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THE PHASING OUT OF EU AGRICULTURAL EXPORT SUBSIDIES: IMPACTS OF TWO MANAGEMENT SCHEMES

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ABSTRACT. The present round of multilateral trade negotiations at the World Trade Organisation is likely to put an end to European export subsidies on agricultural and food products. This paper attempts to evaluate such a policy scenario. Its main contribution is to compare two management schemes for the European Union economy. The first one has confidence in the equilibrium role of market prices while the second one favours a supply management approach. Our empirical results, based on a computable general equilibrium model, show huge effects on the dairy sector and reveal that the choice of a management scheme has a substantial bearing on sectoral welfare effects.

JEL Classification: Q11; Q18; D58.
Keywords: World Trade Organization; Common Agricultural Policy; Export Subsidies; Supply Management.

RÉSUMÉ. Les présentes négociations commerciales multilatérales conduites à l'Organisation mondiale du commerce vont probablement aboutir à une suppression des subventions européennes aux exportations de produits agricoles et agroalimentaires. Cet article propose une évaluation des impacts économiques d'un tel scénario au niveau européen. Sa contribution majeure est de comparer deux modes de gestion de cette suppression, le premier par une baisse des prix domestiques, le second par un renforcement des mesures de contrôle de l'offre domestique. Les résultats d'une modélisation en équilibre général calculable montrent que la suppression des exportations subventionnées affecte très fortement la filière laitière et que le choix d'un mode de gestion a des conséquences substantielles sur les gains et pertes des différents agents économiques.

Classification *JEL* : Q11 ; Q18 ; D58.
Mots-clefs : Organisation mondiale du commerce ; politique agricole commune ; subventions aux exportations ; contrôle de l'offre.

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Introduction

World Trade Organisation (WTO) members are now truly engaged in a new round of multilateral trade negotiations, often referred as the Millenium Round (MR) or the Doha Development Agenda (DDA). The final outcome of the MR is at present highly uncertain, notably due to the excessive complexity of the agricultural dossier. Agricultural negotiations focus on three main areas: market access, domestic support and export competition. There exist many economic analyses showing that progress on the market access chapter may be difficult to obtain because further liberalisation here may be detrimental for developing countries (mainly *via* lost benefits from preferential trade agreements) (for instance, Francois *et al.*, 2003). In the same vein, available economic analyses tend to conclude that further liberalisation of "domestic support" instruments may lead to very limited benefits, if any (for instance, Dimaranan *et al.*, 2003). On the other hand, the negotiations on the third area seem to be less difficult to conduct as there is only one major user of export subsidies (the European Union, EU) and accordingly, impacts for each WTO member are more easily identified. Some observers then believe that these negotiations with the large number of players with diverse and conflicting interests are likely to evolve towards a modest outcome characterised by only new firm commitments on export subsidies (for instance, Vanzetti and Peters, 2003).

According to their position papers, the vast majority of WTO members are calling for outright elimination of export subsidies. Leading countries for the complete removal of these instruments include the members of the Cairns Group and the USA. As expected, the EU does not (officially) support this proposal. Instead, the EU position paper of January 2003 proposes an average 45% cut in the level of export subsidies and requests flexibility in the implementation of this constraint. The analysis of the evolution of EU export subsidies may help to understand this proposal. Since the beginning of the 1990s, one can observe a tendency towards the reduction of EU total export subsidies. They decrease on average by nearly 10% annually, but this reduction is unequally distributed between agricultural products. Export subsidies on dairy and sugar products have slightly decreased compared to export subsidies on arable crops or meat products. The two reforms of the Common Agricultural Policy (CAP) (the "MacSharry" reforms of 1992 and the "Agenda 2000" of 1999), with reductions of market price support compensated by increasing direct payments, clearly have positively contributed to this phenomenon. It is still too early to perceive the full effects of the last reform but it seems not unlikely that export subsidies continue to prevail in the near future, at least on dairy and sugar products. In a general way, economic analysis of the Agenda 2000 CAP reform supports this view. For instance, Van Meijl and Von Tongeren (2000) argue that there will remain significant export subsidies on dairy and sugar products accompanied by only small export subsidies on other products after Agenda 2000.[2] They furthermore underline

2. According to these authors, the export subsidies on feed grains are heavily dependent on world market conditions.

that further adjustments of the CAP are inevitable in case of new international commitments on export subsidies. The "45%" proposal of the EU may thus be viewed as a first negotiation position which minimizes CAP adjustments and still represents an offer at the WTO.

Given this political context, we believe that a complete removal of EU export subsidies on agricultural and food products is a likely scenario. In fact, several quantitative evaluations of such scenario have already been performed. They generally focus on the market effects of this policy experiment and rarely discuss effects on agents' welfare. TABLE 1 shows selected results from published studies. Most of them find that the phasing out of European agricultural export subsidies, after the full implementation of the Agenda 2000 CAP reform, will lead to notable reductions of domestic prices and will have moderate impacts on world prices. The impacts on EU exports will all be negative, except for wheat due to cross-market effects. However, the magnitudes of these effects differ substantially across studies. An example is the reduction of the domestic price of soft wheat ranges between 0% and 8.6%. It is well recognised that several modelling factors have a substantial bearing upon model outcomes. For example, the OECD and US Department of Agriculture (USDA) analyses highlight the sensitive issue of exchange rate assumptions. On the other hand, one common feature of all these evaluations concerns the management scheme of the removal of export subsidies. All assume that domestic prices are allowed to adjust downwards in order to restore market equilibriums. Other things being equal, these price reductions stimulate domestic demands and reduce domestic supplies, so that export supplies contract. Without any compensation in the guise of new or increased direct payments, this necessarily leads to a decrease of farmers' profits, an increase of the domestic consumer surplus and a reduction of public expenditures.

Our main purpose in this paper is to contribute to this literature on the evaluation of the phasing out of agricultural export subsidies by comparing the impacts of two alternative management schemes. The first scheme, hereafter referred as the price management scheme, assumes, like previous analyses, an adjustment of domestic prices to restore market equilibriums. The levels of other CAP instruments are unchanged in this case. In contrast, the second scheme, hereafter referred as the quantity management scheme, relies on the strengthening of supply control instruments. The main Common Market Organisations (CMOs) of the CAP involve instruments designed to regulate domestic supply of agricultural and food products. The most evident examples are the production quotas in the dairy and sugar CMOs. As far as the arable crop CMO is concerned, one must be aware that the land set-aside scheme restricts cultivated land and, by way of consequence, the domestic supply of arable crops. The beef CMO also includes supply control measures, mainly through animal density limits for direct payments. Therefore, the political tools are already present to impose greater control on domestic supplies and thus to reduce export supplies, other than through price reductions.

Table 1 - Literature review on the impacts of the phasing out of agricultural export subsidies

Differences in percentages from the benckmark

	Authors				
	OECD*	Elbehri and Leetma	Leetma**	Bienfield *et al.*	Gohin and Meyers***
Wheat					
European price	–3	–0.4	–8.6	–7	0
World price	–1	+0.3	–6.1	n.a.	n.a.
European exports	+14	+0.6	+19.5	+3	+0.4
Coarse grains					
European price	–14	–0.7	–13.2	–9.3	–2.3
World price	+1	+1.4	+4.9	n.a.	n.a.
European exports	–59	–14.4	–17.3	n.a.	–71.6
Beef					
European price	–14	–0.3	–59.7	–17	+1.6
World price	~0	+1.5	n.a.	+3	n.a.
European exports	–72	–6.9	–100	–70	–14.2
Pork/Poultry					
European price	+2	–0.2	–13.2	n.a.	–0.4
World price	0	+0.9	+10.1	n.a.	n.a.
European exports	–32	–2.4	–44	n.a.	–35.4
Milk					
European price	–10	–0.2	n.a.	–17	–18.7

n.a.: non affected.
* Results obtained in the base case regarding the value of the Euro.
** Results obtained with a Euro stronger than dollar.
*** Results obtained with the flexible specification.

Evaluating the impacts of the quantity management scheme may at first sight appear as not relevant, given that the CAP had evolved since 1992 towards a re-instrumentation of income support in favour of direct payments and to the detriment of market price support. Moreover, the last reform (the so-called Mid Term Review (MTR)), while still not completely defined, will make this re-instrumentation more pronounced. Despite this evolution, we are of the opinion that a new evaluation is valuable for the following reasons. Firstly, some EU members are actually reluctant concerning some MTR decisions, notably the reduction of dairy intervention prices and the increase of dairy quotas. Secondly, the main organisations representing interests of the EU farmers are also opposed to new price reductions and furthermore they argue that supply management should be part of the future EU agricultural policy. Thirdly, the quantity management system may have the support of some EU institutions, like the European Court of Auditors. Fourthly, this strategy may also favour net exporters in the Rest of the World (RoW), because it provides support to the world price of agricultural and food products (for instance, FAPRI, 2002 on the arable crop CMO). Finally,

this system is widely applied both in agriculture (for instance, the milk sector in North American) and in non-agricultural sectors (e.g. crude oil). Consequently, there potentially exist some supporters of the quantity management scheme and our comparative analysis can be viewed as a contribution to the debate about the future of the CAP.

Our numerical assessment of the two management schemes is conducted with a recently built Computable General Equilibrium (CGE) model focused on the EU food and agricultural sectors. This CGE model offers a detailed representation of CAP instruments and is therefore well designed for our objective in this paper. Moreover, by its very nature, this modelling framework allows us to evaluate the impacts of the two schemes on market variables (supply, demand, price, export, etc. as well as on agents welfare (consumer surplus, farm profits, taxpayer contribution, etc.). Hence we can identify winners and losers in each case. Before embarking on this empirical analysis, we first turn to a review of the theoretical advantages and drawbacks of the two management schemes.

PRICE *VERSUS* QUANTITY MANAGEMENT: A THEORETICAL ANALYSIS

Analytical framework

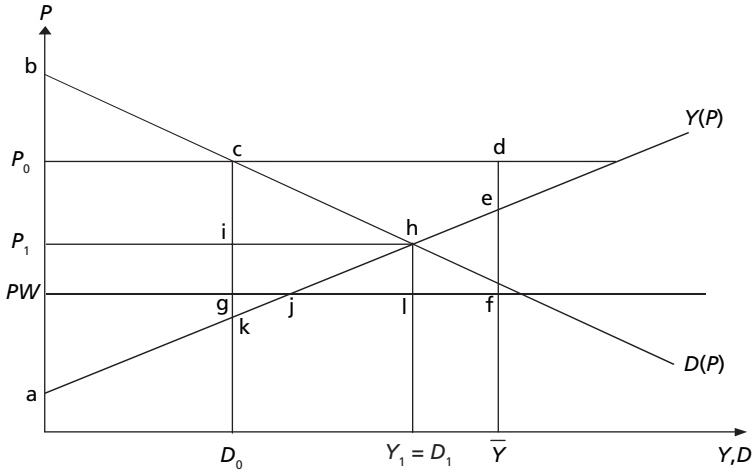
The main consequences of the two management schemes for the phasing out of agricultural export subsidies are set out with a graphical analysis (see FIGURE 1). To keep this analysis manageable, we first consider a partial equilibrium framework with only one agricultural market and where the world price (*PW*) is assumed to be exogenous (small country assumption). This initial framework is very stylised but still permits some critical trade-offs to be identified.

We assume that two agricultural policy instruments are initially in place: a market price support system at price P_0 and a production quota system at level $\overline{Y}$. The market price support system is in practice ensured by the imposition of a tariff (at least equal to the difference between the guaranteed price and the world price) which prevents imports and by the granting of export subsidies which allows excess domestic supply to be disposed on the world market. The production quota system is assumed to be active in this initial situation, as domestic producers want to produce more than the quota level at the guaranteed price. Linked to this quantity constraint is the unit quota rent, defined by the difference between the guaranteed price and the shadow price of the quota (i.e. the price that would induce farmers to produce freely at the quota level). This unit quota rent is given by the distance *de* in FIGURE 1. In this initial situation, the domestic supply is greater than the domestic demand (denoted by D_0) and the export level is given by the difference between these two quantities. Export subsidies then amount to the area *cdfg*. Producer profit is equal to the area *a* P_0 *de* and consumer surplus to the area *b* P_0 c. Total welfare is usually measured as the sum of these two welfare measures, less public expenditures. It is given here by the difference between the area abcgj and the area *jef*. At this stage, one can check that this initial welfare

is lower than in the free trade case, but greater than in the situation with only a market price support system. In other words, the production quota system reduces the distortions in production due to the market price support regime, but is only a second-best solution.

In this setting, let's first consider the price management scheme whereby policy-makers allow the domestic price to adjust downward in order to fit domestic supply to unsubsidised total demand. The resulting equilibrium is then characterised by the new domestic price P_1 which is lower than the initial guaranteed price. This price reduction stimulates domestic demand to the level D_1 and, at the same time, reduces production incentives. We observe that, at the end of the day, domestic production is equal to domestic demand and that the quota level is no longer binding. In other words, the price reduction is sufficient to set the quota rent at zero. The production quota system is therefore not active, whereas the market price support system operates with a new guaranteed price, lower than the initial one. There still exists one tariff which prevents imports from entering into the domestic market. If there is no

Figure 1 - Market impacts of two management schemes of the phasing out of export subsidies



Welfare impacts of two management schemes of the phasing out of export subsidies

	Initial situation (I)	Price management (II)	Difference (II) – (I)	Quantity management (III)	Difference (III) – (I)	Difference (III) – (II)
Producers profit	*a* P_0 *de*	*a* P_1 *h*	$-P_0$ P_1 *hed*	*a* P_0 *ck*	*–cdek*	P_0 P_1 *ci-ihk*
Consumer surplus	P_0 *bc*	*b* P_1 *h*	$+P_0$ P_1 *hc*	P_0 *bc*	0	$-P_0$ P_1 *hc*
Public expenditure	*cdfg*	0	*–cdfg*	0	*–cdfg*	0
Total domestic welfare	*abcgj-jef*	*abh*	*+cgfeh*	*abck*	*ejf-gjk*	*–chk*

compensation in the form of direct payments, the producer's profit becomes equal to the area $a\ P_1\ h$. It is therefore lower than the initial profit due to both price and supply reductions; the profit reduction is equal to the area $P_1\ P_0\ deh$. On the other hand, the consumer's surplus increases by the area $P_1\ P_0\ ch$, thanks to the price reduction and the consequent increase in domestic demand. Finally, public expenditures become zero. Total welfare is then equal to the area *abh* and greater than the initial one by the area *cgfeh*. This welfare gain results from the reductions of distortions to domestic production and to domestic demand. The resulting welfare is still lower than in the free trade case, as we assume that there remains one tariff which is at least equal to the difference between the new equilibrium price and the unchanged world price.

Let's now consider the quantity management scheme. The reduction of total demand following the phasing out of export subsidies may be accompanied by an exogenous reduction of domestic production. For simplicity, we assume that the policy-maker is able to fix the production quota at the initial level of domestic demand (D_0). Accordingly, the resulting equilibrium is given by an unchanged domestic price (P_0) and domestic supply equals domestic demand, so that exports are again zero. The production quota system becomes more binding, as suggested by the increased quota rent which reaches the *ck* distance on FIGURE 1. The market price support system is also active, insofar as tariffs are still required to prevent imports. The welfare effects of the quantity management scheme are completely different from those obtained with the price scheme. Consumers surplus is stable relative to the initial situation, because the domestic price is unchanged. Producers' profit decreases by the area *cdek*, due only to a volume effect. Public expenditures are still zero. As a whole, it is however not possible to determine if there is a welfare gain or loss. Total welfare changes by the difference between the area *efj* and *gjk*. This ambiguity can be explained as follows. The distortions in domestic consumption are unchanged with the quantity management scheme. The distortions in domestic production are, on the one hand, reduced thanks to the volume effect but, on the other hand, a new distortion appears. The shadow price at the new quota level is lower than the world price. Accordingly, some producers not only want to produce more given domestic price but also want to produce more given this world price. The total effect on the distortions in domestic production is therefore ambiguous.

We are now in a good position to compare the two management schemes. This is done according to two criteria. We first examine their economic efficiency before discussing their acceptability at the WTO.

Economic efficiency

In the static, partial equilibrium framework outlined above, there is no doubt that the price management scheme is more efficient than the quantity management scheme. The gain in total welfare is represented by the area *chk*. One can note at this stage that both schemes lead to autarky and that this area corresponds to the welfare loss of imposing a production

quota at level D_0, in a closed economy. There is also no doubt that the price management scheme is preferred by consumers, their surplus gain being equivalent to the area $P_0 P_1 hc$. Both schemes remove export subsidies; thus taxpayers are indifferent between them. As far as the interest of producers is concerned, we cannot provide a clear-cut conclusion. The difference in profit between the quantity and the price schemes is given by the area $P_0 P_1 ic$, less the area ihk. The trade-off facing producers is therefore between the pair "high price; low quantity" and the pair "low price; high quantity". It mainly depends on the production technologies and the structure of production costs. For instance, if the price elasticity of supply is very low, the positive volume effect in the price scheme can be modest and thus the producer will prefer the quantity management scheme. Therefore, if the political objective is to minimize the welfare loss of producers following the phasing out of export subsidies, this first theoretical analysis cannot provide a definitive answer. It may be in the interest of producers to strengthen the supply management instruments, as indeed they generally request.

At this stage, some qualifications are in order. Firstly, our demonstration is very simplified and a much more rigorous presentation of the welfare effects of different agricultural policy instruments, under different price elasticities of supply and demand, is available in Gardner (1983). Our contribution here is to adapt the general results detailed in this paper to our specific case of the removal of export subsidies. At the same time, we note that many papers have made use of Gardner's results.[3] For instance, de Gorter and Meilke (1989) determine the optimal policy instrument in order to achieve a given welfare of EU arable crop farmers and find that a policy based on production quotas is generally the most efficient. Secondly, our analysis is conducted assuming that only two policy instruments are available: the market price support system and the production quota. Extending this analysis by taking into account direct payments to primary factors will naturally affect the result, for example if we assume that compensation of profit loss by new direct payments is possible. The critical issue is to know whether the support of farm incomes by taxpayers is more efficient than the support by consumers. If one rests on the static, perfect competition, partial equilibrium framework used so far and considers that lump sum direct payments exist, then the compensation for the loss of producer income is no longer a real issue, and the price management scheme is then better for all economic agents than the quantity management scheme.

This last result depends on several assumptions that deserve, at the very least, further discussion. We successively consider, in a very brief and intuitive manner, some implications of three, maintained hypotheses: static, perfect competition and partial equilibrium.[4] The introduction of dynamic elements makes the comparison between the two management schemes even more complex. On the one hand, it is well recognised that production quotas hamper structural changes and thus generate inefficiencies. Moreover, gains from technical changes

3. Many are quoted in Bullock and Salhofer (2003) and Alston and James (2003).
4. More elements can be found in Gohin *et al.* (1999).

are not transmitted to the "market", and thus make reforms more difficult to finalise. On the other hand, farmers' expectations about output prices are not as critical in the quantity management scheme (with a binding level for the production quota) as they are in the price management scheme. Secondly, perfect competition is a widely adopted assumption, mainly by convenience. However, if one thinks that food processing and/or food retailing industries are not perfectly competitive, then the efficiency ranking of the two management schemes may again be altered. For instance, if scale economies are present and these industries adopt average pricing, the quantity management scheme may therefore be less efficient, as it reduces the supply of raw materials for these industries. In contrast, if these industries as a whole have oligopsony power, then the price reductions resulting from the price management schemes may not reach the final consumer, but may result in an increase of rents in these industries. Finally, the partial equilibrium analysis neglects the various effects in the rest of the economy. On the one hand, it does not consider the induced effects on other agricultural and food markets. If the quantity management scheme is applied to only one agricultural sector, there will be some reallocations of primary factors to other production activities and consequently the issue may only be displaced to another sector. On the other hand, this partial equilibrium analysis focuses on the market effects of the food and agriculture sectors and omits their non-market effects. In other words, the multi-functional role of agriculture was ignored so far. The design of an optimal policy for promoting the positive roles of agricultural activities on rural development and the environment is very complex, notably due to the difficulty to evaluate the transaction costs. In that respect, production quotas may have a role as they allow some farmers to stay in activity in some less favourable regions.

To sum up this discussion, the superiority of one management scheme in terms of economic efficiency is very difficult to establish theoretically. Excluding the traditional static, perfect competition, partial equilibrium analytical framework where lump sum transfers are assumed to exist, it seems possible to always find theoretical arguments in favour of one management scheme.

WTO acceptability

The comparison of the two management schemes in terms of acceptability at the WTO is much easier, because the focus is on market effects (price, production, demand, exports and imports) and not on the welfare effects discussed in the previous paragraph. The comparison of market effects is much less dependent of the analytical framework adopted (static/dynamic, etc.) insofar as the quantity management scheme will always lead to a higher domestic price than the price management scheme. For simplicity, we return to our initial analytical framework to discuss this point.

The acceptability of the two management schemes at the WTO is assessed in light of the three main areas of the agricultural negotiations. As far as the export competition chapter is

concerned, both management schemes are designed such as to remove export subsidies and naturally they are both acceptable from WTO partners of the EU.

On the domestic support dossier, we first recall the existing rules. Domestic support policies are henceforth placed in "boxes" according to their impact on international trade. Those policies that have "no, or at most minimal trade-distorting effects or effects on production" are placed in the green box and are not subjected to any constraint. There is a second box (the blue box) specifically designed to direct payments which are accompanied by programs aimed at limiting production. Finally, there is a third box (the amber box) which includes all policies that are deemed to be trade distorting. These "amber" policies are subject to reductions which are applied on a Aggregate Measure of Support (AMS). The market price support system presented in our analytical framework is clearly an amber policy and its contribution to the AMS is given by the product of the domestic supply multiplied by the difference between the domestic price and the world price. On the other hand, the production quota system is not an amber policy but, by its impact on price and production, it has some induced impacts on the contribution of the market price support system to the AMS. Returning to FIGURE 1, the initial AMS is given by the area P_0 *PW fd.* It reduces to the area *PW* P_1 *hl* in the price management scheme and to the area P_0 *PW gc* in the quantity management scheme.[5] So both management schemes lead to a reduction of the AMS, but it is theoretically impossible to determine which reduction is greater. At this stage, it must be clear that both management schemes would not be WTO compatible if the AMS must be set at zero.

Finally, the negotiations on the market access chapter are really complex due to the multiplicity of rules and instruments. We just stress here that the enforcement of the quantity management scheme relies on a greater tariff (equal at least to the *cg* distance on FIGURE 1) than the price management scheme (equal at least to the *ig* distance on FIGURE 1) in order to prevent a surge of imports. In other words, the maintenance of the community preference principle, which producers demand, is fundamental in the quantity management scheme.

To sum up, the quantity management scheme is theoretically less sustainable at the WTO than the price management scheme, mainly on the market access dossier. In practice, does it really matter? This is clearly an empirical issue that depends on many factors, notably the evolution of world market conditions and world prices. Let's suppose for a while that the world price in FIGURE 1 is equal to the equilibrium price. In this case, the price management scheme is fully WTO compatible while the quantity management scheme still needs to be negotiated. In the same vein, the effective impacts on welfare of the two management schemes discussed in the previous paragraph depend to a large extent on the world market conditions. Thus we now turn to the empirical part of our paper.

5. It clearly appears within this discussion that the three areas of agricultural negotiations are not completely independent (see de Gorter, 1999, for a comprehensive and useful discussion of this point).

PRICE *VERSUS* QUANTITY MANAGEMENT: AN EMPIRICAL ANALYSIS

Modelling framework

Our empirical comparison of the two management schemes is performed with a CGE model. It is a static, single-country, multi-sector CGE model of the EU15 economy, benchmarked to data for 1995. The model highlights the food and agricultural sectors and can therefore be referred as a "sector-focused" model. The model is neo-classical, assuming perfect competition in all markets and without any risk factors. Accordingly, this model adopts simplifying assumptions and therefore cannot provide a definitive answer to our purpose of comparing two agricultural policies.[6] It nevertheless sheds light for the first time on this topic, by considering simultaneously all agricultural sectors and moreover the whole food chain. We only stress below the most important characteristics of this model for the present analysis; more details are available from Gohin and Meyers (2002).

The first originality of the version of the model used for this paper comes from the disaggregation of the EU economy into activities and commodities (see TABLE 2). The model identifies 17 sectors and 54 products. Many sectors have multi-product technologies, and moreover, some commodities may be supplied by different sectors. Concerning agriculture, we consider one aggregate sector, 19 sub-sectors and 23 commodities. At the food processing level, the current version identifies 6 sectors and 21 commodities. Finally, the 10 sectors of the rest of the economy are mono-product. This rather detailed level of disaggregation of the food complex is motivated by three factors. Firstly, it allows us to capture the main forward and backward linkages among the various agricultural activities, as well as the linkages among these agricultural sectors and their economic environment (food processing, raw material suppliers). Secondly, it facilitates the specification of agricultural production technology, where substitution among intermediate inputs, and between intermediate inputs and primary factors of production, plays a crucial role. Thirdly, it enables an accurate representation of the intricate workings of the main CAP instruments.

This modelling of the CAP instruments is the second originality of the model. In a general way, the main agricultural policy instruments are modelled explicitly and in a complementary fashion. Explicit modelling of policy instruments means that they are represented as closely as possible to their actual functioning. Complementary modelling means that regime switches are allowed. Practically speaking, our CGE model provides a detailed treatment of the following CMOs: arable crops, dairy, sugar, beef meat, pig meat and eggs and poultry, along with the following policy measures: price support, supply control, trade and income support.

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6. Our CGE model is static, i.e. we do not specify dynamic behaviour of economic agents. That does not prevent the usual analysis of short run/long run impacts, which mainly refers to the degree of mobility of primary factors of production between activities.

Table 2 - Sectors and commodities correspondence

Sectors		Commodities
Agriculture		
Agricultural sub-sectors	Soft Wheat	Soft Wheat
	Barley	Barley
	Maize	Maize
	Rape	Rape
	Sunflower	Sunflower
	Soya	Soybean
	Protein crops	Protein crops
	Sugar beet	A&B Sugar beet, C sugar beet
	Fodder	Fodder
	Poultry	Poultry, Organic nitrogen, Organic phosphate, Organic potassium
	Pigs	Pigs, Organic nitrogen, Organic phosphate, Organic potassium
	Laying hen	Eggs, Poultry, Organic nitrogen, Organic phosphate, organic potassium
	Dairy cows	Bovine cattle, Raw milk, Calves, Daity cows, Organic nitrogen, Organic phosphate, Organic potassium
	Suckling cows	Bovine cattle, Calves, Suckling cows, Organic nitrogen, Organic phosphate, Organic potassium
	Beef calf	Bovine cattle, Organic nitrogen, Organic phosphate, Organic potassium
	Calf rearing	Bovine cattle, Heifers, Bulls and Steers, Dairy cows, Organic nitrogen, Organic phosphate, Organic potassium
	Heifers	Bovine cattle, Dairy cows, Suckling cows, Organic nitrogen, Organic phosphate, Organic potassium
	Bulls and Steers	Bovine cattle, Organic nitrogen, Organic phosphate, Organic potassium
	Other agricultural activities	Other agricultural products
Food processing		
Meat industry		Bovine meat, Pig meat, Poultry meat, Carcass meals
Dairy industry		Butter, Skimmed milk powder, Cheese, Other dairy products
Compound feed industry		Compound feed
Cereal processing industry		Grains bran, Corn gluten feed, Other cereal processed products
Oilseed crushing industry		Rape oil, Sunflower oil, soybean oil, Rape cake, Sunflower cake, Soybean cake
Sugar industry		A&B Sugar, C sugar, Sugar beet pulp, Molasses
Rest of the economy		
Mineral nitrogen		Mineral nitrogen
Mineral phosphate		Mineral phosphate
Mineral potassium		Mineral potassium
Pesticides		Pesticides
Veterinary products		Veterinary products
Fish meals		Fish meals
Other energy rich feed		Other energy rich feed
Other protein rich feed		Other protein rich feed
Other feed ingredients		Other feed ingredients
Other sectors		Other sectors

The third originality we want to underline is the specification of price elasticities in this model. It is well-recognised (and quite obvious) that the specifications of production technologies and consumer preferences (or, equivalently, price and income elasticities) are fundamental in all applied models, either of Partial Equilibrium (PE) or General Equilibrium nature. Despite this evidence, much CGE analysis (and even PE analysis) is still performed with poor representations of substitution possibilities on the demand and supply sides. This is not the case with our model, which uses regular-flexible functional forms for the specification of production technologies and consumer preferences. Our price and income elasticities are taken from available econometric results.

Experiment design

The parameters as well as the exogenous variables (in particular, the levels of policy instruments, the world market prices) of our CGE model are calibrated using 1995 data. Accordingly, we first need to define a benchmark situation before comparing the two management schemes. At least three points must be considered for the definition of the benchmark. Firstly, the EU adopted the Agenda 2000 CAP reform in 1999, and the MTR reform in 2003. Basically, these two CAP reforms extend the previous MacSharry reform by lowering price support instruments and increasing direct payment instruments. We introduce in our benchmark the Agenda 2000 CAP reform but do not consider the MTR for two reasons. One is that this reform is still not completely defined, for example regarding cross-compliance. The second is that the phasing out of export subsidies may occur before the full implementation of the MTR, as these export subsidies are now illegal from a WTO viewpoint.

Secondly, the mid-1990s were characterised by high world prices of agricultural products, reduced gaps between European and world prices and limited European export subsidies. Using 1995 data as the benchmark is therefore likely to underestimate the impacts of export subsidies. Since the late 1990s, world prices have considerably decreased and European export subsidies have risen again, at least for cereals. Using recent data for our policy evaluation is likely to lead to stronger impacts of these export subsidies. But many agricultural projections foresee favourable world market developments and high world prices for the forthcoming years of this decade. So it is very difficult to define correct world market conditions. Then we will perform a sensitivity analysis to the world market conditions. In the base case, we assume that world market conditions in the benchmark are similar to those that prevailed in 1995.

Finally, we check that Uruguay Round Agreement on Agriculture (URAA) constraints, as defined in the domestic support and export competition commitments, are satisfied in this benchmark. All other parameters and exogenous variables specified in our CGE model are left unchanged. In particular, the growth of population, the technical change, evolution of consumer tastes, etc., are not taken into account. As a consequence, our reference situation does not intend to represent a precise year in the 2000s.

Endowed with our computed reference situation, we then consider the two management schemes of a phasing out of EU export subsidies. We focus the analysis on the following products: soft wheat, barley, maize, beef meat, pig meat, eggs, poultry meat, butter, skimmed milk powder, cheese, other dairy products, cereal processed products. The price management scenario is implemented by assuming that the domestic prices of all these products can decrease and that the supply control measures (land set-aside, dairy quotas, animal density limits) are left at their Agenda 2000 levels. The quantity management scenario differs from the price management scenario by assuming that the milk quotas are reduced. We test two percentage reductions of the milk quota (–6% and –7.5% with respect to the Agenda 2000 level), as it is not obvious for policy-makers to anticipate the level of domestic demand in the reference situation and the quantity that will leave the domestic price unchanged. In this last scenario, the prices of all products are still free to adjust, upwards or downwards. As already mentioned in the theoretical analysis, the quantity management scheme strongly relies on the assumption that the community preference principle can be preserved. Thus we assume in this scenario that new flow of imports of any agricultural and food product cannot enter the EU market. In other words, we implicitly assume that the EU is able to prevent new imports with actual commitments on tariffs and/or new measures of protection.

We recognize that our comparative analysis is very illustrative as we only focus on the dairy sector and exclude sugar export subsidies (and quotas) from the analysis. But this offers the great advantage that analysis of results is simpler to present, compared to a "multiple shock" scenario, and more understandable. Moreover, we believe that this is not completely irrelevant, in particular because the reform of the sugar CMO has been postponed several times and that there is actually significant opposition to an increase of dairy quotas.

Results and discussion

Brief description of the reference situation

Selected results of the reference scenario are reported in TABLE 3. We provide the reference values of export subsidies, the ratios between world and domestic prices and the shares of exports in domestic production.[7] The most interesting characteristics of this reference situation are the following. Export subsidies on cereal products are nearly zero. In fact, very few export subsidies remain on coarse grains (€2 million on barley). We also note that the domestic price of barley is slightly higher than the world price, and that exports of barley represent a small share of domestic production. Accordingly, the removal of export subsidies on this cereal is likely to lead to very limited reductions of domestic price and/or domestic

7. We adopt in our CGE model the traditional Armington specification to model import demand functions and export supply functions. Accordingly, there is no unique price for the domestically produced good but a price which differs according to the destination. The ratios reported in TABLE 6 are computed using the domestic price of exported products.

production. Export subsidies on bovine meat are also zero in the reference situation. In contrast to the cereals' case, this comes from the fact that exports are zero. The domestic price of bovine meat is far greater than the world price and the preservation of significant market access instruments is clearly critical for the equilibrium of this domestic market. This 100% reduction of subsidies for bovine meat exports mainly comes from the intervention price reduction decided in the Agenda 2000 CAP reform and which stimulates domestic consumption.[8] On the other hand, the domestic consumption of other meats is penalized by this measure and, as a result, there remain some export subsidies on poultry meat and pig meat in this reference situation. It may be noted that, as a whole, export subsidies on all meats are significantly reduced compared to the mid 1990s. The differences between domestic and world prices of the other meats are sizeable, as well as their export shares in total domestic productions. Finally, export subsidies on dairy products are still considerable in the reference situation. They amount to €1.8 billion, which represents a 20% reduction compared to 1995. The dairy quota increase, decided in the Agenda 2000 CAP reform, partly compensates the intervention-price reduction effect on dairy export supplies. Furthermore, it may be noted that the differences between prices are still substantial, notably for butter and the aggregate of other dairy products (which includes whole milk powder), and that export shares are also significant. In particular, exports of skimmed milk powder represent 24% of domestic production. The phasing out of export subsidies will thus have huge impacts on the dairy sector. Generally speaking, these reference figures are in line with previous analysis (see introduction).

Table 3 - Export subsidies, price wedges and share of exports in the reference situation

	Export subsidy $(P_0 - PW)(\bar{Y} - D_0)$	World price/ Producer price* PW/P_0	Export/Production $(\bar{Y} - D_0)/\bar{Y}$
	Millions euros	%	%
Soft wheat	0	100	9.7
Barley	2	96.9	1.6
Processed cereals	0	100	0.6
Bovine meat	0	47.8	0
Poultry meat	177	81.0	5.9
Pig meat	125	91.1	3.5
Eggs	29	82.0	3.4
Butter	192	62.2	9.2
Skimmed milk powder	66	88.9	24.0
Cheese	566	74.3	9.1
Other dairy products	992	69.7	7.1

* World price divided by the domestic price of exports.

8. We once again stress that our reference situation is built on simplifying assumptions, notably that the tastes of consumers for all food products are unchanged with respect to the base situation (1995).

Impacts of the price management scenario

Market impacts of our three policy scenarios (one price management and two quantity managements) are reported in TABLE 4 and welfare impacts are displayed in TABLE 5. As expected, the phasing out of export subsidies has limited impacts on the arable crop markets. For instance, domestic supply of soft wheat decreases by only 0.4% relative to the benchmark; its domestic consumption also decreases by 0.6%, exports increase slightly (+1.5%) and finally the domestic price decreases marginally (0.1%). Effects on coarse grains (notably barley) are a little more marked, as they benefit from some export subsidies in the reference situation. Generally, the observed effects in the arable crop markets come mainly on the domestic demand side. Domestic demand of cereals decreases due to a contraction of animal production but the cereal price reduction does not compensate this first effect. Surprisingly, the reduction of cereals' production does not translate into an increase of oilseed production. For instance, rapeseed production decreases by 1.8%. Here too the demand side explains most of the results. Domestic demand of meals also decreases due to a contraction effect in this derived demand, while the domestic demand of oils decreases due to a substitution effect between fat products (including butter). As far as the white meat markets are concerned, the results are as expected. Domestic production decreases and domestic demand increases, so that export supplies contract. Despite zero export subsidies in the reference situation, the impact on the bovine meat market is significant. Domestic production even declines as much as poultry meat production. Again, this mainly comes from a demand effect. Domestic demand of bovine meat declines as a result of the substitution between all meats. Since this market is just "domestically balanced" in the reference situation, the reduction of domestic demand directly translates into a reduction in domestic production. The meat price effects may at first sight appear surprising, in particular the increase of the bovine meat price. However, one must note that the evolution of meat prices ratio is fully consistent with the evolution of domestic consumption. As expected, the main impacts of the phasing out of export subsidies are observed on the dairy markets. EU dairy products can hardly compete in world markets without export subsidies, due to the huge differences between prices in the reference situation. Accordingly, exports decline significantly. The most severe reduction is for butter, which experiences a 92.6% reduction in exports. Domestic prices of dairy products significantly decrease but with a rather limited effect on the domestic demand. For instance, domestic demand of butter "only" increases by 4.2%, when its price decreases by 19.3%. But butter exports represent 9.2% of domestic production in the reference situation. Thus domestic production decreases (by 4.6%) to restore market equilibrium. Price reductions of dairy products are translated into a huge decrease in the milk price. The latter is so high that the domestic production of raw milk is lower than the milk quota level. In other words, milk production quotas are no longer binding at the EU level.[9] The domestic production of raw milk decreases by 3.8% with respect to the reference situa-

9. It should be recalled that we do not increase or introduce new direct payments in our policy scenarios.

Table 4 - Market impacts of two management schemes of the phasing out of agricultural export subsidies

Percentage differences from the reference situation

	Domestic production			Domestic consumption			Exports			Domestic prices*		
	Price	Quantity 6	Quantity 7.5	Price	Quantity 6	Quantity 7.5	Price	Quantity 6	Quantity 7.5	Price	Quantity 6	Quantity 7.5
Soft wheat	–0.4	–0.6	–0.8	–0.6	–0.9	–1.2	+1.5	+2.2	+2.8	–0.1	–0.2	–0.3
Barley	–0.8	–1.1	–1.4	–0.4	–0.8	–1.1	–20.5	–18.8	–17.5	–0.8	–1.0	–1.1
Rape	–1.8	–0.5	+0.5	–2.4	–0.6	0.9	+4.7	+0.1	–3.4	–1.3	–0.1	+0.8
Rape oil	–2.7	–0.7	+1.0	–5.4	–0.6	+3.1	+3.3	–0.7	–3.6	–1.5	+0.1	+1.3
Rape meal	–2.7	–0.7	+1.0	–2.4	–1.1	0	–7.6	+5.1	+15.2	+0.8	–1.3	–2.8
Bovine meat	–1.2	–2.1	–2.8	–1.1	–2.0	–2.6	n.s.	n.s.	n.s.	+2.1	+2.8	+3.3
Poultry meat	–1.3	–1.3	–1.4	+1.5	+1.4	+1.3	–48.6	–48.4	–48.3	–1.3	–1.4	–1.5
Pig meat	–0.2	–0.2	–0.2	+0.8	+0.8	+0.7	–26.8	–26.6	–26.4	0	0	–0.1
Milk	–3.8	–6.0	–7.5	–3.8	–6.0	–7.5	n.s.	n.s.	n.s.	–17.3	–1.8	+11.0
Butter	–4.6	–8.6	–11.1	+4.2	+0.5	–2.0	–92.6	–98.9	–99.7	–19.3	–2.3	+12.6
Skimmed milk Powder	–5.7	–11.1	–14.2	+1.9	+0.7	–0.2	–30.2	–48.4	–58.6	–7.8	–4.9	–2.8
Cheese	–2.4	–5.0	–7.0	+2.6	+0.5	–1.2	–55.3	–62.9	–67.9	–5.9	–1.0	+3.0
Other dairy products	–4.6	–4.9	–5.1	–0.3	–0.3	–0.3	–66.0	–70.5	–73.6	–4.6	–0.5	+2.8

n.s. : non significant.

* Composite price of domestic price of exports and domestic price of goods solde on the domestic market.

Table 5 - Welfare impacts of two management schemes of the phasing out of agricultural export subsidies

Differences from the reference situation

	Price management		Quantity management 6%		Quantity management 7.5%	
	Millions euro	%	Millions euro	%	Millions euro	%
Arable crop complex	–239	–0.9	–249	–0.9	–250	–0.9
Arable crop farming	–109	–0.6	–78	–0.4	–51	–0.3
Cereal processing industry	–26	–0.7	–42	–1.2	–55	–1.6
Oilseed crushing industry	–20	–4.0	–11	–2.2	–3	–0.7
Compound feed industry	–84	–2.2	–118	–3.1	–141	–3.7
Dairy complex	–4695	–14.3	–663	–2.0	+2 524	+7.7
Milk farming	–3890	–23.5	+394	+2.4	+3 759	+22.7
Dairy industry	–805	–4.9	–1 058	–6.5	–1 235	–7.7
Meat complex	–122	–0.4	–234	–0.7	–318	–1.0
Ruminant farming	+114	+0.7	+90	+0.5	+72	+0.4
Non ruminant farming	–68	–0.7	+77	+0.7	+178	+1.7
Meat industry	–236	–1.6	–324	–2.2	–391	–2.6
Sugar complex	–14	–0.2	–10	–0.2	–6	–0.1
Sugar beet farming	+18	+0.6	+38	+1.3	+54	1.8
Sugar beet industry	–33	–1.0	–49	–1.5	–60	–1.8
Agribusiness	–5 139	–4.7	–1 080	–1.0	+2 128	+2.0
Agriculture	–3 935	–5.9	+522	+0.8	+4 013	+6.1
Food processing	–1 204	–2.8	–1 603	–3.8	–1 885	–4.5
EU Welfare	+2 652		+2 333		+2 011	

The welfare of producing sectors is measured by their value added. The EU Welfare is measured by the Equivalent Variation.

tion, which explains part of the reduction of bovine meat production. The main losers of this policy scenario are obviously the milk farmers. The first column of TABLE 5 indicates that their value added decreases by nearly €3.89 billion or by 23.5% with respect to the reference situation. This column also reveals that the arable crop growers and non-ruminant farmers lose under this scenario, but in much smaller proportions (respectively, €239 and €68 million).

As a whole, the agricultural sector experiences a welfare loss of €3.93 billion, which represents 5.9% of its value added in the reference situation. The food processing sectors are also adversely affected by this scenario. As a whole, they lose €1.2 billion of value added (2.8% of their reference value added). The milk processing industry is the main contributor to this negative welfare effect, mainly due to a contraction of production. Basically, with less raw milk available for processing, this sector creates less value added. The main winner of

this policy scenario is obviously the domestic consumer, and as a whole EU welfare increases by €2.652 billion.[10]

The impacts of the quantity management scenarios

The aforementioned figures may help to understand the fear of farmers (especially milk farmers) about the phasing out of export subsidies. Let's consider the quantity management scenario where it is assumed that policy makers decide to reduce the milk quota level by 6% with respect to the Agenda 2000 level (or by 3.8% with respect to the base year 1995). We first compare the market impacts of this scenario to those just described (see TABLE 4). Milk production decreases by 6% with respect to the reference run or by 2.2% with respect to the level obtained with the price management scheme. This further reduction of domestic supply allows milk and dairy product prices to be kept very close to their reference levels. The milk price decrease is limited to 1.8%, compared to the 17.3% obtained in the price management scheme. Compared to the price management results, the reduced supply is mainly supported by a reduction of domestic demands and to a lesser extent by exports. For instance, domestic demand of butter only increases by 0.5%, compared to 4.2% in the price management scenario. The impacts of this scenario on the other sectors are qualitatively similar to the impacts of the price management scenario. In particular, domestic production of cereals still decreases, by a slightly larger extent, because the derived demand for animal feeding suffers from a greater contraction effect. On oilseed markets, we have two competing effects. On the one hand, the derived demand of meals decreases a little more according to the same contraction effect. On the other hand, the final demand of oils decreases less than in the price management scenario, as there is less competition from butter. Because the value of rapeseed mainly depends on its oil and to a lesser extent on its meal, the "oil" effect dominates the "meal" effect, so that domestic production of rapeseed decreases less (0.5% compared to 1.8%). Finally, the main induced effects on the meat markets are a greater reduction of bovine meat production and a greater increase of its price.

It clearly appears that the welfare effects are now very different. Milk farmers now gain by €394 million and the value added of the whole agricultural sector increases by €522 million. But this comes at the expense of both the processing industries and domestic consumers. The value added of the food processing industries decreases by €1.603 billion. Nevertheless, the EU economy still gains by eliminating export subsidies, by €2.333 billion. Comparing the welfare effects of the first two scenarios, we find that the welfare gain of farmers is equal to €4.457 billion and the EU welfare loss is equal to €319 million. We thus find that the milk quota instrument is rather efficient in transferring support to agricultural producers, and this is in line with many previous analyses relying on static and perfect competition modelling assumptions.

10. This welfare measure takes into account the loss of agricultural and food processing sectors and roughly corresponds to the area *cgfeh* on FIGURE 1.

It may be tempting to conclude here that a production quota (and more generally supply management measures) are an advantageous policy instrument to support farm incomes. As already mentioned, our modelling framework is not sufficiently broad in scope to provide a definitive answer to this question. However, it makes it possible to show that a policy relying strongly on this instrument may be difficult to define. In this respect, the third scenario is helpful. This scenario considers a quantity management scheme in which the milk quota level is reduced by 7.5% with respect to the Agenda 2000 level. In a general way, the market effects are qualitatively similar to those identified in the second scenario. The welfare effects have the same polarity but their magnitudes are dramatically changed. With the sole 1.5% change in the milk quota level, agricultural value added increases by nearly €3.5 billion (5.3% of the reference value added) compared to €500 billion in the second scenario. This huge difference simply reflects the inelasticity of food demand at the aggregate level. As we prevent new imports in this scenario, the reduction of domestic supply necessarily leads to a huge increase of domestic prices. Thus, we believe that the definition of the "good" level of supply control measures is not a trivial matter.

Sensitivity analysis

The previous results obviously depend on many assumptions and in this paragraph we examine the sensitivity of welfare effects to the world market conditions.[11] TABLE 6 reports the results of this sensitivity analysis. We test two alternative hypotheses. The first one assumes that world market conditions are better for all agricultural and food products. Practically, we consider that the inverse export demand functions for all these products are 10% higher than previously assumed. The second alternative is symmetric (–10% with respect to the base). At this stage, two remarks are in order. Firstly, world prices are assumed, in our CGE model, to be dependent of EU exports and imports and thus are endogenous. On the other hand, the impacts of other countries on these world prices are not explicitly specified, and the 10% assumption indicates a change of the net trade position of these other countries. Secondly, these alternative assumptions about world market conditions also affect the results of the reference scenario. We then compare two management scenarios (price and quantity with a 6% reduction of the milk quota level) on different benchmark situations.

Let's concentrate on the case of better world market conditions and compare it to the base. First of all, we observe that the price management scenario leads to smaller EU welfare gains: €2.048 billion compared to €2.652 billion. This simply reflects the fact that the difference between domestic and world prices is smaller than in the base and accordingly there are less export subsidies in the new reference situation. But the difference between the two management schemes is roughly independent of these world market conditions: €319 million in the base, or €353 million under the favourable conditions. The most interesting result concerns the evolution of the agricultural value added. The price management of the phasing

11. Detailed results are available from the authors.

out of agricultural export subsidies has roughly the same effect on this variable, under the two world market conditions (reductions of €4.071 billion and €3.935 billion). This can be explained as follows. On the one hand, arable crop farming as well as non-ruminant farming gain more because they are able to export more on the world market. On the other hand, animal feeds are more expensive and the price increase of bovine meat is more limited, so that ruminant farming and milk farming loose more. The sum of these two main effects is slightly negative.

In contrast, the world price assumptions significantly affect the impact of the quantity management scenario on the agricultural value added: +522 in the base, +2406 in the favourable conditions. This results from the fact that the EU relies less on subsidised exports, notably of skimmed milk powder, and consequently that the domestic supply reduction generates more price increases in the domestic market. This strengthens our previous finding concerning the extreme difficulty to determine "good" levels for supply control measures.

Table 6 - Sensitivity of welfare effects to world market condition

Differences from the reference situations in millions euro; in parentheses. percentage changes

	World market conditions management					
	Base plus 10%		Base		Base minus 10%	
	Price	Quantity 6	Price	Quantity 6	Price	Quantity 6
Agriculture	–4 071 (–5.9)	+2 406 (+3.5)	–3 935 (–5.9)	+522 (+0.8)	–4 128 (–6.3)	–1 238 (–1.9)
Food processing	–738 (–1.7)	–1 378 (–3.2)	–1 204 (–2.8)	–1 603 (–3.8)	–1 524 (–3.6)	–1 764 (–4.2)
Agribusiness	–4 809 (–4.3)	+1 027 (+0.9)	–5 139 (–4.7)	–1 080 (–1.0)	–5 652 (–5.3)	–3 003 (–2.8)
EU Welfare	2 048	+1 695	+2 652	+2 333	+3 116	+2 876

The welfare of producing sectors is measured by their value added. The EU Welfare is measured by the Equivalent Variation.

Concluding comments

The present round of multilateral trade negotiations at the WTO is likely to put an end to direct European export subsidies on food and agricultural products. Available economic analyses, as well as negotiation positions of WTO members seem to converge on this outcome. This paper attempts to evaluate such a policy scenario in isolation from the other negotiating chapters (domestic support and market access), even if there are obviously some linkages. The main contribution of this paper is to compare two management schemes of this shock on the EU economy. The first one (labelled the price management scheme) has confidence in the equilibrium role of market prices, while the second one (labelled the quan-

tity management scheme) favours a supply management approach. After a theoretical analysis of advantages and drawbacks of both schemes, we conduct an empirical analysis using a CGE model focused on EU agricultural and food sectors. The main originalities of this applied model, which constitute significant departures from other CGE models currently in use, are threefold: a detailed disaggregation of food and agricultural sectors, a detailed representation of CAP instruments and a flexible, regular specification of production technologies and consumer preferences. Moreover, this modelling framework allows the winners and losers to be identified, in addition to evaluating market impacts of policy scenarios.

Both management schemes are evaluated against a common benchmark situation which assumes the full implementation of the Agenda 2000 CAP reform. In this reference situation, export subsidies on cereals and meat products are low, while still considerable on dairy products. In accordance with expectations, our empirical results show that the phasing out of agricultural export subsidies will have huge effects on the dairy sector and more limited impacts on arable crops and the meat sectors, whatever is the management scheme. Our empirical analysis also reveals that the choice of a management scheme has a substantial bearing on sectoral welfare effects. Agricultural value added greatly reduces with the price management scheme and quite independently of assumptions regarding world market conditions. In contrast, this value added does not necessarily decrease with the quantity management scheme. We even find that it can increase in case of strong supply management and/or favourable world market conditions. But this is to the detriment of the "downstream agents" of the food chain (food processing and consumers). As a whole, total welfare effects for the EU economy are rather similar across management schemes, but still slightly more favourable in the price management scheme.

Accordingly, our analysis once again illustrates the relative efficiency of an agricultural policy relying on effective supply management measures. Above all, its main contribution is to demonstrate that the precise definition of such a policy, in particular the levels of supply control measures, is exceptionally tricky. Supporters of an evolution of the CAP towards this direction must be aware of these consequences.

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References

Alston, J.M., James, J., 2003. The incidence of agricultural policy, in Gardner, B., Rausser, G. (Eds.), *Handbook of Agricultural Economics* Vol 2B, New York, North Holland.

Bienfield, J., Donnellan, T., Hanrahan, K., McQuinn, K., Westhoff, P., 2001. The impact of WTO export subsidy reductions on agricultural output, prices and farm incomes in Ireland, available from Teagasc webpage.

Bullock, D.S., Salhofer, K., 2003. Judging agricultural policies: A survey, *Agricultural Economics* 28, 225-243.

de Gorter, H., Meilke, K.D., 1989. Efficiency of alternative policies for the EC's common agricultural policy, *American Journal of Agricultural Economics* 71, 592-603.

de Gorter, H., 1999. Market access, export subsidies and domestic support measures: Issues and suggestions for new rules, paper prepared for the World Bank Conference "Agriculture and the new trade agenda from a development perspective: Interest and options in the next WTO negotiations", Geneva.

Dimaranan, B., Hertel, T., Keeney, R., 2003. OECD domestic support and the developing countries, paper presented at the sixth annual conference on global economic analysis (GTAP), The Hague, The Netherlands.

Elbehri, A., Leetmaa, S., 2001. How significant are export subsidies to agricultural trade? Trade and welfare implications of global reforms, paper presented at the annual conference of the American Agricultural Economics Association, Chicago, Illinois.

FAPRI-Food and Agricultural Policy Research Institute, 2002. The Doha Round of the World Trade Organisation: Appraising further liberalisations of agricultural markets, FAPRI Working Paper 02-317.

Francois, J., van Meijl, H., von Tongeren, F., 2003. A forward-looking analysis of the Doha Round, paper presented at the sixth annual conference on global economic analysis (GTAP), The Hague, The Netherlands.

Gardner, B., 1983. Efficient redistribution through commodity markets, *American Journal of Agricultural Economics* 65, 225-234.

Gohin, A., Gorin, O., Guyomard, H., Le Mouël, C., 1999. Interprétation économique, avantages et limites du principe de découplage des instruments de soutien des revenues agricoles, *Notes et Études Économiques* 10, 10-37.

Gohin, A., Meyers, C., 2002. The phasing out of export subsidies: Impacts on EU agriculture, paper presented at the second international conference on policy modelling, Brussels, www.ecomod.net.

Leetmaa, S., 2001. Analysis of export subsidy elimination, in Burfisher, M. (Ed.), Agricultural policy reform in the WTO – The road ahead, US Department of Agriculture, Agricultural Economic Report 802.

OECD, 2000. A forward-looking analysis of export subsidies in agriculture, Paris.

Van Meijl, H., Von Tongeren, F., 2000. The Agenda 2000 CAP reform, world prices and URAA GATT-WTO export constraints, paper presented at the third annual conference on global economic analysis (GTAP), Melbourne, June 27-30.

Vanzetti, D., Peters, R., 2003. Strategic interactions in trade policy negotiations, paper presented at the sixth annual conference on global economic analysis (GTAP), The Hague, The Netherlands.