the NMS econometric estimation is unwise if not impossible given the transition process and the nature of the data that is available. Whether or not the EU-15 model would be improved if estimated is a valid question. In the case of the GOLD model, the modelers believe that the additional time and resources needed to generate reliable econometric estimates would not be justified in terms of the improvement of projections that this may or may not bring. The scale of the model and the transformation (partially policy related) that the EU-15 agricultural sector itself has undergone are factors in this assessment.

Incorporating CAP Reform

In order to incorporate the latest CAP reforms the commodity coverage of the model was expanded to include rye and rice. The changes in the rye sector feed into the other cereals and oilseed crops, especially in Germany and Poland where the only significant production of rye within the EU is undertaken.

Changes within the reform that were made to existing policy instruments were largely already incorporated within the GOLD model structure. The implementation of the SFP presented a number of practical challenges. The model needed to be able to perform a relatively large number of policy scenarios in relation to the different proposals, and the different possible combination of different member state choices. It was also necessary to be able to compare the situation under Agenda 2000 and the new reforms. The fact that there remained the possibility to re-couple the payments after the reforms meant that the Agenda 2000 framework still had to be retained, anyway, in the generation of the post-reform baseline.

The Single Farm Payment – decoupled?

The decoupling issue is clearly the key to the successful modeling of the CAP reform. In fact, there are two issues that need to be examined – how decoupled the SFP is, but also how decoupled the pre-reform policy instruments are/were. The latter is often neglected in any discussion of the impact of the SFP.

Most of the research that followed the expansion of usage of direct payments under the MacSharry reforms focused on the cereals sector (e.g. Cahill, 1997; Moro and Sckokai, 1999). These studies generally confirmed the belief that the payment was partially decoupled. Producers are free to shift amongst different crops, and the equalization of payment rates with oilseeds as part of the Agenda 2000 reforms further decoupled the payment from arable producers' decision making. In addition to being able to choose between crops, producers could also choose not to produce at all and instead set aside area in excess of the compulsory rate. This is reflected in the model, where the arable area aid payment enters into the cereal and oilseed total area determination, but not in the equations that determine the allocation of that area between the crops. Where it does appear in the total area equations, the impact of a change in rate is half that of an equivalent price change.

Less attention has been paid to the livestock sector, presumably because it is taken that the payments are very highly coupled. In the years after the MacSharry reforms the payments have been increasingly decoupled. MacSharry introduced limits on payments in the beef and sheep sector, which constituted some decoupling. However, in order to receive a payment producers needed to have the corresponding animal, or animals in the case of a cow and a calf. In Agenda 2000 this was relaxed somewhat, with the ability to claim the suckler cow premia on heifers, and the fact that headage payments made in less favoured areas were converted to an area basis in a precursor to the introduction to the SFP. In GOLD, payments influence the level of the breeding herd (in practice the special beef premia influences cow numbers through its capitalization in calf prices) and have a smaller impact than their monetary equivalent, but they have a greater impact than payments in the arable sector.

In the GOLD model, the dairy sector the payments that were to be phased in as part of Agenda 2000 were never incorporated on the basis that milk production would continue to be determined by the quota. The payments are also assumed to have no impact on milk yields or cow numbers. The issue of whether there are any production impacts of payments is delayed until quotas are no longer binding.

The introduction of the SFP undoubtedly further decouples payments made under the CAP. The ability to maintain some of the payments in their Agenda 2000 form means that the reforms were less radical in this respect than was initially proposed under the Mid-Term Review. It has been argued that the SFP is not fully decoupled. If we are willing to assume decreasing absolute risk aversion then increasing producers' wealth will result in them undertaking more risk. The payment will make it easier for producers to obtain credit. In the USA an important factor linking payments to production has been that the ability to re-base area in the past means farmers think that future payments could be linked in current production. In the EU, however, it seems unlikely that farmers will expect wholesale re-coupling of payments in the future.

Perhaps the biggest reason why one might suggest that the SFP is not fully decoupled from production is a result of the fact that the payment is associated with cross compliance criteria. The exact form of these requirements varies from country to country. In particular, claiming a payment requires qualifying land to be held, and that land must be in "good agricultural condition." In addition to this there appears to be some instances of modulated payments being paid in ways that are closely linked to production.

The above discussion highlights the problems for the modeler in terms of the complexity of the CAP reform finally agreed. Countries can choose to re-couple some of their payments. Also, entitlement to the SFP can be calculated in a number of different ways. It seems likely that the SFP is coupled in some way, and therefore these differences need to be accounted for in some way. To complicate issues further there is little research available at the moment that helps guide the decision of how to incorporate the payment in a model of this type.

In contrast to the complex manner of the problem, the SFP is incorporated into the GOLD model in a simplistic way. Where the model in the past has incorporated an Agenda 2000 payment, this is replaced by a "payment" calculated in the following manner:

Types of Payment:
A = SFP payment
B = Re-coupled Agenda 2000 payment
C = New coupled payment
x = "decoupling coefficient"
m = (1 - modulation rate)
s = stocking density

Historic = (A*x+B)*m + C
(where A = old payment not re-coupled)

Regional Crops =(A*x+B)*m + C
Regional Livestock = (A*x*s+B)*m + C
(where A = total payment/area or new payment)

Where countries, such as England, are moving between historic and regional schemes the calculation is adjusted accordingly. For example, for a country that used a historic calculation, and re-coupled to the maximum extent, for years where modulation was 5 per cent, and an *x* of 0.3 was used, (47*.3+16)*0.95=29 euro would replace the arable area aid payment. Since the details of countries plans so far are limited, there are no "C" payments, coupled schemes funded from modulated payments, currently in the model.

Ideally, there would be a value for "x" that had already been determined by research, but this is not the case. It is therefore necessary to choose an arbitrary figure. In the US, FAPRI has faced a similar challenge after the introduction of payments that are similar to the SFP under the 1996 Farm Bill (initially referred to as AMTA or Agricultural Market Transition Act payments now known as direct payments). In the GOLD model a factor of 0.3 was decided upon based on the American experience (Adams et al, 2001) and modeler judgment. In effect this means that 1 euro of the SFP has 30 per cent of the influence on production compared with the same payment as part of Agenda 2000. Note that this does not mean that an increase of 1 euro in the SFP has 30 per cent of the impact of a euro increase in price, far from it in the case of the arable sector, where even before the latest reforms, 1 euro of payments were assumed to have a smaller impact than 1 euro of market returns.

The approach outlined above has the advantages of being simple, transparent, and compatible with the existing model structure. However, the choice of "x" is arbitrary and does not take into account the different sources of coupling between the payment and production. It also assumes that a euro paid under the historic calculation is equivalent to one where entitlement is the same across regions. Another serious issue is that the payment is assumed to have the same impact on production in the NMS, as the EU-15, despite the fact that in most cases producers in the former would not have benefited from payments on this scale, and that wealth levels of the farming community would be significantly lower.

Quantifying CAP reform

Analysis begins from the generation of a baseline. The baseline incorporates agreed policy, and since the baseline that is used here is from the latter part of 2004 it incorporates EU enlargement to 25 countries and cap reform. The baseline is compared to a simulation comprising of Agenda 2000 and the pre-reform agreements on accession (the no CAP reform or NCR scenario). From this, the results of CAP reform are inferred. Due to the nature of the scenario, the results that are generated are different from those that were produced by previous FAPRI studies of the MTR and the final compromise (*op. cit.*).

Crops. Under the NCR, scenario crop area increases (Table 1). This is partly due to the reintroduction of the marginally more coupled arable area payment, the increase in the durum payment, and the fact that re-introducing the monthly increments increases the effective intervention price. Wheat sees the biggest increase in area as a result of the relatively larger increase in durum area. The increase in cereals production has a negative impact on prices of 2-3 per cent in the short run, and slightly less in the longer run.

Table 1: Impact of no CAP reform scenario (NCR) for crop variables.

	2006-2010 Average				2010-2014 Average			
	Baseline	Scenario	Abs. dif.	% change	Baseline	Scenario	Abs. dif.	% change
Area			million hectares					
Wheat	22.92	23.19	0.28	1.21%	22.94	23.20	0.25	1.10%
Barley	13.16	13.21	0.05	0.41%	13.10	13.18	0.08	0.59%
Maize	6.26	6.30	0.04	0.57%	6.24	6.28	0.04	0.70%
Rapeseed	4.07	4.13	0.07	1.68%	4.08	4.13	0.05	1.23%
Net Trade			million tonnes					
Wheat	12.30	13.03	0.73	5.97%	12.97	13.38	0.41	3.15%
Barley	8.22	8.39	0.18	2.15%	8.41	8.52	0.11	1.34%
Maize	0.56	0.68	0.12	21.32%	0.63	0.71	0.08	13.11%
Rapeseed	0.09	0.30	0.20	217.29%	0.23	0.34	0.12	50.97%
EU Prices			euro/tonne					
Wheat	118.93	115.82	-3.11	-2.61%	117.51	115.16	-2.35	-2.00%
Barley	109.02	106.48	-2.54	-2.33%	107.95	106.02	-1.93	-1.79%
Maize	123.74	120.63	-3.11	-2.52%	122.21	119.93	-2.28	-1.87%
Rapeseed	186.10	183.04	-3.05	-1.64%	184.23	182.06	-2.17	-1.18%

Livestock and meat. The fact that the various premia payable under Agenda 2000 are more closely coupled to production means that the results of the NCR scenario are more dramatic in the livestock sector than for the crops (Table 2). Re-introduction of the various premia increases the number of beef cows by over a million head, or around 10 percent, despite the fact that prices are substantially lower under NCR. The increase comes mainly from the re-coupling of payment in the EU, but also from the fact that the payments are coupled in the NMS-10, although the small number of beef cows and the subsequent low ceilings for premia rights mean the contribution from the NMS to the increase is limited.

Sheep numbers also increase under NCR as a result of the re-coupling of the premia. The larger impact on price in the sheep sector in relation to the beef sector is a result of the lesser degree of openness for sheep meat, where imports are controlled by the tariff rate quota (TRQ) and there are few exports.

The substantial reductions in price for beef and sheep meat have knock-on impacts in the pork and poultry sectors. These sectors experience price reductions of around 1.5 to 2 percent, and small decreases in both production and consumption.

Table 2: Impact of no CAP reform scenario (NCR) for livestock and meat variables.

	2006-2010 Average				2010-2014 Average			
	Baseline	Scenario	Abs. dif.	% change	Baseline	Scenario	Abs. dif.	% change
Numbers			million head					
Beef cows	11.01	12.11	1.11	10.09%	10.94	12.12	1.18	10.75%
Cattle	81.71	83.57	1.86	2.27%	80.65	83.21	2.56	3.17%
Pigs	152.84	152.78	-0.06	-0.04%	153.13	152.84	-0.29	-0.19%
Sheep	85.06	89.28	4.22	4.96%	84.83	89.15	4.31	5.09%
Production			thousand tonnes					
Beef	7,825	7,926	101.07	1.29%	7,730	7,897	167.04	2.16%
Pork	21,557	21,561	3.62	0.02%	21,652	21,595	-56.82	-0.26%
Sheep meat	991	1,046	54.76	5.53%	989	1,045	55.93	5.65%
Poultry	10,969	11,008	38.50	0.35%	11,090	11,060	-29.37	-0.26%
Consumption			kg/head					
Beef	16.03	16.08	0.05	0.30%	15.91	16.04	0.13	0.85%
Pork	40.00	39.99	-0.01	-0.03%	40.17	40.04	-0.13	-0.32%
Sheep meat	2.50	2.58	0.08	3.07%	2.49	2.57	0.08	3.20%
Poultry	21.03	21.09	0.06	0.26%	21.25	21.18	-0.07	-0.31%
EU Prices			euro/100kg					
Beef	271.86	260.13	-11.73	-4.32%	275.40	259.51	-15.89	-5.77%
Pork	127.40	125.12	-2.28	-1.79%	126.45	124.65	-1.80	-1.42%
Sheep meat	301.23	271.86	-29.37	-9.75%	301.46	271.21	-30.26	-10.04%
Poultry	128.72	126.28	-2.44	-1.90%	127.26	125.48	-1.78	-1.40%

Dairy. The impact of the re-imposition of Agenda 2000 in the dairy sector is smaller than in the other sectors as a result of the continuance of the dairy quota, which determines the volume of milk produced. There is a difference in the timing of the reduction in intervention prices for butter and SMP. Under Agenda 2000 the butter intervention price was scheduled to be higher than has been decided by CAP reform. The butter market price tracks the increase in the intervention price under NCR, and this shifts production out of cheese and into butter. The shift of production into butter also increases the volume of SMP produced and this has the effect of reducing the SMP price.

Table 3: Impact of no CAP reform scenario (NCR) for dairy variables.

	2006-2010 Average				2010-2014 Average			
	Baseline	Scenario	Abs. dif.	% change	Baseline	Scenario	Abs. dif.	% change
Production			thousand tonnes					
Cheese	8,531	8,515	-16.31	-0.19%	8,596	8,551	-44.50	-0.52%
Butter	2,053	2,069	16.05	0.78%	2,043	2,064	20.14	0.99%
SMP	1,117	1,143	26.65	2.39%	1,094	1,130	36.19	3.31%
WMP	767	787	19.72	2.57%	755	782	26.79	3.55%
Consumption								
Cheese	8,069	8,055	-14.04	-0.17%	8,138	8,094	-43.85	-0.54%
Butter	2,067	2,015	-52.07	-2.52%	2,049	2,007	-42.81	-2.09%
SMP	1,046	1,053	7.12	0.68%	1,036	1,049	13.31	1.29%
WMP	320	304	-15.20	-4.76%	310	300	-10.38	-3.35%
Prices			euro/100kg					
Milk	26.24	26.72	0.49	1.87%	26.18	26.65	0.47	1.80%
Cheese	482.11	488.02	5.91	1.23%	482.15	487.36	5.21	1.08%
Butter	278.88	294.24	15.36	5.51%	274.99	291.66	16.67	6.06%
SMP	188.97	187.69	-1.27	-0.67%	189.34	187.31	-2.03	-1.07%
WMP	221.06	227.21	6.15	2.78%	219.24	226.04	6.80	3.10%

Enlargement and the GOLD model

When new countries are incorporated into a trading block or customs union the focus of economic analysis is often on questions of changing trade patterns. In the case of the enlargement of the EU to 25 member states and the agricultural sector the issue is more complex. Since the early 1990s the transition to a market economy in many of the CEC has had a profound impact on the agricultural sectors of those countries. In the early years a reduction in consumption subsidies and an increase in input prices lead to a cost squeeze that dramatically reduced both production and productivity. In recent years the agricultural sectors have stabilized, but can still be characterized as being less productive than their EU counterparts. In Poland land ownership and operation is still fragmented in a significant part of the country. Upstream and downstream industries are also just emerging from the changes of transition.

If our models are going to be used primarily for the analysis of changes in the CAP then is it necessary to address these issues – which are primarily issues regarding the baseline. It is important to remember that the baseline is a projection that will be used for comparison purposes, and not a forecast of the evolution of the sector. Nonetheless it is important that it capture developments in the sector. The best example is for cereals. If we were to assume a rapid and full convergence of yields between the NMS and the EU-15, this would likely push prices in the EU-25 to close to intervention levels. This will impact on the results of any scenario that put pressure on crop prices; in this case the impact would be a build up of stocks, whereas if less yield convergence were built in the impact would be felt in price levels and their relativities.

SAPS, the SFP, and CAP reform

As the NMS were concluding their accession agreement Agenda 2000 was still the prevailing CAP policy. In the mid-1990s numerous studies were produced that postulated large increases in agricultural production in the NMS on enlargement – based on the CAP in operation at that time. By the time the accession agreements were being concluded, the changes that had been made to the CAP, particularly the restrictions on the number of premia that could be paid (and the fact that the base year for these calculation was from the late 1990s), meant that the production stimulating effect of enlargement was reduced. In addition to this, agricultural policies in the NMS had evolved to resemble its CAP counterpart in many countries. Moreover, NMS except Slovenia, adopted the option upon accession of using the single area payment scheme (SAPS) rather than the standard CAP payments system. The SAPS is somewhat like the SFP to be adopted later and therefore introduced more decoupled payments as early as 2004.

The (further) decoupling of payments from production that was undertaken as part of the most recent reforms has further reduced the likely impact of the adoption of the CAP in these countries. However we have argued above that the SAPS/SFP should not be considered as fully decoupled and it is therefore likely to influence production to some extent. In the GOLD model payments are incorporated in the NMS in the same manner as for EU countries adopting a regional scheme, i.e. as a reduced value of the equivalent Agenda 2000 payment. Although the impact of the introduction of payments is limited, incorporating the CAP is likely to influence the sector, with changes in the levels of market support changing market prices.

The impact of converging market prices is relatively straightforward in the model. There are other issues of CAP implementation that are more problematic. One of the uncertainties is regarding the implementation of set aside. Under SAPS there is no obligation to set aside land. Even after countries implement the SFP, they may be able to avoid set aside implementation for several years. Also, farms below a certain area will not have to implement set aside, and these tend to be more prevalent amoung the NMS. Given the structure of farms in the NMS, and the fact that set aside will be spread over a larger area than would have been the case had Agenda 2000 been implemented, the

impact of set aside will be less than in the EU-15. However, one might expect that enlargement might prompt a restructuring of farms into larger units that could influence the outcome.

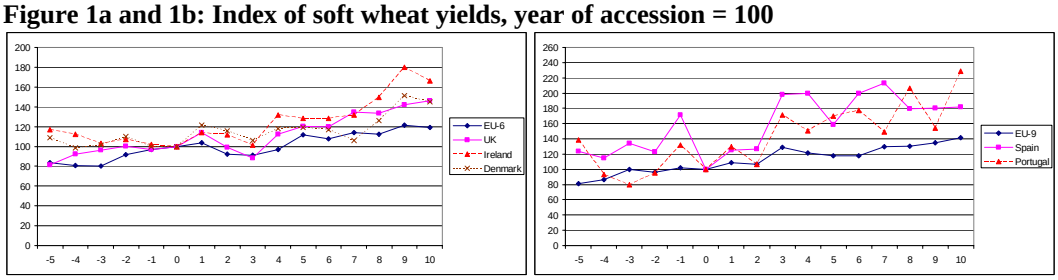
The Untenables

In addition to the impact of the adoption of CAP reform the act of enlargement itself is likely to impact the evolution of the agricultural sector in other ways, such as through increased flows of investment, increases in competition etc. A comprehensive evaluation of these impacts is beyond the scope of this paper but two key issues are discussed here for illustrative purposes. The importance of assumptions regarding yield growth for crops has already been outlined above. Yields in the GOLD model are influenced by economic factors with an increase in the price of a product increasing yields, and an expansion of planted area having the opposite effect. The most important component of the yield equations is the exogenous assumption that is made over technology.

As a result of the transition process yields in the NMS fell dramatically in most cases. There are a number of approaches that could be taken in determining future yields. One could assume that relativities between the NMS and EU-15 could return to their pre-transition levels, but high yields in the NMS in that period were boosted by subsidies on inputs. A convergence to EU-15 yields could be assumed, but the speed and extent of such convergence remains a question. A further choice could be to assume no convergence.

The 2004 enlargement is not the first enlargement of the EU. Figures 1a and 1b show the evolution of soft wheat yields in countries involved in the first two expansions of the EEC/EC/EU. The figures show that in the period after accession in all cases yields grew faster in the countries that joined in relation to existing members. Prior to accession, it appears from this rudimentary measure that growth in yields was at or below the EU level. It is not possible to form strong conclusions from this as there are many other factors that influence the situation, with a different CAP in place, and differences between the members and those acceding. Nonetheless, if the CEC yields were to converge with those of the EU-15 it would not be unprecedented.

Figure 1a and 1b: Index of soft wheat yields, year of accession = 100



In the model there is partial yield convergence – with the convergence varying by crop and by country, partially on the basis of existing differences between EU and NMS yields. In the first three years of accession some catch up is assumed, and thereafter yields in the CEC are assumed to grow faster than in the EU. For Example, over the projection period EU-15 wheat yields grow by 10 per cent, but NMS-10 yields are projected to grow by 25 per cent, but remain 25 per cent below EU yields by the end of the period.

In the early months after accession some of the livestock markets saw large changes in prices. In Poland, cattle prices pre-accession were half the level in neighbouring EU-15 countries, and there was a rapid period of equalization. Changes in these price differentials were built into the model, but it is harder to anticipate changes in the structure of industries themselves. CEC food companies have had to undertake widespread change in order to attain the kinds of standards of the EU-15, and where this continues to be the case CEC processors may struggle to compete with those in the EU-15. On the other hand, it may be that the populations of the CEC may be more open to establishment or

expansion of, say, pig or poultry processing facilities than those of some EU-15 countries. The EU has witnessed the migration of the pig industry south within the EU-15, perhaps EU enlargement would prompt a move east.

The examples that have been outlined above have been chosen to illustrate areas where economic models have difficulty, but which nonetheless have to be incorporated in a modeling framework. The FAPRI approach is to address these through interaction with experts in the form of policy makers or people from industry. Where analyst judgments are made it is important to make these transparent.

Quantifying the impact of enlargement

The baseline for this scenario is the one outlined above, that includes both enlargement and CAP reform. Is it possible to use this to assess the impact of enlargement? It is difficult as we would have to think carefully as to what constitutes a non-enlargement scenario. The issue of the CEC becoming members of the EU has been on the table since the early 1990s, and although a timetable for accession did not appear until much later, there has been the expectation of enlargement for many years, with agricultural policies moving towards a CAP like structure in many countries. In addition to this the Europe Agreements began a process of market integration, although the liberalization of agricultural trade was slower than for other products given CAP sensitivities.

Therefore a scenario quantifying the complete impact of enlargement is not possible given the model as it exists. What is possible, however, is to remove from the NMS in the model both the CAP, and the various adjustments that have been made such as those to yields mentioned above, and to observe the implications for the various markets. The model still solves for prices by clearing the EU-25 market, and therefore the model overstates the impact of changes in the NMS-10 on the EU-15. The scenario is therefore not very informative on the issue of enlargement but is useful in assessing the impact of the changes that we have made to the model.

Crops. Under the non-enlargement (NE) scenario, crop area is higher, Table 4. This is primarily as a result of the fact that prior to enlargement the CEC were not subject to set aside. Production increases are much smaller than the increase in area as a result of the fact that yield growth is not as high as in the baseline. Yields drop as the positive adjustment is removed, while lower prices and an expansion in area also reduce yields. The increase in production reduces EU prices and therefore EU-15 area falls slightly for cereals.

Table 4: Impact of NE scenario on crop variables, change between baseline and scenario, 2014.

	NMS-10	EU-15	EU-25
Area			
Wheat	4.56%	-0.03%	1.02%
Barley	5.31%	-0.13%	1.08%
Maize	0.02%	-0.40%	-0.27%
Rapeseed	2.75%	0.52%	1.09%
Production			
Wheat	1.15%	-0.10%	0.12%
Barley	1.96%	-0.15%	0.21%
Maize	-1.91%	-0.44%	-0.79%
Rapeseed	0.09%	0.49%	0.40%
Yield			
Wheat	-3.27%	-0.07%	-0.89%
Barley	-3.18%	-0.02%	-0.86%
Maize	-1.93%	-0.04%	-0.52%
Rapeseed	-2.59%	-0.03%	-0.68%
EU Prices			
Wheat		-2.83%	
Barley		-1.92%	
Maize		-2.40%	

Dairy. The projections for the impact of enlargement on both the dairy sector and the beef sector are dominated by assumptions regarding the Polish dairy sector. Poland is responsible for about half of the NMS-10 production of milk. Therefore, when approximately 10 per cent of this production is removed it has a large impact on the NMS-10 markets. The knock on effects on the EU-15 markets are small, however, given the existence of quota, and the relative size of the two regions. Eu-15 prices fall, but none by more than 1 per cent.

Table 5: Impact of NE scenario on dairy variables, change between baseline and scenario, 2014.

	NMS-10	EU-15	EU-25
Production			
Cheese	2.90%	0.07%	0.30%
Butter	7.54%	-0.12%	0.78%
SMP	7.66%	-0.77%	1.43%
WMP	6.22%	-0.14%	0.46%
Consumption			
Cheese	0.13%	0.31%	0.29%
Butter	-0.16%	0.51%	0.42%
SMP	-0.37%	0.22%	0.10%
WMP	0.30%	0.84%	0.78%
Prices			
Milk		-0.69%	
Cheese		-0.59%	
Butter		-0.98%	
SMP		-0.70%	
WMP		-0.62%	

Livestock and meat. The cattle sector results are dominated by the evolution of the herd in Poland. Under the baseline, dairy production is reduced dramatically to levels close to the quota. With this adjustment removed, the number of dairy cows is higher and this supports beef production which therefore increases as well. The increases come despite the fact that beef cow numbers are significantly lower as a result of the increase in dairy cow numbers and lower prices for beef. The removal of the SFP also has an impact, although this is much lower than would be the case if the comparison were to its Agenda 2000, more coupled, counterpart. Pork production in the NMS-10 is reduced because a positive adjustment to sow numbers in those countries is removed.

The impact on the EU-15, and on the total EU-25 figures is muted by the relative size of the NMS-10, particularly with respect to the number of beef cows. In both the EU-25 and EU-15 none of the variables changes by more than 1 per cent. The NE scenario results in lower beef, sheep meat and poultry prices, with the decrease in pork production in the NMS-10 resulting in a small positive impact on EU-15 pork prices.

Table 6: Impact of NE scenario on livestock and meat variables, change between baseline and scenario, 2014.

	NMS-10	EU-15	EU-25
Numbers			
Beef cows	-12.77%	0.11%	-0.74%
Cattle	2.46%	0.04%	0.31%
Pigs	-5.01%	0.68%	-0.52%
Sheep	-2.35%	0.11%	0.06%
Production			
Beef	1.96%	0.05%	0.22%
Pork	-5.11%	0.84%	-0.16%
Sheep meat	-3.36%	0.08%	-0.05%
Poultry	0.18%	0.24%	0.23%
Consumption			
Beef	0.06%	0.09%	0.09%
Pork	-0.13%	-0.17%	-0.16%
Sheep meat	-0.11%	-0.05%	-0.05%
Poultry	0.17%	0.21%	0.20%
EU Prices			
Beef		-0.53%	
Pork		0.24%	
Sheep meat		-0.10%	
Poultry		-0.74%	

As has been noted below the NE scenario is a rather artificial scenario that does not capture all the impacts of EU enlargement. It is difficult to determine an alternative situation where all the aspects of enlargement are incorporated, given that even without accession there would have been some integration of the two markets through the trade agreements, or through foreign land ownership or some other transfer of EU-15 production techniques. All the scenario really shows is that on the variables that we model, the adjustments that we are making to attempt to capture the transition process may have significant impacts on the countries concerned, but the reform of the CAP really means that the impact of implementing the CAP is likely to be limited.

The reader should not take this as an argument that either enlargement or the introduction of the CAP will have limited impact on the EU or the NMS-10. Clearly, the transfer of payments will see incomes of those who receive them rise dramatically, and this will impact on the evolution of the overall rural economy of the NMS-10.

Conclusions

The objective of this paper has been to focus on the practical aspects of the incorporation of CAP reform and enlargement in a partial equilibrium model of the agriculture sector. In some respects, these examples illustrate the strengths and weaknesses of the type of approach that is used here. The advantages of a model such as GOLD is that it is relatively flexible, and can therefore be amended in an attempt to incorporate the idiosyncrasies of the SFP, for example. The disadvantage is that the modeler is often reliant on the input of research from outside of the model for key parameters, including the decoupling coefficients. Where such research is not available the model is not able to generate its own estimates of those parameters and therefore the calibration of the model is reliant on the available information, the judgment of the modeler and the input of the peer review groups.

The results that the model produces on the impact of CAP reform are largely consistent with those that have been reported by other similar models. The impacts are largest in the livestock sector where the Agenda 2000 payments were most coupled, whilst there is a limited effect in the cereals sector.

Reform has limited the impact of the introduction of the CAP in the NMS. It is likely that the introduction of SAPS and the SFP will have an impact on the evolution of the sector, but the larger implications may be for the rural economy as a whole as a result of the impact on incomes. Enlargement itself is likely to have a greater impact, both through access to EU markets, but in a number of other ways that are altogether more difficult to model, such as the acceleration of yields or the implications of different tolerances for certain agricultural practices.

As the modeling system is so reliant on the rather ad hoc approaches that are outlined in this model, criticism is often made as to the validity of the modeling exercise. However, models such as GOLD are capable of making valuable additions to the policy debate, because the assumptions that underlie the projections are very transparent and the models capture the complex interactions in markets and provide useful information for policy makers, whilst the assumptions that underlie the projections are made transparent. The usefulness of such models was illustrated by the contributions that were made during the CAP reform process.

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