

Membership of NAFTA: A Viable Alternative for UK Agro-Food Producers?

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ABSTRACT

As the EU enlarges to 25 members, the UK continues to stagnate on further integration, particularly euro membership. Against this background, senior Eurosceptics have mooted NAFTA accession as a possible alternative, whilst a literature search reveals only one corresponding quantitative impact study. This paper revisits this issue, whilst focusing mainly on the impact on agro-food (AF) sectors, since under the auspices of the common agricultural policy (CAP), UK support (non-border) and trade (border) protection is almost exclusively the preserve of AF sectors. Detrimental impacts to farming incomes are expected, whilst potential real income gains to the UK economy are reported.

1. INTRODUCTION

IN NOVEMBER 1999, the Senate Finance Committee requested the United States International Trade Commission (USITC) to investigate the impact of including the UK within the North American Free Trade Agreement (NAFTA). In June of the following year, an unofficial delegation of four US senators were received by senior members of the UK's Shadow Cabinet, including the previous leader of the Conservative party, Iain Duncan-Smith. Whilst, at worst this may have been viewed as a transient strategy to appeal to the electorate given public opinion on the euro,² at best, such interest reflects longer term beliefs of a common politico-economic culture between the UK and the US. Indeed, certain commentators (Hulsmann, 2000; Global Britain, 2000) argue that the model of free-market economic management exhibited in both countries is incongruous with European statist principles, which favour a significant role for government intervention and a greater tendency toward protectionism.

A high profile example of such statist dogma is the common agricultural policy (CAP), where the European commission spends just under half of the EU's budgetary resources subsidising a farming sector which today accounts for merely two percent of EU GDP. Whilst this has prompted UK politicians to call for deeper cuts in support, France and Germany appear keen to preserve real expenditure ceilings as far as 2013. Moreover, the

French President, Jacques Chirac, has renewed calls for the British budget rebate, negotiated under the Thatcher government and deeply unpopular with a number of member states, to be reviewed. If ceilings are maintained and the rebate is reduced, this could lead to a severe worsening of the UK's financial position.

On examining the viability of EU membership to the UK, Black (2000) argues that unilateral withdrawal from the CAP would result in significant budgetary savings and the loss in farm support would be more than compensated by welfare gains from cheaper food prices from trade diversion and creation effects. This assertion is supported by Hindley and Howe (1996) and Leach (2000), who predict a UK net cost of approximately one percent of GDP from EU membership largely due to the CAP, whilst Mindford (1996) suggests that the figure could be as high as one and a half percent. Other commentators (Barrell and Pain, 1997; Pain and Young, 2001) remain sceptical, arguing that UK special relations with transatlantic partners are heavily dependent on our continued membership and influence within the EU. Indeed, Pain and Young (2000) estimate that UK membership of the EU yields a net benefit of two and a quarter percent of GDP principally from foreign direct investment (FDI) effects.

However, the estimates presented here assume unilateral UK withdrawal from a customs union when in all probability, a renegotiation of the UK's position would either; (a) preserve many aspects of the UK's relationship with the EU; (b) involve a secure deal with another trading body (i.e., NAFTA); or (c), a combination of (a) and (b). Whilst simultaneous membership of the EU and NAFTA is prohibited by articles 133 and 310 of the Treaty of Rome, Black (2000) and Bandow (2001) posit that the UK could join the European Free Trade Association (EFTA), which would qualify the UK for membership of the European Economic Area (EEA), thereby allowing negotiation for joint membership of NAFTA.³ If the UK were to follow this strategy, it would continue to reap the benefits of tariff-free access to the EU's single market, whilst remaining free from the commitments of monetary union, common policies (in particular the CAP) and closer political integration (e.g., EU-wide defence policy). In exchange, however, continued free access to EU markets through the EEA would require signatory contributions to Brussels, whilst EU disaffiliation would not entitle the UK to any reciprocal funding. Moreover, Rollo (1995) notes that EEA membership would result in regulation without representation, as the UK would have little or no input into EU decision-making, whilst being forced to accept the outcomes of this process.⁴

Thus, investigating the impact of a UK-NAFTA agreement, USITC (2000) employ two hypothetical scenarios: (i) the UK unilaterally joins NAFTA and erects import barriers with the EU on mutual trade at rates equivalent to those imposed by the EU on third countries; and (ii) that the UK joins NAFTA but maintains free trade links with the EU (as a member of the EEA). In both hypothetical situations, UK trade relations with countries outside of NAFTA

and the EU (i.e., the rest of the world) are assumed unchanged. To characterise the complex interactions that would occur both intra- and inter-regionally between agents and markets under such scenarios, the USITC study employed the comparative static (CS) Global Trade Analysis Project (GTAP) computable general equilibrium (CGE) model. As border protection between the UK and NAFTA is largely tariff free (with the exception of agro-food (AF) sectors), their results suggested only marginal UK real growth changes of -0.02 percent and 0.10 percent under scenarios (i) and (ii) respectively, with the GDP increase in the latter mainly attributed to output increases in transportation, textiles and chemical industries.

2. AIMS AND OBJECTIVES

UK border protection is heavily skewed toward AF sectors, suggesting that the repercussions of a UK-NAFTA agreement on individual AF sectors could be substantial. This issue is not investigated in USITC, which treats agriculture and food processing as composite entities. Accordingly, the main aim is to examine the potential impacts on individual AF sectors by employing the same counterfactual scenarios as USITC. Equally, *non-border* support to upstream primary agricultural sectors is considerable. Thus, explicitly modelling agricultural support mechanisms by sector (i.e., set-aside, quotas, etc.), the study also examines the concomitant financial impacts on UK farm sectors and the broader economy from variations in non-border support.

Furthermore, this study employs the dynamic version of the GTAP model (Ianchovichina and McDougall, 2000) for theoretical and policy reasons. Firstly, with the inclusion of time as an explicit variable, UK accession to NAFTA is more realistically treated as a gradual process of adjustment over a series of interdependent periods, where in USITC it is assumed that these policy shocks occur instantaneously. Secondly, CS models have often been criticised for theoretical inconsistency in that on the one hand consumers and producers follow complex optimisation procedures to determine decision making (e.g., allocation of expenditure between food and services), whilst exhibiting relatively simplistic behaviour in the allocation of long-run investment. The dynamic GTAP addresses this issue employing a considerably more complex characterisation of long-run savings-investment behaviour based on investor expectations. Moreover, the model also captures capital accumulation and its associated income effects, whilst more realistically permitting capital to move *between regions* as well as sectors (CS GTAP only allowed the latter). This improved characterisation of international financial behaviour is particularly pertinent given the importance of FDI impacts to the UK (Rugman and Kudina, 2001).

3. GTAP MODEL AND DATA

The standard CS GTAP trade model (Hertel, 1997) relies on conventional nested neo-classical optimisation techniques (utility maximisation; cost minimisa-

tion) to characterise nested final and intermediate demands. Production activities are determined by market clearing equations, assuming constant returns to scale and perfect competition. The *regional household* accrues income from the ownership of factors and net tax revenues, which are apportioned over three forms of final demand: non-homothetic private expenditures, public expenditures and future expenditures (savings). Bilateral trade relations between regions are characterised with an Armington specification, which avoids complete specialisation effects from otherwise homogeneous goods. Finally, long run closure involves the use of a fictitious agent, known as the *global bank*, which collects each region's investment funds (savings) and allocates them such that changes in expected rates of return across all regions are equalised. In the single period CS model treatment, all investment is region specific and does not affect the current level of productive capital services. The accompanying GTAP database (Dimaranan and McDougall, 2002) consists of three principal data inputs: domestic input-output tables for the regions; bilateral gross trade flows; and protection and support data represented as *ad valorem* price wedges. Thus, support policy changes can be implemented by exogenous shocks between the relevant price wedges. The model is calibrated to the benchmark year of 1997 employing borrowed trade, factor and input substitution parameter estimates.

The dynamic (intertemporal) version extends the CS model and data treatment by incorporating capital accumulation, adaptive (lagged) expectations and modifications to the accounting conventions of the data to incorporate international capital mobility.⁵ Regional capital stock accumulation is a function of *continuous* time, which is consistent with the GTAP database where stock, and flow data refer to a single temporal point. Investor expectations of the actual rate of return on an asset are based on the extent to which *current* period capital stock growth diverges from a reference or *natural* growth rate which is consistent with constant growth in the actual rate of return through time and revised according to ongoing changes in the capital stock and the actual rate of return in the current time period. Thus, if current capital stock growth exceeds the natural growth rate, investors adjust their expectations of the actual rate of return downwards in the next period (i.e., lagged expectations). Over the long run, the adaptive expectations treatment employs an error correction mechanism such that lag errors between expected and actual rates of return in each region are eventually eliminated and expected return rates across regions converge, although this long run effect may not be realised within the chosen time frame of the model scenario.⁶

The dynamic treatment also extends the standard GTAP data by incorporating domestic and foreign wealth (i.e., capital ownership). Due to data constraints the model does not measure the impacts of FDI from specific bilateral partners (e.g., NAFTA countries). Accordingly, a second-best approach incorporates a *global trust*, which assumes the duties of the global bank whilst also handling foreign investments. Thus, data by region for household (domes-

tic) wealth consists of home ownership of domestic capital (HW_{DK}) and the stake in the trust (i.e., home ownership of foreign capital — HW_{FK}):

$$HW_D = HW_{DK} + HW_{FK} \quad (1)$$

This must be distinguished from the region's wealth (WD), consisting of domestic (home) ownership (HW_{DK}) and foreign (trust) ownership (FW_{DK}):

$$W_D = HW_{DK} + FW_{DK} \quad (2)$$

By definition, the total stake the trust holds in all regions (inward foreign investment funds) is equal to the sum of each region's stake in the trust (outward foreign investment) and income (rent) accruing from wealth are administered by the trust:

$$\sum_{reg} FW_{DK} = \sum_{reg} HW_{FK} \quad (3)$$

A further development in the model is the incorporation of imperfect competition. In marketing theory, primary agricultural products are perceived as homogeneous, whilst remaining sectors (food processing, manufacturing and services) are product differentiable. Thus, in characterising demands for varieties, endogenous horizontal product differentiation is implemented following similar trade studies (Harris, 1984; Hertel, 1994). Producer behaviour is consistent with McCorristen (2002) who suggests that food processing sectors in North American and European markets are more typically characterised as oligopolistic. Thus, producer behaviour follows an eclectic approach (Hertel, 1994; Harrison, *et al.* 1995) combining the assumptions of product differentiation and freedom of exit/entry with endogenous price mark-ups based on strategic conjectural variations.⁷

4. EXPERIMENTAL DESIGN

The chosen regional aggregation includes the UK, individual NAFTA members and the composite EU14 region, whilst developed (DC) and developing country (LDC) composites are included to facilitate easier implementation of the Uruguay Round (UR) reforms. The commodity aggregation focuses on key primary agricultural and food sectors within the UK, whilst incorporating a composite services and manufacturing sector.⁸ The benchmark year is 1997 and it is assumed that UK accession scenarios begin in 2003 and are gradually phased in over five successive yearly time periods to 2007.

A realistic inter-temporal baseline scenario requires the inclusion of relevant macro (population, real growth, gross domestic investment, skilled and unskilled labour) UR tariff shocks, which are applied employing data from Walmsley *et al.* (2000). Secondly, simultaneous implementation of the export

subsidy/volume agriculture commitments within the UR follows Blake *et al.* (1999) for all subsidised bilateral routes, where agreed non-EU region value/volume reductions are equal in each period, for the relevant UR time horizons (six years for DCs, ten years for LDCs). Since the benchmark year is 1997, it is assumed that a time proportional level of reform has already occurred. As the EU accounts for 90 percent of agricultural export subsidy expenditure, a more detailed shock treatment is imposed. Thus WTO notifications on export expenditure and volumes by sector are collected and binding constraints are calculated and implemented. Uruguay Round output subsidy expenditure reductions are imposed, with the exception of the EU regions where the 1992 MacSharry reforms reduced the aggregate measure of support below the stipulated commitment levels under the UR reform.

Thirdly, as in USITC, NAFTA liberalisation and the EU-Mexico FTA agreements are fully implemented. In the former, trade protection within the NAFTA trade-bloc is removed by 2003 using data from Walmsley *et al.* (2000). The latter permits Mexico unfettered access to EU markets from 2003, with reciprocal trade facing a maximum Mexican tariff of five percent. The agreement stipulates that almost all EU exports to Mexico will be allowed free access by 2007. In this study, all protection on EU exports to Mexico is removed by 2007. Annual tariff reductions under both agreements are based on equal percentage reductions in each period. Finally, to estimate the economic costs to UK agriculture from accession into NAFTA necessitates the implementation of the Agenda 2000 reforms, which in turn requires an explicit representation of CAP support and budget mechanisms.⁹

The *alternative* scenarios follow USITC, where scenario one (S1) examines the impact of complete withdrawal from the EU customs union (and CAP) with simultaneous integration into NAFTA. In scenario two (S2), the UK remains part of the single market as a member of the EEA, whilst releasing itself from the financial commitments of the CAP. A sensitivity analysis varying levels of non-border support to UK farmers is also conducted and reported. A full description of the model scenarios is provided in Figure 1 of the appendix.

5. RESULTS

The left side of Table 1 describes the pattern of protection on UK imports and exports with NAFTA members in 2002 (prior to UK accession). Significant protection prevails in most AF sectors, although in both livestock sectors, and vegetable oils and fats production, protection is low, whilst oilseeds have zero protection. In the non-AF sectors, manufacturing exhibits relatively low border support and in services protection is zero. Whilst UK services dominate GDP, UK trade is dominated by manufacturing and is largely biased toward the EU.¹⁰ Oilseeds and cattle & sheep trade is skewed toward NAFTA, whilst UK sugar (upstream and downstream) trade is mainly with DCs and LDCs. Raw milk production is non-tradable. The discussion mainly focuses on the

Table 1: The structure of UK trade and protection prior to accession in 2002.

Commodity	UK protection on NAFTA trade prior to accession in 2002 (percentage of market price)												UK trade with the EU14 and NAFTA As a percentage of total UK trade in 2002						
	Import tariffs						Export subsidies						Imports from:			Exports to:			
	USA	CAN	MEX	USA	CAN	MEX	EU14	NAFTA	USA	EU14	NAFTA	USA	EU14	NAFTA	USA	EU14	NAFTA	USA	
Wheat	36.3	36.3	3.8	5.2	5.0	3.7	62.9	31.4	6.9	63.1	31.1	6.8	6.8	31.1	6.8	6.8	31.1	6.8	
Other grains	27.8	27.8	1.9	19.8	22.0	17.0	79.5	3.4	2.6	80.9	3.2	2.3	2.3	3.2	2.3	2.3	3.2	2.3	
Oilseeds	0.0	0.0	0.0	0.0	0.0	0.0	21.7	36.0	30.5	22.8	35.5	30.0	30.0	35.5	30.0	30.0	35.5	30.0	
Sugar	41.2	36.3	1.5	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	
Raw milk*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cattle & Sheep	2.8	3.1	0.8	0.0	0.0	0.0	18.5	39.0	35.4	18.8	38.9	35.4	35.4	38.9	35.4	35.4	38.9	35.4	
Pigs & poultry	0.6	1.1	0.1	0.0	0.0	0.0	57.8	12.7	7.9	58.2	12.3	7.6	7.6	12.3	7.6	7.6	12.3	7.6	
Fruit & vegetables	12.7	12.7	0.3	0.8	0.8	0.8	67.7	7.4	6.2	70.2	7.0	5.9	5.9	7.0	5.9	5.9	7.0	5.9	
Other agriculture	9.6	4.0	0.0	0.2	0.3	0.2	39.2	7.0	5.7	39.9	6.9	5.7	5.7	6.9	5.7	5.7	6.9	5.7	
Cattle meat processing	35.8	35.9	3.5	17.8	19.7	10.5	20.4	3.6	2.1	21.8	3.7	2.1	2.1	3.7	2.1	2.1	3.7	2.1	
Other meat processing	23.6	23.6	1.4	4.0	1.9	0.5	88.9	1.2	1.0	89.2	1.2	1.0	1.0	1.2	1.0	1.0	1.2	1.0	
Sugar processing	7.0	15.9	3.6	20.1	37.4	29.0	1.3	4.1	0.8	1.3	3.8	0.7	0.7	3.8	0.7	0.7	3.8	0.7	
Dairy	46.7	46.7	1.7	19.5	19.5	19.7	72.0	6.3	1.0	72.8	6.1	0.9	0.9	6.1	0.9	0.9	6.1	0.9	
Vegetable oils & fats	2.0	7.0	0.2	0.1	0.1	0.1	52.0	8.2	7.4	54.4	7.3	6.6	6.6	7.3	6.6	6.6	7.3	6.6	
Other food processing	5.8	8.1	0.8	1.0	1.0	0.2	52.8	14.2	12.1	53.3	13.8	11.7	11.7	13.8	11.7	11.7	13.8	11.7	
Other primary	0.0	0.0	0.0	0.0	0.0	0.0	5.4	8.8	4.2	5.3	8.2	3.8	3.8	8.2	3.8	3.8	8.2	3.8	
Manufacturing	2.2	1.7	0.1	0.0	0.0	0.0	51.7	16.3	15.1	52.3	16.3	15.1	15.1	16.3	15.1	15.1	16.3	15.1	
Services	0.0	0.0	0.0	0.0	0.0	0.0	31.4	29.9	25.5	31.4	29.9	25.5	25.5	31.4	25.5	25.5	31.4	25.5	

Source: GTAP database * Milk is non tradable

impact to the AF sectors and the financial impact to agricultural producers in the UK economy, whilst aggregate welfare results are reported for the remaining regions. All estimates are presented as *cumulative differences* from the baseline scenario in 2008.

5.1 UK trade - overview

Table 2 shows cumulative differences in trade values from the baseline in 2008 for each scenario. Given the pattern of UK trade in Table 1, the trade loss in S1 from the EU is not compensated by increased trade with NAFTA. In S1, aggregate exports (Table 2) to the EU fall by \$US29.643bn, whilst exports to NAFTA rise by US\$5.024bn. For aggregate imports, the corresponding statistics are -\$US33.656bn, and US\$14.770bn respectively. In S2, competitive import substitution from NAFTA still occurs, although with continued free access to EU markets, trade diversion is considerably weaker. Thus, UK exports (imports) to the EU and NAFTA change by -\$2.126bn and \$4.286bn (-\$1.333bn and \$13.194bn) respectively. As expected, manufacturing dominates aggregate trade results, whilst UK trade relations with NAFTA are mainly with the USA.¹¹

5.1.1 UK AF trade.

Following aggregate trade trends, UK-EU export falls in S1 in many AF sectors are larger than UK-NAFTA export increases, particularly in AF sectors where (a) swings in high protection occur from NAFTA to EU trade (e.g., cereals, downstream meat sectors, dairy), and (b) where UK trade before withdrawal is skewed to the EU (e.g., cereals, pigs & poultry, fruit & vegetables, other meat processing, dairy). With large relative import price movements from changes in the structure of border protection and Armington preferences, Table 2 also reports significant import substitution in dairy and wheat sectors. In a minority of AF sectors (oilseeds, cattle, sugar and sugar processing) trade diversion in S1 is much less dramatic since (a) protection is low (e.g., cattle & sheep) or even zero (e.g., oilseeds) and (b) trade is already skewed toward NAFTA (e.g., oilseeds, cattle & sheep) or third countries (e.g., sugar, sugar processing). Summing over both trade blocs, total AF exports (imports) in S1 fall by \$US4.153bn (\$US3.059bn).

In S2, import diversion from the EU to NAFTA in all AF sectors is muted since free trade continues with the EU. Relative to the baseline, AF imports across both trade blocs rise \$US3.488bn. Similarly, export trade increases to both trade partners in S2, where access to relatively cheaper intermediate inputs from NAFTA over successive time periods and continued free access to the EU market results in increases of \$US0.636bn and \$US0.440bn to the EU and NAFTA respectively.

5.2 Growth and retail prices

Given that the largest policy shocks occur in the AF sectors, which account for only eight percent of UK GDP in the data, real growth impacts (see Table 3) are small. There is a real growth fall of 0.06 percent in S1 and a corresponding rise of 0.12 percent in S2. Real growth in the NAFTA regions is largely unaffected, although with greater trade penetration in the UK under S1, growth is stronger. In the EU14, the partial loss of UK trade, particularly in S1, has a slight detrimental impact on growth. The impact of high trade protection in AF sectors results in larger falls in the UK retail food price index (RFPI) compared with the retail price index (RPI) in S1 (see Table 3), where primary factor (particularly land) prices fall in response to reduced economic growth. In S2, UK RPI increases slightly with economic growth and associated factor price rises, although the RFPI falls (relative to S1 and the baseline) since there are no countervailing EU import tariffs imposed on UK trade. In the EU14, a small rise in the RFPI (and RPI) under S1 is due to the raising of trade protection on UK trade, whilst in the USA and Canada, increased trade with the UK bids up factor, and ultimately, consumer prices, with greater activity in S1 resulting in relatively higher RPI and RFPI estimates.

5.3 Aggregate economic welfare

Table 3 decomposes cumulative aggregate welfare for each region in 2008. In S1, the UK experiences a slight equivalent variation (EV) loss of \$US0.817bn, while in S2, there is a corresponding EV gain of \$US1.509bn.¹² In both scenarios the EU14 loses, particularly in S1 (-\$US6.132bn) since UK/EU free trade links are severed. Overall NAFTA emerges as a net gainer, particularly in S1 (\$US1.525bn in S1 and \$US0.786bn in S2).

In terms of the CAP budget, gradual UK withdrawal from the common financing scheme brings significant reductions in support and payments, although the net impact to the UK and EU14 in both scenarios is relatively small.¹³ In S1 and S2, the UK realises cumulative budgetary gains (\$1.378bn and \$0.749bn respectively) since it is a net loser from the CAP budget in the baseline run. In S2, the UK's loss in CAP support is slightly smaller over the five year period, largely because support payments to cereals and milk sectors fall less dramatically over time with improved output levels compared to S1.¹⁴ Allocative efficiency effects are negative in S1 (\$US0.757bn) but slightly positive in S2 (\$US0.212bn) due to the relative improvement (S2 vs. S1) in manufacturing industry output and higher positive growth in the services sector. The UK terms of trade is slightly negative in S1 (-\$US0.063bn) whilst rising in S2 (\$US0.124bn).

Related to the modelling of imperfectly competitive sectors are the welfare impacts of variety and pro-competitive effects. In theory, the removal of trade protection reduces market power by domestic firms resulting in falling mark-ups (pro-competitive efficiency gains) and, *ceteris paribus*, falling profitability leading to an exodus of firms/product variants (negative variety

**Table 2: Cumulative difference from the baseline in 2008
(\$US 1997 millions) under scenario one (scenario two)**

Commodity	UK exports to:			UK imports from:			UK trade balance with:		
	EU	NAFTA	USA	EU	NAFTA	USA	EU	NAFTA	USA
Wheat	-374.3	0.1	0.0	-144.4	184.3	42.1	-229.9	-184.2	-42.1
	(-2.2)	(0.0)	(0.0)	(-75.4)	(145.9)	(33.2)	(73.2)	(-145.9)	(-33.2)
Other grains	-121.7	-0.2	-0.2	-140.3	40.9	36.3	18.6	-41.1	-36.5
	(-2.6)	(-0.2)	(-0.2)	(-14.5)	(27.2)	(24.4)	(11.9)	(-27.4)	(-24.6)
Oilseeds	3.5	0.1	0.1	1.7	1.5	0.4	1.8	-1.4	-0.3
	(2.4)	(0.1)	(0.1)	(3.2)	(2.0)	(2.4)	(-0.8)	(-1.9)	(-2.3)
Sugar	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	(-0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Cattle & Sheep	-17.3	18.8	18.8	-9.9	19.4	18.4	-7.4	-0.6	0.4
	(2.5)	(8.9)	(8.9)	(-1.1)	(13.8)	(13.1)	(3.6)	(-4.9)	(-4.2)
Pigs & poultry	-23.5	1.2	1.0	-11.9	6.1	5.9	-11.6	-4.9	-4.9
	(10.9)	(1.0)	(0.9)	(-3.1)	(5.1)	(5.2)	(14.0)	(-4.1)	(-4.3)
Fruit & vegetables	-151.8	2.8	2.6	-869.4	386.5	333.5	717.6	-383.7	-330.9
	(1.8)	(2.7)	(2.5)	(-122.3)	(208.4)	(182.6)	(124.1)	(-205.7)	(-180.1)
Other Agriculture	-102.1	47.7	47.0	-123.6	113.9	107.9	21.5	-66.2	-60.9
	(-17.5)	(45.8)	(45.2)	(-20.2)	(104.4)	(99.5)	(2.7)	(-58.6)	(-54.3)
Meat processing	-414.4	-2.9	-2.7	-378.6	610.1	556.8	-35.8	-613.0	-559.5
	(-27.5)	(-3.0)	(-2.8)	(-5.3)	(591.0)	(539.8)	(-22.2)	(-594.0)	(-542.6)
Other meat processing	-505.1	10.0	2.9	-1891.6	117.0	115.5	1386.5	-107.0	-112.6
	(17.1)	(7.2)	(1.3)	(-72.8)	(109.8)	(108.6)	(89.9)	(-102.6)	(-107.3)
Sugar processing	-1.7	-0.4	-0.3	9.8	133.7	22.0	-11.5	-134.1	-22.3
	(-1.8)	(-0.4)	(-0.3)	(-0.4)	(135.8)	(21.8)	(-1.4)	(-136.2)	(-22.1)
Dairy	-753.5	37.8	16.4	-2467.5	4057.9	699.1	1714.0	-4020.1	-682.7
	(294.1)	(40.8)	(17.0)	(-1467.9)	(3612.7)	(650.8)	(1762.0)	(-3571.9)	(-633.8)
Vegetable oils & fats	-40.9	3.8	3.7	-158.5	27.3	19.4	117.6	-23.5	-15.7
	(9.1)	(3.4)	(3.3)	(-6.0)	(16.6)	(10.3)	(15.1)	(-13.2)	(-7.0)

Cumulative difference from the baseline in 2008

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Other food processing	-2148.6 (368.0)	379.3 (334.0)	175.9 (149.1)	-3438.3 (-493.9)	864.9 (782.6)	699.2 (629.8)	1289.7 (861.9)	-485.6 (-448.6)	-523.3 (-480.7)
Other primary	104.1 (19.9)	142.3 (92.8)	148.8 (109.2)	-33.5 (-18.3)	-37.7 (-10.4)	-24.9 (-11.3)	137.6 (38.2)	180.0 (103.2)	173.7 (120.5)
Manufacturing	-25188.1 (-2701.0)	4127.1 (3689.2)	3453.3 (3077.7)	-23940.1 (606.1)	8580.2 (7163.0)	8242.2 (6907.1)	-1248.0 (-3307.1)	-4453.1 (-3473.8)	-4788.9 (-3829.4)
Services	92.5(- 380.5)	256.6 (64.1)	197.1 (65.3)	-59.9 (346.8)	-336.2 (285.6)	-291.4 (221.4)	152.4 (-727.3)	592.8 (-221.5)	488.5(- 156.1)
Total	-29642.9 (-2125.5)	5024.1 (4286.4)	4064.5 (3477.2)	-33656.0 (-1333.1)	14769.8 (13193.5)	10582.4 (9438.7)	4013.1 (-1092.4)	-9745.7 (-8907.1)	-6518.0 (-5961.5)
Agriculture	-787.3 (-4.7)	70.5 (58.3)	69.3 (57.4)	-1297.8 (-233.4)	752.6 (506.8)	544.5 (360.4)	510.6 (228.7)	-682.1 (-448.5)	-475.2 (-303.0)
Food	-3864.2 (640.8)	427.6 (382.0)	195.9 (167.6)	-8324.7 (-2034.3)	5810.9 (5248.5)	2112.0 (1961.1)	4460.5 (2675.1)	-5383.3 (-4866.5)	-1916.1 (-1793.5)
Agro-food	-4651.5 (636.1)	498.1 (440.3)	265.2 (225.0)	-9622.5 (-2267.7)	6563.5 (5755.3)	2656.5 (2321.5)	4971.1 (2903.8)	-6065.4 (-5315.0)	-2391.3 (-2096.5)

* Raw milk is non tradable and therefore not included in the table.

effects).¹⁵ Focusing on the UK, variety and pro-competitive effects are negative in S1 as UK firms face trade barriers from their largest export market (EU14). The net regional varietal loss (gain) to the UK is \$US0.456bn (\$US0.134bn) in S1 (S2), with corresponding pro-competitive losses (gains) of \$US0.105bn (\$US0.306bn).¹⁶

Table 3: Decomposition of cumulative changes from the baseline in regional welfare in 2008 (\$US 1997 millions except where indicated) for scenario one (scenario two).

	UK	EU14	USA	CAN	MEX	DC	LDC
Net real income	-817.33 (1508.93)	-6131.85 (-3054.08)	1289.92 (755.55)	289.11 (75.15)	-54.21 (-44.30)	514.36 (-229.53)	573.83 (11.66)
Real growth (%)	-0.06 (0.12)	-0.11 (-0.05)	0.02 (0.01)	0.05 (0.01)	-0.01 (-0.00)	0.01 (-0.00)	0.02 (0.00)
RFPI(%)	-3.28 (-4.23)	0.54 (-0.66)	0.19 (0.13)	0.83 (0.66)	-0.06 (-0.10)	-0.01 (-0.06)	-0.02 (-0.07)
RPI(%)	-0.27 (0.08)	0.17 (-0.10)	0.08 (0.06)	0.32 (0.28)	-0.02 (-0.03)	-0.01 (-0.02)	-0.01 (-0.03)
<i>Decomposition of net real income</i>							
Allocative	-756.64 (212.21)	-2194.41 (-1387.59)	90.28 (67.24)	-73.06 (-81.70)	23.61 (16.84)	672.47 (163.22)	357.41 (93.44)
Terms of Trade	-62.56 (123.98)	-1751.86 (-758.39)	834.42 (537.52)	593.26 (487.15)	-66.08 (-89.28)	-243.18 (-230.57)	51.61 (-37.71)
Financial effect	-468.51 (621.33)	-263.01 (-136.59)	154.70 (-114.35)	-60.65 (-164.91)	-17.17 (-7.42)	-300.37 (12.68)	148.21 (-52.01)
Variety effect	-455.51 (134.49)	-877.63 (-115.50)	423.19 (264.84)	-105.78 (-129.01)	37.56 (28.98)	373.88 (-130.94)	119.25 (-21.59)
Procomp. effect	-105.30 (306.10)	250.10 (-208.85)	-280.33 (-37.35)	-68.01 (-38.83)	-31.64 (9.08)	-13.93 (18.57)	-86.52 (61.17)
Other*	-347.54 (-638.52)	83.69 (302.02)	67.66 (37.65)	3.35 (2.45)	-0.49 (-3.16)	25.49 (-62.49)	-16.13 (-31.64)
CAP Budget	1378.73 (749.34)	-1378.73 (-749.18)	N/a	N/a	N/a	N/a	N/a
<i>of which:</i>							
CAP Support**	-16302.28 (-15727.42)	4551.24 (4077.83)	N/a	N/a	N/a	N/a	N/a
CAP Payments***	-17681.01 (-16476.76)	4910.94 (4827.01)	N/a	N/a	N/a	N/a	N/a

* Other consists of changes in non-accumulable endowments, technology and MU effects

** Support on setaside, export subsidies, all input and output subsidies

*** Payments in the form of GDP/VAT and import tariff payments on agriculture

5.4 Dynamic financial effects

The first row in Table 4 presents the net financial position of each region (with the global trust) in 1997, where for example, the UK is a net-creditor (i.e., UK ownership of foreign capital exceeds foreign ownership of UK capital) by US\$24.421bn. The remaining rows show the capital accumulative impacts over successive time periods for each region to 2008 relative to the baseline, which consists of regional capital earnings net of depreciation and net foreign ownership income flows. Indeed, the size of the latter effect is a measure of the financial mis-specification inherent within the CS GTAP model. Reductions (increases) in real growth in the UK in S1 (S2) lead to falls (rises) in capital stock accumulation and subsequent reductions (increases) in capital earnings of \$US0.307bn (\$US0.826bn). A similar pattern in capital earnings is to be found across all regions in both scenarios.

Table 4: Decomposition of financial changes from the baseline in 2008 (\$US 1997 millions) for scenario one (scenario two).

	UK	EU14	USA	CAN	MEX	DC	LDC
Net Foreign Income in 1997	24420.58	-1049.41	20050.25	-19793.74	-11830.03	27661.75	-39459.58
<i>Financial effects:</i>							
Capital earnings effect	-307.29 (826.42)	-1797.34 (-369.95)	905.09 (66.97)	245.36 (165.09)	2.14 (1.66)	834.63 (-432.41)	330.53 (-159.22)
Financial inflows	-315.88 (120.74)	-54.78 (22.42)	-211.98 (87.59)	-59.25 (-15.13)	-1.80 (0.61)	-1055.13 (262.69)	-14.91 (4.62)
Financial outflows	154.66 (-325.83)	1589.11 (210.94)	-538.41 (-268.91)	-246.76 (-314.87)	-17.51 (-9.69)	-79.87 (157.04)	-167.41 (102.59)
Net financial effect	-468.51 (621.33)	-263.01 (-136.59)	154.70 (-114.35)	-60.65 (-164.91)	-17.17 (-7.42)	-300.37 (12.68)	148.21 (-52.01)

Regionally owned investment abroad (i.e., financial inflows) is largely a function of regionally weighted changes in the global rate of return on foreign investment. Moreover, the fall in the global rate of return has a greater negative impact on larger net creditors such as the UK, USA and DC regions, whilst for remaining regions (small net creditors and net debtors), the effects are more marginal. In S2, small rises in the global rate of return result in marginal rises in inward capital payments to large net creditors, whilst the effects elsewhere are negligible.

Foreign owned investment in a region (i.e., financial outflows) responds to changes in rates of return in the host region. Thus, in S1 (S2) reductions (rises) in UK rates of return on foreign investments lead to greater capital flight (inflows), falls (rises) in payments made to foreign investors and gains (losses) in UK income relative to the baseline. There is also less foreign direct investment into the EU in both scenarios as foreign investors reallocate investment portfolios. In NAFTA, the rate of return on foreign investments rise as the

region expands with added membership of the UK, whilst this impact is stronger in S1.

5.5 UK agricultural household income

Cumulative estimates for changes in UK agricultural household income (including agricultural support, factor incomes and quota rent (sugar and milk only)) by sector in 2008 are presented in columns 2 and 5 of Table 5 for S1 and S2. By far the largest recipients of support funding are arable, livestock (mainly cattle & sheep) and dairy sectors. For arable farmers, incomes fall (rise) by \$US0.873bn (\$US0.370bn) in S1 (S2) with falls (rises) in aggregate arable output relative to the baseline. Interestingly, 72 percent (67 percent) of this loss (gain) comes from area payment receipts (not shown). For livestock producers, receipts improve in S1 (\$US0.162) due to support payment increases on expanding cattle & sheep sector output, whilst smaller increases in cattle & sheep output and factor reward increases lead to a gain in S2 (\$0.078bn). For milk producers, there are losses in total factor incomes and quota rents from reductions in milk output, where greater reductions in milk output in S1 result in greater income losses (\$US0.333bn in S1; \$US0.051 in S2). In the other food sectors (dominated by the 'other agriculture' sector), agricultural subsidy is much lower, where improvements in 'other sector' income in S2 compared to S1 arise from improved factor income receipts.

5.6 Variations in border support

The results of a sensitivity analysis of border support (see appendix) are presented in Table 5 for 50 (100) percent non-border support reductions in S1a and S2a (S1b and S2b) over five years compared with the baseline. Accordingly, estimates of UK opportunity costs range dramatically from - \$US0.817bn in S1 to \$US13.706bn in S2(b), which are mainly attributed to allocative efficiency gains as resources are diverted from AF sectors into services and manufacturing sectors. As expected favourable impacts to the UK economy are stronger under S2, which result in improved UK real growth of up to 1.12 percent in S2(b).

At the bottom of Table 5, greater reductions in agricultural support under (a) and (b) inevitably lead to further income losses to UK farmers, although larger reductions in agricultural support in (b) (*vis-à-vis* (a)) encourages stronger reallocation of labour and capital, such that factor returns (except land) improve slightly in (b) relative to (a).¹⁸ Similarly, larger losses accrue in S1 (*vis-à-vis* S2) given the loss of free EU trade on agricultural output and associated agricultural factor price reductions. Thus, with 50 (100) percent reductions in support, incomes in heavily supported arable, livestock and dairy sectors fall cumulatively *by as much as* \$US5.423bn (\$US8.966bn), \$US3.778bn (\$US7.008bn) and \$US1.588bn (\$US2.380bn) respectively. Overall, total (cumulative) losses in agricultural household income are estimated to be as high as \$US16.172bn and \$US18.106bn for S2b and S1b respectively.

Table 5: Sensitivity analysis examining the cumulative impact in 2008 (\$US 1997 millions except where indicated) of (a) 50 percent and (b) 100 percent reductions in UK agricultural support relative to the base-line for scenarios one and two.

Decomposition of UK aggregate welfare (EV)						
Scenario:	Scenario 1			Scenario 2		
	S1	S1a	S1b	S2	S2a	S2b
Net real income	-817.33	5612.95	9412.13	1508.93	7559.52	13705.97
Real Growth (%)	-0.06	0.46	0.79	0.12	0.62	1.12
<i>Decomposition of net real income:</i>						
Alloc. efficiency	-756.64	3492.97	6473.96	212.21	5052.55	9212.75
Terms of Trade	-62.56	-104.55	-185.11	123.98	-193.10	-453.21
Financial Effect	-468.51	854.04	1259.98	621.33	1387.11	2117.05
Variety Effect	-455.51	165.75	582.32	134.49	648.76	1430.04
Pro-comp. effect	-105.30	45.01	205.74	306.10	221.22	451.29
Other ⁴	-347.54	-387.50	-441.16	-638.52	-673.99	-711.67
CAP Budget	1378.73	1547.23	1916.40	749.34	1116.97	1659.72
<i>Of which:</i>						
CAP Support ²	-16302.28	-17720.71	-19882.84	-15727.42	-17301.86	-19108.76
CAP Payments ³	-17681.01	-19267.94	-21799.24	-16476.76	-18418.83	-20768.48
<i>Impact on real UK farm household income¹</i>						
Arable ⁵	-873.24	-5422.62	-8965.81	369.68	-4975.34	-8552.92
Livestock ⁶	161.83	-3778.36	-7008.35	78.46	-3488.98	-6221.31
Dairy	-332.57	-1587.97	-2379.61	-51.23	-1287.34	-1853.84
Other Sectors ⁷	-245.67	135.80	247.90	79.22	242.70	456.53
Total	-1289.65	-10653.15	-18105.87	476.13	-9508.96	-16171.54

Notes:

1 UK agricultural support (factor income) totals in 2002 in \$1997 millions: Arable 5419.79 (4978.85).

Livestock 3883.08 (7031.47); Dairy 1444.18 (5351.35); Other 210.86 (7652.09).

2 Support on set-aside, export subsidies, output and input subsidies.

3 Payments in the form of GDP/VAT and import tariff contributions on agriculture

4 'Other' largely consists of changes in non-accumulable endowments and technology effects.

5 Includes wheat, other grains and oilseeds sectors.

6 Includes, cattle & sheep and pigs & poultry.

7 Includes sugar, fruit and vegetables and other agriculture.

6. CONCLUSIONS

The pace of development of European integration has quickened in recent times with full implementation of the euro in 2001, whilst major reform of the constitution and enlargement of the Union are completed by 2004. In contrast, the UK continues to stagnate on the issue of Europe with the prospect of a euro-referendum unlikely before the next parliament (2005 at the earliest). In this context, this paper follows USITC in evaluating the potential impact on the UK from pursuing the alternative possibility of UK membership of NAFTA, with particular focus on AF sectors.

At the regional level, the results suggest that UK real income is estimated to fall slightly (-0.06 percent) from severing ties with the EU and accession to NAFTA (S1), whilst membership of the EEA and NAFTA (S2) leads to a UK real income increase of 0.12 percent. Interestingly, these estimates are remarkably close to USITC (correspondingly -0.02 percent and 0.10 percent) despite the inclusion of intertemporal effects although, to some extent this general result is to be expected since significant shifts in protection largely occur in the AF sectors, which constitute a relatively small part of UK production.

An examination of the associated impacts in AF sectors reveals that in S1, agriculture and food processing contract by 1.35 percent and 0.94 percent, with cereals, milk and dairy activities and meat processing experiencing significant contractions.¹⁹ These estimates are similar to USITC (0.49 percent and 0.63 percent respectively), although larger given the addition of negative pro-competitive and varietal impacts in food processing, which are not apparent in the USITC study. For upstream cereals and milk producers the results in this paper translate into real income losses of \$US0.873bn and \$US0.333bn, whilst livestock (mainly cattle and sheep) trade competitiveness results in income gains of \$US0.162bn.

In S2, the AF results contrast with USITC, where agriculture (0.21 percent) and food processing (1.49 percent) output increases (USITC estimates: agriculture -0.71 percent; food -0.12 percent), whilst arable and livestock producers' incomes marginally improve by \$US0.370bn and \$US0.078bn respectively. Improved food output in the UK in S2 is largely attributed to two factors, which do not appear in the USITC model treatment. Firstly, the competitive impacts over successive time periods of cheaper intermediate imports from NAFTA into UK downstream food processing sectors and its associated improvements in export competitiveness in tariff free EU markets. Secondly, these gains are magnified in the food processing sectors with the introduction of (positive) pro-competitive (reduced mark-ups) and varietal effects (increased varietal diversity effects on aggregate utility).

Additional sensitivity analysis experiments varying non-border support to primary agriculture magnify the impacts on UK economic growth, particularly in S2b where optimal UK growth is 1.12 percent above the baseline (\$US13.706bn). Most of the gains from these scenarios accrue through reallo-

cation of resources into manufacturing and services sectors, and capital earnings effects. Indeed, in the latter, the effects of greater UK investment abroad (particularly in S2), produces a significant additional gain (unaccounted for in USITC). Moreover, improved allocative efficiency is magnified by (the introduction of) gains in pro-competitive and varietal effects in the expanding services and manufacturing sectors. On the other hand, the income loss to primary agricultural producers (particularly arable and livestock) from (partial) removal of non-border support is estimated to be between \$US9.509bn (S2a) and \$US18.106bn (S1b) over the five year accession period.

Clearly there are potential welfare gains to the UK (particularly S2b), whilst the results suggest that food processors, who are only afforded border protection, would actually fare better under S2. Whilst it is very difficult to predict the extent (if any) support to UK farmers would fall below EU levels on accession to NAFTA, it is politically unlikely that the UK government would cut farm support entirely. Moreover, there are important caveats which could significantly impact on model estimates such as the absence of non-tariff barriers in the data (particularly services trade), the lack of bilateral FDI data and potential negative impacts on UK gain estimates in S2 from signatory contributions to Brussels as an EEA member. Perhaps most importantly, USITC (2000, p. iii) note that, 'there is no precedent for a member withdrawing from the EU, so the impact on the UK's trade relationships with non-EU and non-NAFTA countries is unclear', where in particular the results do not, 'take into account any retaliatory trade measures that the UK may face' (USITC, 2000, p. xiv). Thus, protagonists of alternative futures outside of the EU should be mindful of the unaccounted benefits of EU membership in facilitating favourable trade conditions for UK (food) producers on the world stage.

Accepted for publication: 20th May 2004.

APPENDIX

A Description of Scenarios I and II and Sensitivity Analysis

Scenario I: UK forms a free trade area with NAFTA, whilst severing all ties with the EU customs union (all policy shocks have a five year phase in period imposed in equal proportions between 2003 and 2007).

Policy shocks

- UK and each NAFTA member eliminate all bilateral trade protection.
- The UK leaves the common financing principle of the CAP budget over five years beginning 2003. UK agricultural support is maintained at the same levels as the baseline which implies gradual concurrent increases in assistance from the UK government to maintain the same levels of farm support
- Import barriers are erected on all bilateral trade between the EU14 and the UK at the EU common external tariff rate on third countries in the baseline scenario.

- The UK treats imports from both remaining developed and developing countries at the same rate as the EU common external tariff rate on third countries in the baseline scenario.

Scenario II: UK forms a free trade area with NAFTA, with the UK becoming a member of the EEA (all policy shocks have a five year phase in period imposed in equal proportions between 2003 and 2007).

Policy shocks

- UK and each NAFTA member eliminate all bilateral trade protection.
- The UK leaves the common financing principle of the CAP budget over five years beginning 2003. UK agricultural support is maintained at the same levels as the baseline which implies gradual concurrent increases in assistance from the UK government to maintain the same levels of farm support.

Sensitivity analysis on nationally funded agricultural support for scenarios I and II:

(a) Total agricultural support gradually reduced to 50 percent of CAP support in the baseline over five years beginning 2003. The UK government assistance is gradually introduced to provide 50 percent of the level of support the UK receives in the baseline. Agricultural support ceilings are 90 percent of the baseline level in year one, 80 percent of the baseline level in year two and so on.

(b) Total agricultural support gradually eliminated over five years, with production quotas and set-aside eliminated in 2007. Agricultural support ceilings are 80 percent of the baseline level in year one, 60 percent of the baseline level in year two and so on. Thus, no response from the UK government to support farmers on withdrawal from the CAP budget.

ENDNOTES

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2. A recent ICM research poll (February 2004) suggests that the majority of UK citizens (67 percent) would vote against euro membership in a referendum, with only 22 percent in favour. Interestingly, the UK government has not said what it would do in the event of a 'no' vote.

3. Pressure from EFTA for closer ties with the EU resulted in the EEA agreement in 1994, which extends free movement of goods, services, labour and financial services to signatory members. EFTA currently includes Iceland, Liechtenstein, Norway and Switzerland, although the latter has not joined the EEA.

4. In this context, Pain and Young (2001, p.19) also note that, '... against a background of growing political complaints about the legislation which is already passed as a result

of majority-voting in the EU, it seems more plausible to assume that the UK would not (solely) withdraw into the EEA'.

5. For a full description of dynamic GTAP see Ianchovichina and McDougall (2000).
6. Adaptive expectations theory reconciles the apparent contradiction between theory and practise, when regions with high rates of return exhibit low investment levels (Ianchovichina and McDougall, 2000).
7. Full modelling details of the representation of imperfect competition in the model can be obtained from the author on request.
8. The sectors are: wheat, other grains, oilseeds, sugar, milk, cattle and sheep, pigs and poultry, fruit and vegetables, other agriculture, meat processing, other meat processing, sugar processing, dairy, vegetable oils and fats, other food processing, other primary, manufacturing and services.
9. Full modelling details of the Agenda 2000 reforms can be obtained from the author on request.
10. Services (Manufacturing) accounts for approximately 60 percent of the value of UK production (66 percent and 70 percent of exports and imports respectively) prior to accession (GTAP baseline - beginning 2003).
11. Under the EU-Mexico agreement, UK-Mexico trade protection is also eliminated in the baseline scenario. Thus, the 'additional' impact in both scenarios on UK-Mexican trade is minimal.
12. In seeking to incorporate a recursive dynamic feature into the standard GTAP treatment without constraining model size, a resulting cost is that the representative agent is not 'designed' to maximise inter-temporal equivalent variation (EV) in the strict sense. Indeed, total EV over the time horizon is the sum of successive period EV values, rather than employing initial period prices as is consistent with microeconomic theory.
13. Given budgetary balance, the budgetary impact in the two regions must net to zero. Thus, UK withdrawal from the budget in both S1 and S2 merely implies that the UK government pays funds to farmers directly rather than via Brussels (where a proportion does not return to the UK as it is a net loser) over the five year period.
14. Output results for sectors are not presented, although a full table of corresponding output estimates with discussion are available on request from the author.
15. Variety effects are based on varietal availability home and abroad, although there is a bias toward home varieties since expenditure share weights are traditionally larger. Moreover, *ceteris paribus* refers to a theoretical partial equilibrium fixed industry output assumption. Of course, given CGE modelling practice where 'everything changes', it is perfectly conceivable that output per firm and varieties both increase with sufficient rises in industry output.
16. These estimates reflect the summation across all imperfectly competitive sectors. Thus, an aggregate increase in food processing and services output in S2, outweighs the concurrent contraction in the manufacturing sector.

17. Comparing across policy scenarios, this improvement in S2 is due to rises in other grains output, relative output improvements in the wheat sector and slight rises in factor rewards.

18. Given the growth in the usable land endowment from elimination of land set-aside in (b) land prices fall further compared with (a).

19. See endnote 14.

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