
Modelling the effects of the EU Common Agricultural Policy

Catherine Costa, Michelle Osborne, Xiao-guang Zhang, Pierre Boulanger and Patrick Jomini¹

Paper presented at the Australian Conference of Economists
Sydney, 27–29 September 2010

Abstract

In this paper, the economic impacts of the Common Agricultural Policy (CAP) on the European Union, Australia and other major economies are estimated using the Global Trade Analysis Project (GTAP) general equilibrium model.

The CAP has undergone significant changes under recent reforms, with the aim of improving its market orientation. There is an increasing focus on breaking the link between direct income payments and production decisions — so called ‘decoupling’. This has changed the incentives faced by farmers in the European Union and around the world. The modelling results indicate that, despite attempts to cut the link between support and production, the CAP contributes to maintaining the farm and food sectors in the European Union at up to 8 per cent larger than if the CAP did not exist. The overall economic efficiency costs of the CAP for the European Union are estimated at \$US 52 billion. These costs are partly compensated for by an improvement in the European Union’s terms of trade, at the expense of its trading partners.

The additional farm and food output in the European Union depresses world prices for these goods, and increases world prices for manufactured goods and services. In non-EU regions, these price movements induce a contraction in the farm and food sectors, and an expansion in the manufacturing and services sectors. Some of the largest contractions occur in the livestock sectors in Australia–New Zealand and Latin America, and in the food processing sectors in most regions.

The estimated net effect of the CAP is to reduce global welfare by about \$US 45 billion, with the largest welfare loss incurred by the European Union itself.

¹ Catherine Costa, Michelle Osborne, Xiao-guang Zhang and Patrick Jomini are staff of the Productivity Commission. Pierre Boulanger is a research and teaching fellow at Groupe D’Economie Mondiale (GEM). This analysis was originally published as a Productivity Commission Staff Working Paper. The authors wish to acknowledge the helpful comments from referees Neil Andrews (ABARE), Catherine Moreddu (OECD) and Antoine Bouet (IFPRI). The views expressed in this paper are those of the authors, and do not necessarily reflect those of the organisations with which they are affiliated.

1. Introduction

Successive reforms of the Common Agricultural Policy (CAP) have seen it evolve from a set of commodity-specific programs designed to improve food security and support farm incomes in Europe, to a system of industry assistance with multiple objectives. Relatively recent developments of the CAP have included:

- the partial decoupling of direct income payments to farmers from production
- an increased focus on using assistance to achieve rural development and environmental objectives.

In addition to changes in policy, the membership of the European Union itself has changed dramatically with successive enlargements. For example, enlargement of the European Union from 15 to 25 member states added 4 million farmers to the existing 7 million, and increased the cultivated farming area by around 30 per cent to 130 million hectares (European Commission 2009a).

These changes in policies and membership have influenced how the CAP affects EU economies and, through global markets, economies around the world. The purpose of this paper is to estimate the likely economic benefits and costs of the CAP to the European Union and to the global economy.

Approach

The economic impacts of the CAP are evaluated using a computable general equilibrium (CGE) modelling framework. The Global Trade Analysis Project (GTAP) comparative static CGE model is used, together with the latest version of the GTAP database (version 7), which has a base year of 2004.

To evaluate the impact of the current regime on economic outcomes, a counterfactual scenario is modelled, where elements of the CAP are removed. Although the components of the CAP are interdependent, the main components have been modelled separately in order to better interpret their roles and contributions to the overall effects of the CAP.

The modelling results provide an indication of the aggregate allocative efficiency and welfare effects, along with sectoral effects — both within and outside of agriculture — on the European Union and on other parts of the world.

Economic modelling is limited in its ability to replicate the detail and complexity of the CAP, as well as the complex interactions of the global economy. Although CGE modelling is the most useful tool available for assessing the global and allocative economic effects of the CAP, it can only do so in a stylised way. It requires many simplifying assumptions, and

cannot directly estimate many potentially important effects of the policy, such as positive or negative externalities and adjustment costs. This means that although the modelling can be used to provide insights for policy analysis, for a complete analysis, it should be complemented by consideration of additional factors that are not accounted for in the modelling.

Scope

In this paper, the effects of three major components of the CAP — direct income payments, export subsidies, and border protection — are analysed. Rural development spending is not modelled because the effects of this class of spending are too complex and uncertain, and difficult to value (for example, the value of animal welfare or some environmental values), making it difficult to represent this class of expenditure and its effects in the existing GTAP database structure and model.

The reference year for this study is 2007 and mostly reflects policy from the major reform program implemented in 2003. It is important to note, however, that the CAP is continually evolving and, while some of the 2003 reforms are yet to be fully implemented, other reforms have been agreed to since then and are being implemented.

All 27 members of the European Union are covered in this study. This includes the EU15 member states and the 12 new member states (NMS).² In the case of direct payments, however, the focus is only on the EU15 because, as at 2007, the NMS account for only a small share of direct payments. The main focus of CAP expenditure in the NMS is on rural development. Direct payments to the NMS are being phased-in gradually over the period to 2013 in most cases.

The impacts of assistance to agriculture on both the European Union and other parts of the world are evaluated. Assistance to agriculture covers the crop, meat, dairy and wool sectors. Recognising, however, that protection for agriculture is also implemented at the stage of processing agricultural products, the relevant food processing sectors are also covered in the case of export subsidies and border protection.³

² The EU15 include: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. Ten of the NMS joined in 2004: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia. Two more NMS joined in 2007: Romania and Bulgaria.

³ Fishing has its own assistance program called the Common Fisheries Policy, and forestry is affected indirectly by some CAP policies (such as land set-aside and rural development; see below).

2 The Common Agricultural Policy

The CAP often represents nearly half of the EU budget, providing support to a shrinking part of the EU's economy. It has undergone significant reforms since the early 1990s, with the aim of improving its market orientation (box 1). This section focuses on the policy framework which results mainly from the 2003 reforms.

Notwithstanding major reforms in 2003, the CAP is continually evolving. Adding to the complexity, EU members can use additional, national intervention tools that are applied within a common EU legal framework.

Box 1 Major CAP reforms

- **1992** — The 'MacSharry' reforms reduced the reliance on market price support and introduced a greater emphasis on direct income support to farmers that was tied to producing certain goods. They also included limits to production to reduce surpluses, including through mandatory land set-aside. In addition, rural development measures were implemented, with a focus on improved environmental outcomes.
- **2000** — The 'Agenda 2000' reform enhanced the market orientation and environmental focus of the CAP. It integrated rural development policy within the institutional CAP framework, and implemented further reductions in intervention prices which were compensated for by direct income payments to farmers.
- **2003** — These reforms initiated the process of decoupling direct income payments from production, giving farmers the incentive to make their production decisions according to prevailing market conditions. They also redirected funding away from direct payments, toward rural development policies. Since 2003, there have been subsequent, more targeted reforms of the wine, fruit and vegetable and sugar sectors, aimed at increasing their exposure to market forces.
- **2008** — A 'Health Check' was introduced to adjust and extend the implementation of the 2003 reforms (appendix table A.1).

The CAP is characterised by two 'pillars':

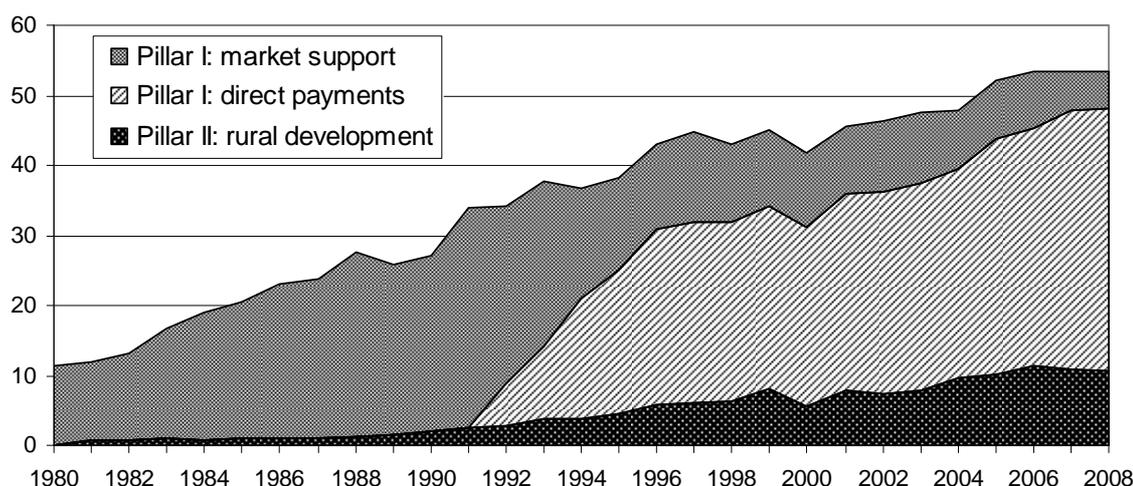
- Pillar I — market support and direct income payment programs.
- Pillar II — rural development programs.⁴

In 2007, Pillar I funding represented around 80 per cent of the EU budget devoted to the CAP, mostly in the form of direct income payments, with the remainder used to fund market support programs (figure 1). The declining share of expenditure on market support

⁴ Pillar 1 expenditures are funded through the European Agricultural Guarantee Fund (EAGF). Pillar II expenditures are funded through the European Agricultural Fund for Rural Development (EAFRD).

over time reflects reforms that reduced the reliance on market support and compensated farmers with direct payments. It also reflects high world prices for agricultural goods, which reduced the amount of market support as the gap between market and support prices narrowed (discussed below).

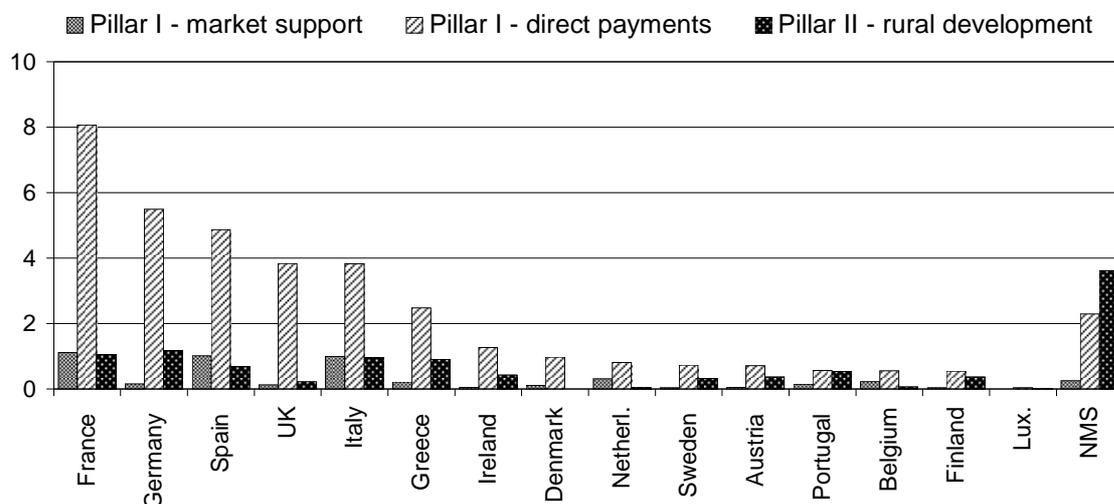
Figure 1. European CAP expenditures by measure
Billion Euros



Data source: European Commission, DG AGRI, Unit I.1, pers. comm., 18 August 2009.

EU members have more flexibility than ever to define measures and implement, monitor and source funding for CAP policies. As a result, relative spending between the first and second pillars varies across member states (figure 2). In the EU15 member states, most expenditure is on direct income payments (except Portugal). Rural development (pillar II) expenditure accounts for a sizeable share in the NMS. The share of direct payments is expected to increase once in the phasing-in period of these payments to the NMS is completed (2013 in most cases).

Figure 2 CAP expenditures by member state: Pillar I and Pillar II
Billion Euros, 2007



Data source: European Commission 2008c.

Pillar 1

Market support

The predominant market support measure is the price guarantee to farmers. The level of price guarantees has been reduced steadily since the 1990s, but still remains for selected commodities.

Under the price guarantee, when the domestic price falls below the guaranteed price, the government intervenes to deal with any excess production until the domestic price returns to the guaranteed price. The excess production can lead to subsidies for storage, selling on world markets (exporting) at prices below the support price, or other interventions such as destroying vines.

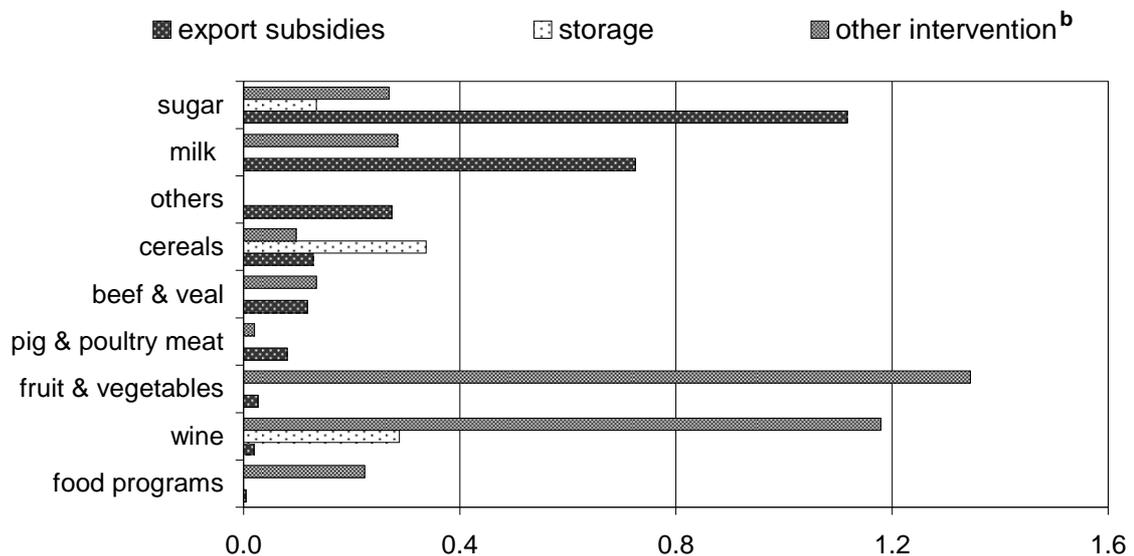
In the case of export subsidies, these are paid by the government to bridge the gap between EU guaranteed prices and world market prices. As a consequence, the unit cost of the subsidy and its total cost vary with changes in world prices, exchange rates and domestic prices. A necessary condition for maintaining guaranteed prices is the presence of trade barriers to prevent cheaper imports.

High world food prices over recent years have reduced expenditure on price guarantees, and recent CAP reforms have reduced the number of commodities eligible for price

support.⁵ In recent years, the sugar and dairy sectors have attracted most of the budgetary expenditure devoted to export subsidies (figure 3).⁶

Apart from price guarantees, market support can also be effected through production quotas which limit production (mainly for sugar and milk) and do not involve budgetary expenditures, and land set-aside programs (compulsory or voluntary) that have budgetary expenditures that are integrated into direct payments.⁷ These measures aim to reduce supply and raise prices, thereby supporting farm incomes.

Figure 3 Expenditure by sector and type of market support measure^a
Billion Euros, 2006



^a Export subsidies for pig meat, fruit and vegetables and wine have now been abolished (WTO 2009). ^b Other intervention includes, for example, funding of producer organisations in the fruit and vegetable sector, and funding for the wine sector to distil surplus wine and grub up vines.

Data source: European Commission 2008a.

⁵ For example, price support for pigmeat, maize, barley and sorghum has been abolished.

⁶ The market support expenditure presented here is distinct from the Market Price Support (MPS) estimates produced by the OECD. The OECD MPS includes price intervention measures, and also trade barriers, which are discussed separately in this paper. In addition, the MPS estimates include consumer transfers associated with higher domestic prices.

⁷ Land set-aside was first introduced to prevent surpluses accumulating and was compulsory for large producers. Compulsory land set-aside was abolished under the CAP Health Check in 2008.

Direct income payments

Direct income payments were designed to compensate farmers for the decrease in guaranteed prices that began in 1992. They have traditionally been ‘coupled’ — that is, tied to either producing certain commodities (measured by areas planted to specific crops, or livestock animal numbers) or to using certain inputs in the production process.

While originally intended to be a compensatory entitlement, direct payments now resemble ongoing income support. There have also been efforts to break the link between income support and agricultural production to move toward more ‘decoupled’ direct payments. Decoupled payments are designed to give farmers a guaranteed minimum level of income without the market distortions created by linking payments to the production of targeted commodities (discussed further below).

The 2003 CAP reforms⁸ strengthened the move toward decoupling payments by introducing the Single Payment Scheme (SPS), in which direct payments are unrelated to current production decisions (box 2). Also introduced were ‘cross-compliance’ conditions for payments, whereby payments are linked to farmers achieving certain environmental, animal welfare and quality standards. Cross-compliance makes full payment conditional upon land being maintained in good agricultural and environmental condition (according to standards established at national levels), and adherence to the pre-existing EU statutory management requirements regarding the protection of the environment, public, animal and plant health, and animal welfare.⁹ Direct payments are funded entirely from the European budget, unlike the Pillar II rural development measures that are co-funded by each country.

⁸ For a detailed analysis of the 2003 CAP reforms, refer to OECD 2004.

⁹ Designed as additional incentives to comply with pre-existing regulation and often requiring little change to farm practices, cross-compliance payments can be interpreted as a subsidy that reduces farmers’ out-of-pocket cost of operating in the existing regulatory environment (Alliance Environment 2007).

Box 2 The Single Payment Scheme

The Single Payment Scheme (SPS) is designed to cut the link between income support and production decisions. There are two basic SPS models:

- an historic model, in which payments to each farm are based on the amount of payments it received during a reference period (2000–2002), divided by the number of hectares farmed in the reference period
- a regional model, in which a flat rate of entitlement per hectare is paid based on the total amount of payments received in the region during the reference period, divided by the total number of eligible hectares declared in that region in the year the SPS was introduced.

Where the historic approach is applied, farmers who did not receive direct payments in the reference period are not eligible for payments under the SPS. However, entitlements are transferable in most countries.

Hybrid models have also been implemented, where a part-historic, part-regional model is used. These can be static or dynamic. In the static version, the entitlements remain the same over time. In the dynamic version, a proportion of the entitlement is based on an historical reference period, which is then phased out over time. A compensating flat rate payment increases concurrently, until the full entitlement is based on the flat rate. The most common SPS model is the historic model (table below).

The SPS exists in the EU15 member states and two of the NMS (Slovenia and Malta), and a transitory Single Area Payment Scheme (SAPS) exists in the remaining 10 NMS. The SAPS is a uniform payment per hectare of agricultural land, up to a national ceiling. The direct payments will be fully paid by the EU budget to the NMS once a phasing-in period is completed (2013 for all except for Bulgaria and Romania, for which the period ends in 2016).

SPS implementation models

<i>Historic</i>	<i>Regional</i>	<i>Static hybrid</i>	<i>Dynamic hybrid</i>
Austria	Malta	Denmark	Finland
Belgium	Slovenia	Luxembourg	Germany
France		Sweden	UK-England
Greece		UK-N.Ireland	
Ireland			
Italy			
Netherlands			
Portugal			
Spain			
UK-Scotland			
UK-Wales			

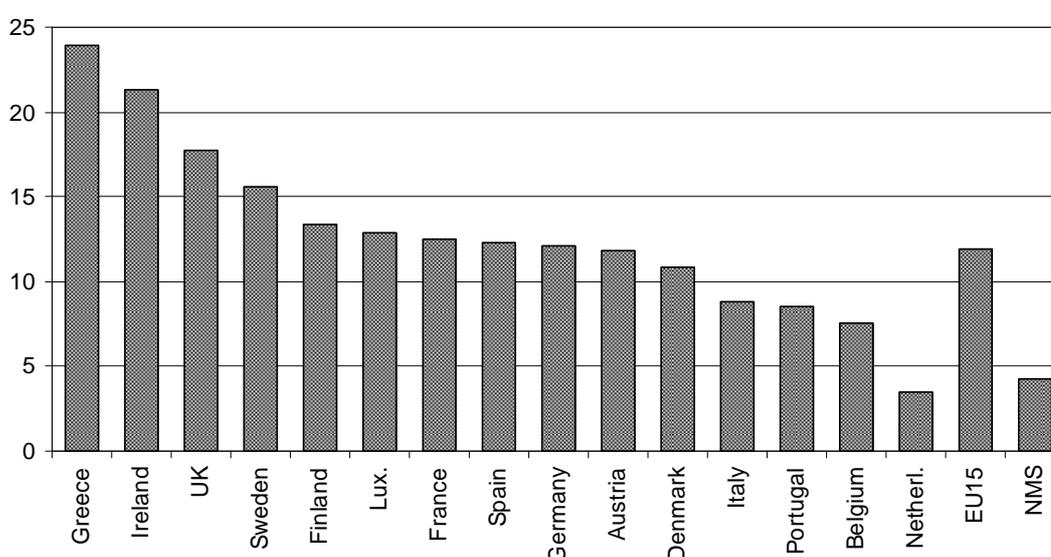
Sources: European Commission 2008e and 2009c.

The value of direct payments to each EU member divided by the gross value of assisted agricultural output for that member gives a measure of the relative level of assistance

across the European Union.¹⁰ Figure 4 shows that the most heavily assisted countries are Greece and Ireland, with assistance rates above 20 per cent. This compares with the EU15 average of 12 per cent. The rate of assistance for the NMS is low, at less than 5 per cent, both because these members are phasing-in direct payments since joining the European Union, and because they have a greater emphasis on rural development spending.

Figure 4 Rate of assistance to agriculture from direct income payments^a

Per cent, 2006-07



^a Direct payments divided by the gross value of assisted agricultural output.

Data source: European Commission 2008c, Eurostat 2008.

Despite the implementation and management of direct payments occurring within an EU-wide framework, the 2003 CAP reforms provided member states with some flexibility in implementing the SPS, including the scope to retain some commodity-specific payments. Member states can:

- maintain a proportion of product-specific direct support when production abandonment or severe market disturbances might result from moving to the SPS. The option applies to beef, cereals, cotton, goats, olive oil, seeds, and sheep, and the proportion allowed varies across commodities (appendix table A.2)

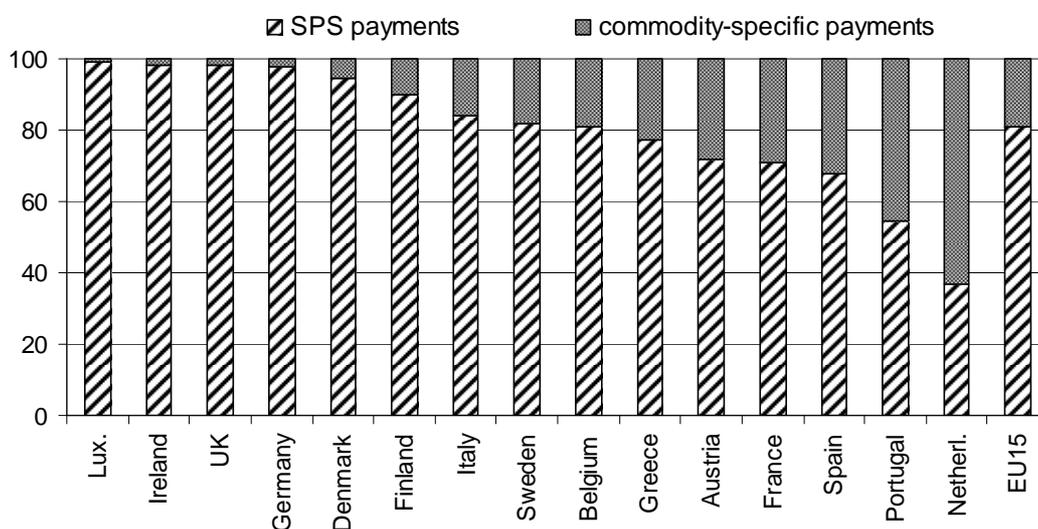
¹⁰ The gross value of assisted agricultural output used in these calculations includes gross output of fruit and vegetables, even though this sector does not receive much by way of direct income payment support. Under a 2008 CAP reform of the fruit and vegetable sector, land devoted to fruit and vegetable production will become eligible for payments under the SPS, replacing existing support, mainly in the form of operational funds to producer organisations, currently worth around 800 million Euros.

- grant ‘additional payments’ to specific types of farming considered important for protecting or enhancing the environment, or for improving the quality and marketing of agricultural products. These additional payments can use up to 10 per cent of the funds available under national ceilings in the SPS.¹¹ Additional payments therefore reduce the funds available for SPS and product-specific payments.

Where commodity-specific subsidies still exist, they are generally defined per hectare for land-based commodities such as energy crops,¹² durum wheat, protein crops, and rice. In the animal husbandry sector, payments are generally based on herd size.

In the 2007 financial year, around 20 per cent of direct payments in the EU15 remained commodity-specific, though this masks large differences in the shares across the EU15 member states (figure 5). Only Ireland, Luxembourg, Malta and the United Kingdom have moved almost entirely to the SPS. Others have retained a sizeable proportion of commodity-specific payments, including Portugal, Spain and the Netherlands (though absolute amounts are small). Of the payments that remain commodity-specific, more than 50 per cent are allocated to the crop and beef sectors (table 1).¹³

Figure 5 SPS and commodity-specific payment shares^a
Per cent, 2006-07



^a The high share of commodity-specific payments in the Netherlands in 2006-07 reflects the decoupling of the dairy premium in the following year; the dairy premium accounted for around one quarter of all direct payments made in the Netherlands in 2006-07.

Data source: European Commission, 2008b.

¹¹ Article 68 (previously Article 69) of Council Regulation (CE) 1782/2003.

¹² These are crops for the production of biofuels, and that provide biomass for the production of electrical and thermal energy.

¹³ See also appendix table A.2.

Table 1 Share of total commodity-specific payments by type^a

Per cent, 2006-07

	Aus	Bel	Den	Fin	Fra	Ger	Grc	Ire	Ita	Lux	Net	Por	Spa	Swe	UK	EU15
Cereals, oil seeds & protein crops	1.2	0.9	1.6	3.4	50.3	9.6	3.7	16.9	9.4	16.7	0.4	0.2	29.5	1.7	26.8	27.3
Beef	47.2	98.9	73.9	51.2	38.1	0.9		70.8	4.6	33.3	19.8	37.4	21.8	29.5	2.8	27.2
Sheep & goats			1.6	1.6	3.4		0.1	5.8	0.2			11.0	14.8		0.4	5.3
Dairy	50.0						4.2	0.6	0.1		75.5	25.6		62.3		10.1
Potatoes	1.4		19.5	7.8	0.7	43.1					4.2			2.6		1.4
Rice					0.4		2.2		17.1			4.4	3.2			2.8
Olive groves							2.3					0.2	7.2			1.9
Tobacco					1.9	24.4	4.8		31.9			2.8	4.3			5.4
Hops						2.8										
Nuts					0.1	0.1	0.9		2.7			1.7	4.2			1.4
Energy crops	0.3	0.2	3.4	1.4	0.7	19.1		5.8		50.0			0.6	1.6	14.8	0.9
Silkworms							0.1									
Dried grapes							22.2						0.1			1.8
Bananas							0.1					1.0	2.9			2.0
Sugar beet & cane					3.3				3.1							0.3
Cotton							38.4						4.0			4.1
Country specific payments				34.6			18.7		31.1			3.8	6.6	2.3	55.2	6.7
POSEI ^b					1.1		2.7					11.8	0.9			1.3
Other																
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

^a Blank cells indicate that no coupled payments are made in that country for that commodity. ^b Programme d'Options Spécifiques à l'Éloignement et l'Insularité' (POSEI) measures target agriculture in the European Union's remote regions, taking into account geographical and economic disadvantages.

.. between 0 and 0.05.

Source: European Commission 2008b.

The 2008 CAP Health Check introduced measures to move most payments that remain commodity-specific into the SPS by about 2012. According to the European Commission, this will increase the level of ‘decoupled’ support as a percentage of all direct payments to over 90 per cent (WTO 2009).

The economic effects of decoupled payments

The OECD generally analyses decoupling as a continuum of degrees of decoupling because, in reality, no payment is ‘truly decoupled’ — a truly decoupled payment is one that would not alter the level or composition of output, or the adjustment to economic shocks, that would occur in the absence of any support. The degree of decoupling determines how much payments distort the market outcome away from the efficient outcome. The OECD has a large body of analysis on the issue (see, for example, OECD 2001, 2005a and 2005b) which is drawn upon in this paper.

The distortions associated with any direct payment other than a truly decoupled payment can be summarised as follows.

- Cross-commodity effect — payments can affect the relative prices that farmers face and the relative profitability of producing one agricultural commodity over another (or using one input over another). These payments can affect the allocation of resources within agriculture, thereby altering the production mix.
- Aggregate supply response — payments encourage a movement of resources out of other industries, into agriculture, that would otherwise not occur. This leads to an expansion of overall agricultural output, and a contraction of output in other industries, such as manufacturing.¹⁴

The magnitude of these effects depends on the mobility of factors of production. In the case of cross-commodity effects, the mobility of factors within agriculture matters.¹⁵ In the case of the aggregate supply response, the mobility of factors across different sectors matters — for example between agriculture and manufacturing. Where they are very mobile, there will be stronger resource reallocation away from other industries into farming. Where an input is either less mobile or in fixed supply, such as agricultural land, any potential aggregate supply response will be dampened, depending on the degree of substitutability of this input with other inputs (Frandsen, Gersfelt and Jensen 2002).

¹⁴ In a dynamic sense, coupled support can also influence farmers’ investment decisions, insofar as investment decisions are affected by current production decisions (Frandsen, Gersfelt and Jensen, 2002).

¹⁵ See Gohin, Guyomard and Le Mouël (2000) and Frandsen, Gersfelt and Jensen (2002) for a discussion of how factor mobility affects the direction and magnitude of cross-commodity effects payments.

According to the OECD (2005b), payments based on variable input use are the most distortionary kind, followed by payments based on output. These sorts of payments are characteristic of the coupled, or commodity-specific payments of the CAP, which are tied to producing certain commodities, or to using certain inputs into production.

Payments based on the area of land used in agricultural production are generally the least distorting, especially if payments are made based on historical references and if few or no conditions are imposed on the use of eligible land (OECD 2005b). In this case, if inputs are perfectly mobile across agricultural activities there will in theory be no cross-commodity effects (Frandsen, Gersfelt and Jensen 2002).

Although lump sum income payments, with no requirements on production, may prevent cross-commodity effects, they can still induce an aggregate supply response. Lump-sum income payments can alter the incentive structure such that it becomes more profitable for some farmers to stay in the sector rather than to leave. That is, payments may induce an unprofitable farmer who would otherwise exit the industry to keep on producing, as the payments cover the losses from farming. It can also make it more costly to enter the industry, since payments could be capitalised into land and make it more expensive for new entrants to purchase land (Van Tongeren 2008). There may also be incentives for farmers to maintain large production quantities as insurance against the possibility of losing established entitlements. This may occur if the government were to perceive, through a review process, that some future level of production is too small to warrant ongoing support (Roberts and Gunning-Trant 2007).

The effects of greater decoupling in the EU

In the case of the move toward a greater degree of decoupling through the SPS of the CAP, cross-commodity effects can still take place. Firstly, agricultural inputs including machinery and buildings can be highly specialised and therefore relatively immobile in the short to medium term, resulting in potentially large cross-commodity effects. Secondly, even when payments are based on historical entitlements, if current conditions play a role in distributing payments, incentive effects can occur. Cross-compliance conditions attached to SPS payments are a good example; these conditions can affect production patterns (box 3).

Indeed, it is sufficient for payments to be contingent on the recipient being involved in farming for the measure to have some effect on production patterns. As the historical area based payments of the SPS require that recipients carry out (or not carry out) some agricultural activity on the land, there can still be an effect on production (OECD 2005b). Whether there is an effect depends on whether the conditions are binding — if they are not, production decisions will not be affected by the SPS, but if they are, the farmers' actions will change in response to the payment.

Box 3 Economic effects of cross-compliance measures

Cross-compliance measures make assistance payments conditional on farmers achieving certain environmental and animal welfare standards in production. These requirements aim to address social and environmental objectives, while also providing direct income support to farmers. Importantly, cross-compliance requirements in the European Union are already enshrined in existing legislation. Cross-compliance therefore aims to increase the effectiveness of enforcement of these established laws.

Cross-compliance measures can create incentives to change production patterns, or induce a change in production methods and commodity yields. The extent of these effects depends on the nature of the requirement, the cost of compliance and the cost structure of production across commodities. For example, animal welfare requirements affect livestock farmers but not crop farmers, and the limitation of the use of pesticides could affect crop farmers more than livestock farmers.

The cross-compliance regulations can increase unit costs for farmers. This shifts up the supply curve for farmers and, as a result, can lower output and increase prices. Evidence to date suggests that the majority of cross-compliance obligations have had little or no direct impact on farm production costs. The associated direct income payment, however, will tend to shift the supply curve back down. The net effect on production and prices is ambiguous; accurately measuring the cost of cross-compliance measures is therefore difficult and would require detailed, probably partial equilibrium, modelling.

There may be significant externalities ensuing from cross-compliance that would require consideration when evaluating the net impact of the measures on society, but which are inherently difficult to measure. For example, the impact of cross-compliance measures on the agricultural sector can depend on the willingness of society to pay for the cost of meeting enhanced environmental and animal welfare standards.

Sources: Alliance Environnement 2007, OECD 2005b and Van Tongeren 2008.

The existing landscape of support is a crucial factor in determining the effects of any attempt to decouple support. Unless a new payment system results in the same level and composition of production and trade that would prevail if all existing coupled payments were removed, it cannot be considered to be fully effectively decoupled, and some distortions will be maintained (Roberts and Gunning-Trant 2007). Furthermore, although direct payments may be ‘decoupled’, the overall system of support might not be if other distortionary support is in place (Roberts and Gunning-Trant 2007). Therefore, even if the SPS were considered to be a fully decoupled direct payments system, as long as it coexists with market support and trade barrier measures, market outcomes will be distorted.

Border protection

The European Union protects the agricultural sector with various import duties — ad valorem and specific tariffs, and tariff rate quotas.¹⁶ Tariff protection of agriculture, as well as food processing, is higher than that for the rest of manufacturing (table 2). In general, agricultural and processed food goods with the largest domestic production presence in the European Union receive the highest rates of protection. For example, cereals have an average most favoured nation (MFN) tariff rate of about 50 per cent. Agricultural goods generally not produced in the European Union tend to have lower levels of protection (see appendix table A.3).

Table 2 EU applied MFN tariff rates
Per cent, 2008

<i>Description^a</i>	<i>Simple average tariff</i>	<i>Range</i>
Agriculture and hunting ^b	9.9	0-139.6
Manufacture of food, beverages, tobacco	19.4	0-604.3
Manufacturing (excluding food processing)	3.8	0-89.8

^a ISIC (Rev. 2) definitions. ^b Import duties for durum wheat, high quality soft wheat, rye and sorghum were suspended between December 2007 and June 2009 (European Commission 2008b).

Source: WTO 2009.

The European Union grants preferential tariff rates on imports of agricultural products and processed food from some countries and regions. Duties on imports from many European countries outside the European Union, as well as from least developed countries, are particularly low (1–2 per cent).

The European Union's dispersion of protection is very high, with a large variation in rates of protection across trade partners, and across products due to tariff peaks on a few agricultural commodities such as sugar, meat and dairy (Bouet et al. 2008).

Of the import duties imposed on agricultural products and processed food, a little over half are ad valorem tariff rates. Another 30 per cent are specific tariffs.¹⁷ In addition, in 2006 the European Union had 91 tariff quotas on agricultural products that were managed by the Commission through a licensing system (WTO 2007).

¹⁶ A tariff rate quota is a two-tier tariff regime. Imports within the quota enter at a lower (in-quota) tariff rate, and a higher (out-of-quota) tariff rate is used for imports above the concessionary access level.

¹⁷ Across the entire tariff schedule for all goods, around 10 per cent of tariffs are non-ad valorem rates which can be specific, compound or mixed rates. All of these are applied to agricultural products. All tariff rates greater than 100 per cent are also for agricultural products.

3 Modelling approach

Given the interest in this study for the inter-sectoral effects and net aggregate effects of the CAP, we use a general equilibrium model of the economy. This paper uses version 6.2 of the GTAP model,¹⁸ which is a comparative static model of the world economy.

The model describes economic behaviour in all markets in the real economy:

- the producer sector, composed of farmers, food processors — who are primarily affected by the CAP as producers and users of inputs — as well as that of producers of other goods and services
- the household sector, which consumes agricultural and food products and all other goods and services, invests and saves, and supplies labour, capital and land to the rest of the economy
- the government sector, which collects taxes and provides government services and income transfers.

As a model of the real economy, GTAP excludes financial markets and any possible effects of monetary policy — the model provides projections of changes in relative prices.

In the model, regions can include national economies (for example, the US, Australia, New Zealand and each EU member state) or regions (for example, rest of Europe). In the implementation of the GTAP model used for this study, resources are assumed not to move across regional borders. This captures short term adjustments, including the reallocation of resources within the economies modelled.

The database employed in this study is GTAP version 7 (Narayanan and Walmsley 2008). Key features of this version include:

- a 2004 base year
- 113 regional economies
- 57 industries.

The database is composed of a set of detailed input–output tables linked by bilateral trade data. The trade data are combined with protection and transportation cost data to represent international trade linkages across regions.¹⁹

¹⁸ The model is available at <https://www.gtap.agecon.purdue.edu/models/current.asp>. Documentation of the model is found in Hertel (1997).

¹⁹ Further details on the GTAP database are found on the GTAP website: <https://www.gtap.agecon.purdue.edu/databases/v7/default.asp>.

For the purposes of this study, the database is aggregated into 40 regional groups and 24 industries. As agricultural policy is the focus of this study, agricultural, forestry and fishing, and food processing industries are separately identified. Mining and manufacturing industries are aggregated into one group ('manufacturing') and all services sectors are aggregated into another group ('services').²⁰

Within the 40 aggregated regional groups in the database, the EU15 member states are each represented individually, so that the CAP programs are modelled for each member. The NMS are aggregated in the database into a single region.²¹

For ease of presentation, results are further aggregated into nine regions — EU15, NMS, rest of Europe, Australia–New Zealand, East Asia, rest of Asia, North America, Latin America and Africa. Results are also aggregated into six industries — crops, livestock, forestry and fishing, food processing, manufacturing and services.

Agricultural support in GTAP

To account for increased decoupling of agricultural support around the world, the method for building the GTAP version 7 database differs from that used for earlier versions. In particular, rates of domestic support for crop sectors (based on data from the OECD producer support estimate (PSE)) were not calculated on a sector-specific basis, as has been the case in the past. Instead, for the European Union, rates of subsidisation were *equalised* across all crop sectors. This strategy aims to reflect the idea that direct income support is increasingly paid independently of the type and volume of commodity produced.

Subsidies to the livestock sectors (including cattle, sheep, goats and raw milk) were not equalised. The database *only* represents decoupling for the crop sectors. This is consistent with payments to livestock remaining more coupled than those to crops (refer to table 1).

It is important to note that the OECD payments data used in the allocation process exclude market price support, but include some rural development expenditure. Therefore, the database amounts are not strictly confined to CAP direct income payments.

Although efforts have been made to represent a greater degree of decoupling in the database, the subsidy rates are still different across commodities and, therefore, distortionary cross-commodity effects can still be expected. This is consistent with the

²⁰ In the aggregation process, 'natural resources' of the fishing and mining sectors are combined.

²¹ The reference year in the database is 2004, and Romania and Bulgaria were not part of the European Union at that time. However, since we take the database to represent a 2007 CAP policy situation, Romania and Bulgaria have been included in the NMS aggregation.

fact that, on average, 20 per cent of direct payments in the European Union remain coupled to production. Furthermore, although decoupling means ‘equal payment per unit of land or capital’, irrespective of the activity undertaken, the effect of the subsidy on an activity is determined by the intensity with which it uses land and capital.

The simulations

The effects of the CAP are estimated by simulating its elimination. This creates a counterfactual which represents the global economy without the influence of the CAP, against which impacts on welfare, production and trade flows can be assessed, globally and within economies.

Although the programs within the CAP are part of an integrated policy and cannot be disassociated from each other, the main programs have been modelled separately in order to interpret the role and contribution of each. Four modelling scenarios were undertaken:

1. direct payments
2. export subsidies
3. border protection
4. the total CAP.

The strategy in this paper is to attempt to capture the effects of the CAP in 2007. For this reason, direct payments data for 2007 have been used to shock the model instead of the assistance as represented in the original GTAP database, which is based in 2004. The direct payments simulation therefore assesses the impact of eliminating the rate of assistance observed in 2007 (shown in figure 4). As direct payments are comparatively small in the NMS, the direct payments scenario is only applied to EU15 members.²²

In contrast to domestic support, export subsidies and import duties for 2007 are approximated by the rates found in the original GTAP database with a reference year of 2004 (tables 3 and 4). In doing so, it is assumed that the rates have not changed between 2004 and 2007. In practice, export subsidies move in line with changes in the gap between world and domestic prices of agricultural goods, and this gap narrowed between 2004 and 2007. However, movements over that period are not necessarily representative of the average trend. For example, in 2008-09 export subsidies increased due to lower world prices. The assumption of no change is therefore considered to be a reasonable approximation of the average level of export subsidy. In the case of import duties, border protection policies changed little over the period 2004–07.

²² Direct payments will increase in the NMS once the phasing-in period is completed by 2013 for most.

The export subsidy and border protection simulations involve setting the rate of export subsidy and import duty (more precisely, the ad-valorem tariff equivalents) in the database to zero for agricultural and food processing goods in all EU countries (including the NMS).

Table 3 EU export subsidy rates by commodity

Per cent of export value

<i>GTAP commodity</i>	<i>Subsidy rate</i>
Cereal grains nec	2.11
Vegetables, fruit, nuts	0.13
Bovine meat products	2.30
Meat products nec	0.65
Dairy products	5.64
Processed rice	3.64
Sugar	25.97
Food products nec	0.52
Beverages and tobacco products	0.03

Source: Calculated from the GTAP 7 database.

Table 4 Trade weighted average ad valorem equivalent tariff rates on EU imports

Per cent

<i>Exporting regions</i>	<i>Crops</i>	<i>Livestock</i>	<i>Food processing</i>	<i>Average</i>
Australia-NZ	4.36	0.37	16.62	11.89
East Asia	16.52	0.64	17.02	15.94
Rest of Asia	4.73	0.93	19.38	10.86
North America	9.55	1.82	16.17	11.93
Latin America	19.43	8.32	23.96	21.37
Africa	2.10	0.05	19.86	9.34
Rest of Europe	6.00	0.42	13.31	10.69
Total	10.94	1.75	18.76	14.62

Source: Calculated from GTAP 7 database.

The total CAP simulation involves applying all of the other three scenarios simultaneously, in order to assess the overall impact of the CAP. The sum of the simulations for each component do not exactly add up to the total effect because of linearisation error. The source of this linearisation error is aggregation, and arises from aggregation across countries and commodities.

Components of the CAP that are not modelled

Quantitative modelling is limited to what can be measured using the available data. Rural development payments (Pillar II) were not modelled for the following reasons.

- Some rural development spending is included in the GTAP database, but it is not separately identified. Rather, it is included in the agricultural support data allocated across GTAP subsidies and equalised across crop commodities and, as such, is treated in the same way as direct payments. This makes Pillar II difficult to model without altering the structure of the database or introducing additional behaviour into the model.
- Even with detailed and accurate data on rural development spending, the effects of these payments are complex and uncertain. Even where the effects are clear, they may be difficult to evaluate because of a lack of information about the value of the benefits of the externality, such as improved environmental and animal welfare outcomes.²³

In addition, cross-compliance requirements of direct payments were not modelled as they are difficult to represent in the model, especially in light of the fact that they are designed to enhance the enforcement of legislation that already exists. As Pillar I funding is being linked to cross-compliance measures that involve externalities which are difficult to evaluate (for example, adherence to environmental and animal welfare standards), it is difficult to assess the entire contribution of Pillar I to welfare in the European Union, or to the world as a whole.

4 Results

The initial effect of the different parts of CAP support is to change the relative prices of supported products, reduce the cost of using inputs in the supported activities and increase the returns to factors employed in the supported activities. Production is reallocated across the world and resources are reallocated within the world's economies in response to these changes in relative returns. A measure of this reallocation is the change in sectoral outputs.

Since resources are assumed to be in fixed supply in each country, changes in real gross domestic product (GDP) can be used as a measure of efficiency gains or losses that are due to allocative changes. The changes in real gross national expenditure (GNE, also referred to as gross domestic absorption) is used as an approximate measure of the effect of the CAP on a country's welfare. The difference between changes in GDP and GNE are

²³ A recent paper by Van Meijl et al. (2009) makes a first attempt at explicitly modelling Pillar II payments.

accounted for by the effects of changes in the terms of trade, that is, changes in the price of a country's exports relative to the price of its imports.

The results in this study are interpreted as the contributions and costs that the CAP generates. Therefore, the signs on the results obtained from the simulations that model the removal of the CAP are reversed. Furthermore, where US dollar amounts are reported, they represent projections for a 2007 year based on the values of GDP in 2007 obtained from the World Bank.²⁴

Sectoral effects within the European Union

The CAP increases the size (in terms of total output) of agriculture by about 8 per cent in the EU15, and by less in the NMS. It also increases food processing by nearly 6 per cent in the European Union as a whole (table 5). The resources required for this expansion come from the parts of the economy that are not supported by the CAP. Manufacturing and services in the EU15, for example, shrink by more than 1 per cent and 0.2 per cent respectively. Resources also come from forestry, which competes with CAP supported industries for agricultural land and is more than 3 per cent smaller in the EU15 than if the CAP did not exist.²⁵

Direct payments, export subsidies and border protection contribute in different ways to these results.

Direct payments

Direct payments create a wedge between the cost of producing a supported commodity and the price paid by consumers. The initial effects of this wedge are to decrease the price paid by consumers without reducing the price received by farmers, and to increase the size of the sectors that benefit from this form of support in the EU15.

Direct payments cause the agricultural sectors in the EU15 to expand by around 2 per cent. Food processors in the EU15 are the main users of some of the products that are made cheaper by direct payments. The reduction in the cost of some of the inputs into food processing contributes to an expansion of the industry in the EU15.

²⁴ The GDP and GNE value changes reported are calculated using the percentage change results from the simulations and the GDP data for 2007 from the World Bank. This means that the sum of the regional changes in value will not sum to the change in the world value as the relative share of each region in world GDP is different in 2007 compared to the database values for 2004. An average conversion rate for 2007 of 0.73 Euros to 1 US dollar can be used to convert US dollar results into Euros.

²⁵ To the extent that direct payments might require farmers to plant some forest (for example, to satisfy some environmental cross-compliance criterion), this effect may be overstated.

Table 5 Effects on sectoral outputs within the European Union

Per cent

<i>CAP component / Region</i>	<i>Crops</i>	<i>Livestock</i>	<i>Forestry & fishing</i>	<i>Food process.</i>	<i>Manuf.</i>	<i>Services</i>
Direct payments						
NMS	-0.49	-1.98	0.95	-0.29	0.26	0.01
EU15	1.92	2.52	-0.95	0.76	-0.29	-0.05
Export subsidies						
NMS	0.02	0.06	-0.03	0.23	-0.05	..
EU15	0.03	0.16	-0.01	0.25	-0.04	..
Border protection						
NMS	2.48	2.41	-0.77	5.56	-1.29	-0.20
EU15	6.23	4.93	-0.77	4.92	-1.02	-0.10
Total CAP						
NMS	1.97	0.64	0.09	5.61	-1.11	-0.19
EU15	8.09	7.64	-1.65	6.02	-1.35	-0.15

.. between -0.005 and 0.005.

Source: Simulation results.

Sectors that do not benefit from direct payments are smaller than they would be otherwise as they supply the resources required for the expansion of agriculture and food processing. This is the case for all non-supported activities, including resource-based sectors, manufacturing and services in the EU15. In 2007, the resources transferred to the agricultural and food processing sectors in the EU15 represented some \$US 8.8 billion.

The cropping and livestock sectors in the NMS are smaller than otherwise because the expansion of EU15 agricultural output reduces the price of agricultural products in world markets. Agriculture in the NMS responds by contracting.²⁶ A relative shortage of local produce and a reduction in the world price of processed foods leads to a contraction of the food processing sector in the NMS. These contractions free up resources, which in turn allow other sectors to expand in the NMS economies.

Export subsidies

Export subsidies lower the cost of exporting goods overseas and therefore expand production in subsidised industries. As export subsidies are highest for processed foods, the results are largest for this sector — output in the food processing sector is around 0.3 per cent larger than it would be without export subsidies. This flows through to increased demand for related inputs from the agricultural sector, leading to a larger than

²⁶ To the extent that direct payments to the NMS are increasing, this effect would be smaller and may be reversed by the end of the phasing-in period of direct payments (between 2013 and 2016).

otherwise crop and livestock sector in the European Union. Manufacturing, on the other hand, is slightly smaller than it would otherwise be.

Border protection

The initial effect of border protection is to increase the cost of imports and expand the industries that produce goods that compete with imports. This expansion occurs at the expense of other sectors in the economy, including any rural activities that do not benefit from the protection.

Of total CAP support, border protection contributes by far the most to increasing the size of agriculture and food processing in the European Union. It has different effects on the agricultural sectors of the NMS and the EU15 because of the different structures of production and imports in different parts of the European Union. Protection rates are weighted toward protecting commodities that are produced more intensively in the EU15.²⁷ Border protection accounts for more than 50 per cent of the total effect of the CAP in the EU15, and is also the main contribution of the CAP to maintaining a larger agricultural sector in the NMS.

Border protection contributes to increasing the size of cropping, livestock and food processing activities in the order of 2.5 to 6 per cent across the European Union. In the European Union as a whole, manufacturing declines by about 1 per cent and services by about 0.1 per cent as a result. In 2007, this represented a transfer of value added to agriculture and food processing in the order \$US 49.7 billion.

Effects on fruit and vegetables and forestry

Two rural sectors do not benefit from direct payments in the model: fruit and vegetable production, and forestry.²⁸ As part of the CAP, however, the fruit and vegetable sector benefits from some border protection. Disaggregated results (table 6) show that border protection increases the size of the EU fruit and vegetable sector by about 5 per cent.²⁹

²⁷ Whether this is because protection was developed in this way or whether protection has influenced the structure of agriculture is not explained by the model. However, the model results, which show that resources flow toward protected activities, are consistent with the latter hypothesis that over time, border protection has distorted the agricultural sector in the EU15.

²⁸ This may change somewhat in the future since land used for fruit and vegetable production is being gradually transitioned into the SPS system, following a 2008 CAP reform. The amount to be transferred is expected to be around 800 million Euros (European Commission 2010).

²⁹ This is an average effect for the fruit and vegetable sector. To the extent that some products are less protected than others (for example, the tariff rate on competing imports is lower), output from producers competing with these imports would decline as a result of the CAP to the benefit of more highly protected products that are included in the aggregate fruit and vegetable sector.

Both sectors compete for land with other agricultural activities. Therefore, when direct payments cause agriculture in the EU15 to expand, the size of the EU15 fruit and vegetable sector is reduced by more than 1 per cent. Similarly, the size of the corresponding sector in the NMS increases by 0.5 per cent (\$US 65.3 million).

In total, the CAP contributes to reducing the size of the forestry sector in the European Union by more than 3 per cent, or around \$US 870 million.

Table 6 Effects on EU rural sectors that do not benefit from direct payments
Per cent

	<i>Fruit and vegetable</i>	<i>Forestry</i>
Direct payments		
NMS	0.49	1.12
EU15	-1.21	-1.70
Border protection		
NMS	4.64	-0.96
EU15	6.66	-1.72
Total CAP		
NMS	4.95	0.04
EU15	5.62	-3.35

Source: Simulation results.

Sectoral effects outside the European Union

Overall, the impact of the CAP outside the European Union is to reallocate a sizable amount of resources away from agriculture and food processing, toward other sectors of the economy (table 7). This reallocation of resources amounts to about \$US 52.7 billion, and reflects a decrease in world prices for agriculture and food processing, and an increase in prices for other commodities (table 8).

Direct payments

With direct payments contributing to reducing the world price of cropping and livestock commodities (and, to a lesser extent, food processing commodities), the reaction in most regions is to reduce activity in these sectors. The largest effect is on cropping and livestock activity in Australia and New Zealand (-0.6 per cent or \$US 188.9 million). Resources are reallocated mainly to the manufacturing sector, which expands in all regions.

Table 7 Effects on sectoral outputs outside the European Union

Per cent

<i>CAP component /Region</i>	<i>Crops</i>	<i>Live-stock</i>	<i>Forestry & fishing</i>	<i>Food process.</i>	<i>Manuf.</i>	<i>Services</i>
Direct payments						
Australia–NZ	-0.31	-1.07	0.21	-0.47	0.22	-0.01
East Asia	-0.11	-0.06	..	-0.11	0.04	..
Rest of Asia	-0.15	-0.46	0.05	-0.07	0.08	0.01
North America	-0.50	-0.34	0.14	-0.07	0.07	-0.01
Latin America	-0.73	-0.44	0.09	-0.15	0.19	0.01
Africa	-0.63	-0.48	0.25	-0.30	0.20	0.04
Rest of Europe	-0.33	-0.35	0.29	-0.41	0.10	0.01
Export subsidies						
Australia–NZ	0.05	-0.60	0.15	-0.48	0.12	..
East Asia	-0.01	-0.04	-0.01	-0.06
Rest of Asia	-0.01	-0.11	..	-0.24	0.02	0.01
North America	-0.03	-0.13	0.01	-0.09	0.01	..
Latin America	-0.04	-0.16	0.01	-0.18	0.04	..
Africa	-0.02	-0.14	0.02	-0.35	0.05	0.01
Rest of Europe	-0.09	-0.12	0.03	-0.43	0.05	0.01
Border protection						
Australia–NZ	-0.19	-3.61	0.77	-3.53	0.97	0.01
East Asia	-0.83	-0.27	-0.07	-0.92	0.16	0.02
Rest of Asia	-0.08	-0.50	-0.06	-4.45	1.15	0.14
North America	-1.73	-1.03	0.29	-0.88	0.19	0.01
Latin America	-2.25	-11.88	0.53	-4.14	2.39	0.06
Africa	-0.18	-2.14	-0.05	-5.21	0.74	-0.03
Rest of Europe	-1.49	-1.46	0.38	-4.98	0.84	0.06
Total CAP						
Australia–NZ	-0.49	-4.89	1.01	-4.30	1.28	0.01
East Asia	-0.96	-0.39	-0.07	-1.10	0.20	0.02
Rest of Asia	-0.23	-1.07	-0.02	-5.01	1.32	0.15
North America	-2.30	-1.50	0.45	-1.07	0.28	..
Latin America	-2.78	-12.70	0.60	-4.51	2.64	0.06
Africa	-0.81	-2.93	0.18	-6.13	1.02	0.02
Rest of Europe	-1.95	-1.94	0.68	-5.90	1.00	0.08

.. between -0.005 and 0.005.

Source: Simulation results.

Table 8 Effect of the CAP on world prices

Per cent

Crops	-2.08
Livestock	-3.91
Forestry & fishing	0.16
Food processing	-0.83
Manufacturing	0.10
Services	0.18

Source: Simulation results.

Border protection

As the European Union applies unique tariff rates at the tariff line level, average barriers for aggregated commodity groups are affected by their composition. This gives rise to differences in the average tariff rates faced by exporters to the European Union (refer to table 4). Given the pattern of its exports to the European Union, Latin America faces the highest barriers of all regions for the crop, livestock and food processing sectors. Thus border protection from the European Union results in the largest reallocation of resources in Latin America, where the size of herds is reduced by about 12 per cent, and manufacturing output increases by about 2.5 per cent.

The high ad valorem tariff equivalents in the food processing sector (well in excess of 10 per cent on average) lead to decreases in output in this sector in many regions of the order of 5 per cent. The total decrease in activity in this sector outside the European Union is about \$US 24.6 billion. The effects of escalation in border protection are well illustrated with the results for Australia and New Zealand. Although the border protection faced by livestock exporters is relatively low, the high protection applied to the meat and dairy sectors has a flow-on impact upstream, reducing the output of the food processing and livestock sectors in Australia and New Zealand by more than 3.5 per cent. Furthermore, it is important to note that, to the extent that trade barriers are underestimated due to prohibitive tariffs (including prohibitive out-of-quota tariffs) not being fully captured in the database, these results are probably underestimates.

Export subsidies

The European Union subsidises exports of processed foods and, to a lesser extent, some agricultural products.³⁰ Export subsidies expand the European Union's markets and benefit importers of EU products by lowering the price of EU exports. The effects of

³⁰ As noted above, a possible alternative to export subsidies is to store or destroy surplus production. Storage and destruction of production are thought to be more expensive alternatives than selling a product on the world market. Some storage occurs in the European Union; the cost of this option is not modelled.

export subsidies on the European Union's trading partners are a function of the amount of subsidy that they receive (table 9). A large share of subsidies accrue to consumers in regions that import large amounts of agricultural and, in particular, food products from the European Union, such as parts of Asia, Africa, Latin America and non-EU Europe. On the other hand, North America, Australia and New Zealand import much less agricultural and food products from the European Union and consumers in these regions benefit little from EU export subsidies.

Table 9 EU export subsidies by destination region

US\$ million, per cent of value of exports

<i>Importing region</i>	<i>Crops</i>		<i>Food processing</i>	
	Value	Rate	Value	Rate
Australia–NZ	0.03	0.04	10.64	0.74
East Asia	0.97	0.13	123.93	1.10
Rest of Asia	1.92	0.23	237.79	3.61
North America	1.68	0.15	99.02	0.66
Latin America	0.32	0.10	53.03	1.56
Africa	1.15	0.06	186.26	2.68
Rest of Europe	6.74	0.17	246.65	1.68
Total	12.81	0.15	957.32	1.60

Source: Simulation results.

As export subsidies reduce the cost of procuring EU exports of agricultural and food products, the demand for these goods expands. Importers therefore substitute away from products from other regions and domestic production is reduced.³¹ This accounts for the decline in agricultural and food production in non-EU regions and the corresponding rise in the outputs of other industries as resources are shifted out of agriculture and food processing and reemployed in manufacturing and services. Livestock activities in Australia and New Zealand are particularly exposed to the reduction in world prices of bovine meat and dairy products. The small effects observed for the African crops sector relative to what may be expected are related to the high prices that prevailed during the period and therefore the relatively low subsidies modelled. This effect could be larger when world prices are low.

³¹ Export subsidies are contingent on the level of the intervention price and on world prices; they bridge the gap between the two. For a given intervention price, the subsidy increases as the world price decreases. As the subsidy increases, it depresses world prices further as the EU production arrives on the already oversupplied world market. The effect shown here is only that of the export subsidy, isolated from that of any initial, unrelated decrease in world agricultural prices.

Welfare and allocative efficiency effects

The following analysis of the global GDP and welfare effects of the CAP is couched in terms of the contribution of the different parts of the CAP as it is modelled. Export subsidy results are not presented, as the GDP and welfare effects of export subsidies in the modelling are very small (equal to zero at two decimal points in almost all cases).

Direct payments

The main welfare impact of direct payments is on the European Union itself — a loss in welfare measured in terms of GNE equivalent to \$US 1 billion per annum (table 10). This result can be decomposed into changes in allocative efficiency (GDP) and the EU15's terms of trade. Most of the loss is attributable to a loss in allocative efficiency (\$US 7.5 billion in terms of 2007 GDP) associated with diverting resources away from non supported sectors. This efficiency loss is partly compensated by a gain in the EU15's terms of trade as the prices of EU15 exports rise relative to the price of their imports.

The rest of the world also suffers a net loss from the direct payments. For example, direct payments reduce GNE in Australia–New Zealand by 0.04 per cent, equivalent to \$US 387 million. In the Americas, the reduction in GNE amounts to \$US 3.5 billion. The welfare losses can be largely attributed to a terms of trade deterioration.

The welfare cost to the world of the EU's direct payments is equivalent to \$US 6.6 billion per annum, which is about 0.01 per cent of global GNE. This is the net effect of the various resource reallocations that occur within the economies across the world, and represents an opportunity cost in terms of consumption possibilities.

Table 10 Effects of direct payments on real GNE and GDP
Per cent, US\$ million in 2007 prices

<i>Region</i>	<i>Gross National Expenditure</i>		<i>Gross Domestic Product</i>	
	Per cent	Value	Per cent	Value
Australia-NZ	-0.04	-387	..	-6
East Asia	-0.01	-1 213	..	135
Rest of Asia	..	18	..	76
North America	-0.02	-2 775	..	190
Latin America	-0.02	-726	0.01	200
Africa	..	-16	0.01	74
Rest of Europe	..	-66	0.01	366
NMS	-0.02	-217	0.02	286
EU15	-0.01	-1 042	-0.05	-7 538
World	-0.01	-6 598	-0.01	-6 598

.. between -0.005 and 0.005.

Source: Simulation results.

Border protection

The European Union suffers the traditional efficiency loss associated with border protection, of about \$US 46 billion, as these measures encourage a larger agricultural sector (and reduced activity in other sectors) in the European Union than is optimal (table 11). These losses are partly compensated by a transfer of income from the rest of the world through an improvement of the European Union's terms of trade, to the tune of almost \$US 15 billion. A standard result of an economy that restricts its imports is to induce a reduction in the world price of its imports and an increase in the price of exports.

Table 11 Effects of border protection on real GNE and GDP

Per cent, US\$ million in 2007 prices

<i>Region</i>	<i>Gross National Expenditure</i>		<i>Gross Domestic Product</i>	
	Per cent	Value	Per cent	Value
Australia-NZ	-0.14	-1 347	..	-34
East Asia	0.04	3 375	0.01	650
Rest of Asia	-0.11	-2 691	0.03	706
North America	-0.01	-1 885	0.01	941
Latin America	-0.23	-7 870	0.05	1 644
Africa	-0.07	-834	..	-46
Rest of Europe	-0.07	-2 314	0.06	1 980
NMS	-0.30	-3 687	-0.45	-5 295
EU15	-0.17	-26 159	-0.26	-40 808
World	-0.08	-40 748	-0.08	-40 748

.. between -0.005 and 0.005

Source: Simulation results.

North America and the rest of the world experience an increase in GDP due to increased imports of manufactured goods by the European Union. This increase in imports is due to the retention of resources in agriculture in the European Union leading to a reduction in production in other sectors. In many cases, however, the increases in GDP are counteracted by worsening terms of trade.

Almost all regions experience a welfare loss from the EU protection from agricultural imports. Latin America as a group suffers the biggest losses because its exports to the European Union face the highest protection. The main source of this loss is a deterioration in the region's terms of trade as the border protection reduces the price they receive for their exports. Similarly, losses in Australia and New Zealand are mainly attributable to a deterioration in the average price of their exports induced by the EU protection. Importers of food experience some benefit from the lower world food prices caused by increased agricultural protection in the European Union.

Overall effects of the CAP

The overall effects of the CAP are made up of the effects of each of the components modelled, as outlined above. The largest contributor to the aggregate effects of the CAP is the border protection component, which accounts for more than 80 per cent of the losses in welfare and GDP sustained by the EU economy as a whole (table 12).

Table 12 Effects of the CAP on real GNE and GDP

Per cent, US\$ million in 2007 prices

<i>Region</i>	<i>Gross National Expenditure</i>		<i>Gross Domestic Product</i>	
	Per cent	Value	Per cent	Value
Australia-NZ	-0.19	-1 850	..	-38
East Asia	0.03	2 468	0.01	891
Rest of Asia	-0.10	-2 552	0.03	908
North America	-0.03	-4 891	0.01	1 293
Latin America	-0.26	-8 730	0.06	1 955
Africa	-0.05	-560	0.01	158
Rest of Europe	-0.06	-1 816	0.09	2 794
NMS	-0.32	-3 943	-0.44	-5 116
EU15	-0.16	-25 541	-0.30	-47 063
World	-0.08	-45 205	-0.08	-45 205

.. between -0.005 and 0.005.

Source: Simulation results.

The estimated allocative efficiency cost to the European Union of all the elements of the CAP exceeds \$US 52 billion. This figure does not account for any administrative and resource costs of managing the CAP (discussed below). A terms of trade gain offsets some of the allocative efficiency loss, but the European Union still experiences a net welfare loss.

In most regions outside the European Union welfare declines, usually due to the terms of trade gain in the European Union. A terms of trade gain for the European Union means a terms of trade loss for the rest of the world. For the world as a whole, the CAP causes gross output (and welfare) to decline by 0.08 per cent or \$US 45 billion.

5 Conclusion

This paper estimates the contribution and costs of the CAP to the EU and global economies. This assessment was conducted using recent data (2007) on the CAP in a general equilibrium framework, in order to capture economy-wide effects. The results show that the CAP leads to:

- an increase in the output of the agricultural and food processing sectors of around 8 and 6 per cent respectively in the European Union
- a decrease in the output of the manufacturing and services sectors in the European Union equivalent to around \$US 65 billion
- decreases in world prices for agricultural goods (of between 2 and 4 per cent) and food processing goods (of around 1 per cent), and increases in world prices for manufactured goods and services
- a reallocation of resources away from agriculture and food processing toward other sectors of the economy in all non-EU regions — some of the largest decreases occur in the livestock sectors in Latin America (12.7 per cent) and Australia–New Zealand (4.9 per cent), and in the food processing sectors in most regions
- forgone production, as measured by a decrease in GDP, in the European Union of about 0.3 per cent, or \$US 52 billion
- a net welfare loss in almost all of the European Union’s trading partners, in most cases due to the terms of trade gains experienced by the European Union, which translate into a terms of trade loss for all the other regions
- net global welfare costs of about \$US 45 billion that mostly accrue to the European Union itself (\$US 30 billion), with the largest contributor to this welfare loss being the border protection component of the CAP.

Other general equilibrium analyses of European assistance to agriculture usually examine the effects of liberalising some or all components of the CAP and are generally consistent with the results presented above (see, for example, Frandsen, Gersfelt and Jensen, 2002).

Some caveats

The modelling results are sensitive to parameter choices, specific model features, and the structure of the database. They are also incomplete, reflecting the limited ability of CGE modelling to capture all costs and benefits associated with the CAP. These factors would need to be accounted for in a more comprehensive analysis of the effects of the CAP.

Using a database with a 2004 base year to model a 2007 policy situation relies on the simplifying assumption that the structure of production and trade has not changed across

countries over that time. This may be a reasonable assumption for many countries. The period between 2004 and 2007 saw some changes in the structure of the European Union: 12 NMS joined the European Union, and direct payments were gradually decoupled over this period. These changes are likely to have induced changes in production and trade patterns which are not accounted for in the database and could affect results.

Aggregating the database into commodity groups can lead to an underestimation of some of the sectoral results. Although in this study all agricultural sectors were left disaggregated, all other industries were aggregated into two — manufacturing and services. This reduces the scope for inter-sectoral resource reallocation in the model, and may understate the allocative efficiency costs associated with the CAP.

Much work has been done in version 7 of the GTAP database to better represent the decoupling of direct income payments. Although the decoupling in the database is incomplete, with only crop sectors accounted, this is presently not of concern as many commodity-specific payments remain. However, as the European Union moves increasingly towards the SPS across all agricultural sectors, away from more traditional assistance measures, this will need to be reflected in the database and future modelling.

Results are sensitive to the parameter estimates used as they affect, among other things, the supply response associated with various forms of assistance. Future work might investigate the appropriateness of the standard parameters that were used in this study, and may produce estimates of the elasticity of output with respect to assistance. However, econometric estimation of this relationship is difficult due to a lack of data.

There are several other considerations that have not been taken into account in the modelling conducted in this study, both because some effects are inherently difficult to model, and because the complexity of the model increases with the number of effects incorporated. Accounting for the following considerations would be an important addition to a comprehensive policy assessment of the effects of the CAP.

- The costs of administering the CAP — that is, the costs of managing the tariff, the quota systems, or the direct payments.³² Their exclusion means that the costs of the CAP are underestimated.
- CAP assistance to farmers can lead to inefficiencies associated with technical change (in addition to allocative inefficiencies). For example, the lack of competitive forces in the presence of subsidisation can remove the incentive to improve management practices, implement best practice farming techniques, and adopt new technology. Including this technical change (productivity) effect in the modelling would increase the estimated costs of the CAP.

³² The costs of administering the tariff schedule can include costs to business of complying with import regulations, import licensing and quarantine restrictions, and costs of government administration.

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- The direct effects of cross-compliance and rural development measures were not modelled, nor were the possible externalities associated with them. Positive externalities could include the value of improved environmental outcomes, animal welfare conditions and rural landscapes. Possible negative externalities could be associated with a higher level of agricultural output under the CAP than would otherwise prevail (such as environmental damage from fertiliser or pesticide use).
 - The CAP is in constant evolution, As such, any study at a point in time is either an ex post assessment of the effects of the CAP (as is this study) or an ex ante evaluation of the possible effects of changes. The former is likely to have more information available, and usually entails numerous compromises to isolate the effects of policies from all that has taken place. The latter is often based on less information, making it more difficult to review and less susceptible to thorough criticism.
 - A successful transition to a more market oriented CAP program means that the costs of CAP assistance may decline over time. This raises the challenge of developing methods for modelling less traditional forms of industry assistance that have a less predictable relationship with economic outcomes.

Notwithstanding the limitations of the modelling, the results suggest that the CAP is generating a significant welfare loss, particularly to the European Union itself. Despite some 'decoupling', CAP assistance still biases production toward products and activities that benefit from strong assistance, either through direct payments or through border protection. This occurs to the detriment of other parts of the economy, including manufacturing and services. but also forestry and some fruit and vegetable crops which compete for land and do not benefit from assistance.

Appendix tables

Table A.1 **2008 CAP Health Check main issues and Council outcomes**

<i>Issue</i>	<i>Council outcome</i>
Set-aside	Abolish the requirement to leave 10 per cent of arable lands fallow
Milk quotas	Increase quotas by 1 per cent annually from 2009 to 2013 (milk quotas will be phased out by April 2015)
Decoupling	<ul style="list-style-type: none"> • Arable crops, olives and hops to be fully decoupled from 2010 • Seeds, beef and veal payments (except the suckler cow premium) to be decoupled by 2012
SPS model	Additional flexibility granted to member states distributing decoupled support under the historic model with funds to be distributed on a regional basis
SAPS	Extend the SAPS to 2013 (initially SAPS needed to be converted to the SPS by 2010-11)
Cross-compliance	<ul style="list-style-type: none"> • Simplify the requirements by withdrawing some irrelevant and redundant rules • Implement new requirements on landscape features and water management
Article 68	<ul style="list-style-type: none"> • Member states may use up to 10 per cent of their financial ceiling to grant measures to address disadvantages for farmers in certain regions specialising in dairy, beef, goat and sheep meat, and rice farming • Risk management measures broadened to include crop, animal and plant insurance and mutual funds for animal diseases and environmental incidents
Modulation	<ul style="list-style-type: none"> • Overall increase in modulation by 5 per cent distributed over four steps beginning in 2009, to reach 10 per cent by 2012 • Progressive modulation of 4 per cent for direct payments above 300,000 Euros
Intervention mechanisms	<ul style="list-style-type: none"> • Abolish intervention for pigmeat • Set at zero the intervention quantity for barley and sorghum • Introduce tendering for common wheat, butter and skim milk powder once threshold has been reached
Payment limitations	Apply either a minimum payment (100 Euros) or a minimum size of eligible area per holding (1 hectare) with the exception of Portugal, Hungary and Slovenia for which the minimum size remains at 0.3 hectares
Specific scheme	<ul style="list-style-type: none"> • Protein crops, rice and nuts will be decoupled by 1 January 2012 • Abolish the energy crop premium in 2010
Rural development	<ul style="list-style-type: none"> • Reinforce programs in the fields of climate change, renewable energy, water management and biodiversity (funded with additional modulation) • Dairy and accompanying measures added as a new challenge

Source: European Commission 2009b.

Table A.2 Share of commodity-specific payments by EU member state and sector

Per cent, 2008

	Coupling max^a	<i>Belgium</i>	<i>Denmark</i>	<i>Germany</i>	<i>Greece</i>	<i>Spain</i>	<i>France</i>	<i>Italy</i>	<i>Netherlands</i>	<i>Austria</i>	<i>Portugal</i>	<i>Slovenia</i>	<i>Finland</i>	<i>Sweden</i>
Livestock														
Sheep and goats	50		50			50	50				50	50		50
Slaughter (calves)	100	100 ^b				100	100		100	100	100			
Beef option 1 ^c suckler cow premium ^d	100	100				100	100			100	100			
slaughter (adults)	40					40	40			40	40			
Beef option 2 slaughter (adults)	100								100					
special male premium ^e	75		75									75	75	75
Crops														
Arable crops	25					25	25							
Hops	25			25			25			25				25
Olive groves	40					6								
Seeds														
All species	100				100	100	100	100	100		100			100
Certain species	100	100				100			100					100

^a In the French overseas departments, Azores and Madeira (Portugal) and the Canary Islands (Spain), 100 per cent of direct payments remain coupled. ^b Only the Northern region (Flanders and Brussels). ^c Member states can choose one of the two options presented in this table for retaining coupled payments to beef. ^d A 'suckler cow' belongs to a herd intended for the rearing of calves for meat production. ^e The 'special male premium' is for the holding of male cows before either slaughter or export.

Source: European Commission, 2008e.

Table A.3 EU applied MFN tariffs on selected products

By classification system, 2008

<i>Code</i>	<i>Description</i>	<i>Number of lines</i>	<i>Average tariff (%)</i>	<i>Range (%)</i>	<i>Standard Deviation (%)</i>
HS2 ^a					
09	Coffee, tea, mate and spices	43	3.0	0-12.5	4.2
10	Cereals	55	49.4	0-138.2	34.5
17	Sugar and sugar confectionary	42	35.7	0.1-604.3	95.0
24	Tobacco	30	28.6	10-74.9	17.4
51	Wool	70	4.0	0-8.0	3.1
52	Cotton	149	6.4	0-8.0	2.3
ISIC ^b					
1	Agriculture, hunting, forestry & fishing	565	9.3	0-139.6	13.8
11	Agriculture & hunting	422	9.9	0-139.6	15.5
12	Forestry & logging	36	0.3	0-3.2	0.9
3	Manufacturing	9 009	6.7	0-604.3	14.8
	Manufacturing excluding food processing	7 247	3.8	0-89.9	4.0
31	Manufacture of food, beverage & tobacco	1 762	19.4	0-604.3	30.4
311	Food products	1 433	20.5	0-485.6	27.7
3111	Meat products	290	25.4	0-204.2	29.2
3112	Dairy products	150	32.4	0-189.7	33.2
3113	Fruit & vegetable canning	383	21.5	0-485.6	32.2
3115	Manufacture of oil & fats	128	10.2	0-161.9	21.8
3118	Sugar products	11	32.9	0-94.7	37.0
3132	Manufacture of wines	108	16.2	0-218.3	33.1
314	Tobacco manufacturing	9	41.8	10-74.9	25.5

^a Harmonized System (HS) of classification. ^b International Standard Industrial Classification (ISIC), Revision 2.

Source: WTO 2009.

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