German reunification
Implications for agricultural trade

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The Federal Republic of Germany and the German Democratic Republic were reunified in October 1990. As a consequence, the former German Democratic Republic automatically became part of the European Community. From an agricultural perspective, a potentially important aspect of reunification is the application of the European Community's Common Agricultural Policy to the agricultural sector in what is now termed eastern Germany. This development has the potential to have an important impact on world agricultural markets and, therefore, on the profitability of Australian farmers. In this study, a world agricultural trade model is used to analyse the impact of German reunification on the European Community's level of exports of major farm products and hence the world prices of these farm products. An assessment is then made of the impacts of German reunification on Australia's major agricultural exporting industries.

Introduction

The Federal Republic of Germany and the German Democratic Republic were reunified in October 1990. As a consequence, the former German Democratic Republic automatically became a part of the European Community (EC). This immediately increased the European Community's land area by just over 10 million ha and its population by nearly 17 million people. Reunification also resulted in the Common Agricultural Policy of the European Community being applied to the agricultural sector in eastern Germany.

Prior to reunification, production of cereals, sugar and beef in the former German Democratic Republic amounted to approximately 5 per cent of the production levels of these products in the European Community. These production levels were achieved under a production system which was controlled by the state, with producers receiving prices which, for some products, were considerably below the prevailing world prices. With the application of the Common Agricultural Policy to agriculture in eastern Germany, the prices received by producers increased to the levels applying in western Germany. This, together with the flexibility provided by the removal of state planning controls is likely to increase the level of production of most agricultural products in eastern Germany and potentially, add to the exportable surpluses of the European Community. Therefore, from an agricultural perspective, German reunification may have important implications for both EC and world agricultural markets.

The objective in this study is to examine the implications of German reunification both for EC and world agricultural commodity markets. Any changes in trade volumes and world prices as a result of reunification will influence Australia's export performance and its economic welfare. The analysis reported includes the effects on the value of Australian trade.

In the next section, a brief overview of the eastern German agricultural sector is provided. The basic trade modelling framework used to analyse the impact of German reunification is presented in the third section, while the information required to incorporate eastern Germany into this modelling framework is discussed in the fourth section. The estimated economic effects of German reunification are presented in the fifth section and the implications for Australian agricultural exporting industries are discussed in the final section.

Overview of east German agriculture

The main agricultural commodities produced in eastern Germany are dairy products, pork, potatoes, beef, coarse grains and wheat. Significant quantities of sugar, poultry meat, rapeseed and sheep meat are also produced. Prior to reunification, the German Democratic Republic was a net importer of cereals, oilseeds, sheep meat and sugar, while it was a net exporter of livestock products such as pork, beef, dairy products and poultry meat.

Before reunification, eastern German agriculture operated within a highly centralised command economy in which production decisions were set by planned targets rather than market forces. Agricultural producers received government determined prices for the set quantities produced. Consumer prices were kept low through the use of government subsidies and, for most agricultural products, retail prices were lower than the prices received by producers. Retail food prices had remained virtually unchanged since the late 1950s. The low consumer prices encouraged high levels of apparent per person consumption (table 1) with considerable wastage of food — for example, it has been estimated by the

Table 1: Retail prices and apparent per person consumption of food in eastern and western Germany in 1988

	Eastern Germany		Western Germany	
	'Retail' price a	Consumption per person	Retail price	Consumption per person
	DM/kg	kg	DM/kg	kg
Pig meat	2.36	64.4	10.00	62.2
Beef	3.08	25.6	14.00	22.0
Butter	3.29	14.9	8.60	8.3
Margarine	0.69	10.7	3.40	7.4
Milk	0.23	111.1	1.20	92.3
Bread (mixed grain)	0.18	93.2	3.10	74.6
Potatoes	0.62	147.2	1.25	71.5
Sugar	na	40.0	na	35.0
Tea	8.22	0.1	2.04	0.2

a Since the Ostmark appears to have been overvalued, domestic prices are converted to Deutschemarks using an adjusted exchange rate. The official exchange rate is adjusted by one-third of the difference between the official and prevailing 'open' market rate in 1986, which results in an adjusted exchange rate of 2.92 mark/DM.
Sources: Agra Europe (1990b); Cowitt (1989).

Leipzig Market Research Institute that, prior to reunification, 25 per cent of bread supplies were either thrown away or fed to livestock (Agra Europe 1990b). While the consumer prices of most foods were kept low, for 'luxury' goods, such as tea, the prices paid by consumers were kept relatively high.

East German agriculture is dominated by very large cooperative farms, which at the time of reunification occupied approximately 95 per cent of the agriculturally productive land (Agra Europe 1990b). At the time of reunification there were just over 4500 farms in eastern Germany, with an average size of about 1500 ha (the largest farms were about 15 000 ha). The use of inefficient and outdated farming methods on the cooperatives over many years has resulted in productivity levels that are significantly lower than levels in other EC countries and has also led to severe environmental damage.

The German government is now encouraging the breakup of the cooperatives into small private farms. However, changing the structure of east German farming will be difficult. There have been signs that some individual members want to leave the cooperatives and set up smaller units on their own. It is very unlikely, however, that the cooperatives will break up totally into small units as very few individuals have the necessary marketing and commercial management skills. The workers on the cooperative farms generally specialise in a very limited range of farming activities and therefore may not possess all the necessary range of skills to manage a farm. Furthermore, few eastern German farmers would have the necessary capital to buy machinery, inputs or buildings should they decide to farm independently (Madell 1990). Some private farms, which are large by European standards, have been set up by west Germans and other Western Europeans. It is likely that these farms will rapidly implement Western farming methods and should become highly competitive producers in the European Community within a short period of time.

The yields of the main agricultural products in eastern Germany have been considerably lower than the corresponding EC levels for a number of years. However, yields can be expected to increase toward Western European levels over time as farmers respond to the incentives provided by a market economy, by adopting Western farming methods and becoming more efficient. The extent to which environmental damage will affect the increase in yields is unclear. However, productivity is rising rapidly as east German farms are now benefiting from west German and EC structural investment and from improved input supply and infrastructure. Apart from the farm land that has suffered environmental damage, the quality of the land in eastern Germany is comparable with that in Western Germany. This, together with the fact that east German farmers will face the same price

incentives as west German farmers, should result in east German yields gradually increasing towards west German levels. Given that eastern Germany is close to self-sufficient in a majority of agricultural commodities, this prospective growth in yields and productivity gives eastern Germany the potential to become an important force in Europe's agricultural economy.

East German farmers, despite having the potential to be competitive producers in the long term, have experienced many difficulties since reunification. Farmers were unprepared for the restructuring process that has been forced upon them because for many years they have been unable to import modern machinery or make use of Western technology. Furthermore, east German farmers have very limited marketing expertise and are having difficulties in finding retail outlets for their produce. Agricultural products are of low quality compared with Western European products and, as a result, east German consumers have developed a strong preference for Western goods. The low demand for east German products has meant that the prices of east German products have stayed below the levels that prevail in the rest of the European Community. The lack of retail outlets for the poor quality food produced in east Germany, and the resulting prices which are relatively lower than in other EC countries, has lead to east German farmers experiencing severe liquidity problems (Agra Europe 1991).

These problems are likely to gradually disappear in the medium to long term as the quality of east German agricultural products becomes comparable with EC levels. However, in the short term, factors such as the lack of sufficient processing facilities, the continued use of outdated equipment and the extensive degradation of farmland in areas of eastern Germany will restrict the development of east German agriculture.

The SWOPSIM modelling framework

SWOPSIM models

The SWOPSIM modelling framework was developed in the Economic Research Service of the US Department of Agriculture. A detailed description of the SWOPSIM framework is presented by Roningen (1986) and Roningen and Dixit (1989). The SWOPSIM framework facilitates the construction of static, partial equilibrium models of world trade in agricultural commodities. The models are based on constant elasticity supply and demand equations, the elasticities being those for a medium term of about five years. This implies that adjustment takes place over the five year period (Roningen and Dixit 1989).

Demand for each product is modelled as a function of its own price, the prices of substitutes and complements, and exogenous changes in income. For some commodities there are, in addition, derived demands: livestock feed demands are in part a function of livestock production (Roningen 1986). Supply of a product is modelled as a function of its own price, the prices of competing products and, in the case of livestock products, the consumer prices of feeds (Roningen 1986).

Models which are developed using the SWOPSIM framework are based on the assumption that world prices are determined so as to balance supply and demand in international and in all domestic markets, taking into account protective arrangements and other policies which distort prices facing producers and consumers in each country or region included in the model. Models created from the SWOPSIM framework are designed to simulate the medium term effects of changes in agricultural policies on production, consumption, trade and prices. In the process of deriving a solution, world and domestic prices are adjusted in the model until total world exports equal total imports for each commodity.

The SWOPSIM model structure does not explicitly allow for stocks of commodities; changes in stocks are, however, included in the base period demand quantities (Sullivan, Wainio and Roningen 1989). It is assumed in the model that any country could export a commodity to, or import it from, any other country and that each commodity is homogeneous, though in reality this may not be true. For example, in reality beef can be differentiated into grass fed beef and grain fed beef. Similarly wheat can be differentiated into, for example, Australian prime hard, Canadian western red spring and US hard red winter wheat varieties. However, in the SWOPSIM model there are no provisions to accommodate differentiated products and hence each commodity in the model is assumed to be homogeneous.

Some of the products in SWOPSIM are raw agricultural commodities and others are processed or partly processed, such as soybean meal and cheese. Some commodities, like corn and coarse grains, are inputs into livestock sectors. For the relevant grain and oilseed products, feed demand is specified as a function of livestock production. In reality, livestock dynamics can take a considerable time to work through. Thus, the model structure is likely to provide overestimates (or underestimates) of feed demand and of total grain demand when livestock industries are contracting (or expanding) as they move toward new long run equilibriums (Kirby, Haszler, Parsons and Adams 1988).

Transport costs are not explicitly taken into account, and trade flows between specific pairs of countries are not represented. Therefore, no definite conclusions can be drawn from the

model results about the specific destinations for, or sources of, a country's traded commodities.

In the SWOPSIM model, various government policies which affect production, consumption, exports and imports are introduced as 'wedges', derived from estimates of producer subsidy equivalents (PSEs) and consumer subsidy equivalents (CSEs), between producer, consumer and trade prices. These price wedges are intended to capture the effects of market intervention by governments on producers, consumers and taxpayers, as well as on exports and imports. Policy changes can be introduced into the SWOPSIM model as changes to these price wedges.

The basic SWOPSIM framework, developed by Roningen (1986) consists of 22 commodities and 36 regions. However, the basic framework does not contain a separate region representing the former German Democratic Republic — rather, the former German Democratic Republic was incorporated into an aggregate Eastern Europe region. In the present study, the 36 regions in the basic framework are aggregated into 14 regions, while an additional region is developed to represent the former German Democratic Republic — with the data relevant to the former German Democratic Republic being deducted from the data in the standard Eastern Europe region in order to avoid double counting. The 15 regions in the current model, together with the countries or regions from the SWOPSIM database which have been included in each of these regions, and the commodities in the model are listed in table 2.

The current version of the model is based on 1986 production, consumption, trade and price data and estimates of agricultural support (or taxation — whether explicit or implicit) in each country included in the model. These data are taken from the world agricultural database maintained by the Foreign Agricultural Service of the US Department of Agriculture (Sullivan, Wainio and Roningen 1989). Although support levels for key agricultural commodities in major developed countries have fluctuated over time, the levels ruling in 1986 are, in many cases, comparable with those in 1990 (the most recent year for which estimates are available). Furthermore, the fundamental nature of agricultural support in major developed countries for key farm commodities remains very similar to that in the mid-1980s.

Own-price and cross-price elasticities of supply and demand for each country have been compiled by the Economic Research Service from the available literature. Details of the elasticities used in the SWOPSIM framework are provided in Gardiner, Roningen and Liu

Table 2: Regions and commodity groupings in the SWOPSIM model

Regions		Commodity groups	
EC	European Community: EC–10, Spain and Portugal		
		BF	Beef
GD	German Democratic Republic a	PK	Pork
AU	Australia	ML	Sheep meat
US	United States	PM	Poultry meat
JP	Japan	PE	Poultry eggs
CN	Canada	DM	Dairy fresh milk
NZ	New Zealand	DB	Dairy butter
SF	South Africa	DC	Dairy cheese
WE	Other Western Europe	DP	Dairy powder
BZ	Brazil	WH	Wheat
AR	Argentina	CN	Corn
CP	Former centrally planned economies and China: former Soviet Union, Eastern Europe, China	CG	Other coarse grains b
		RI	Rice
NI	Newly industrialised Asia: South Korea, Taiwan	SB	Soybeans
AS	ASEAN: Indonesia, Thailand, Malaysia, Philippines	SM	Soybean meal
RW	Rest of the world: Mexico, Venezuela, Central America and Caribbean, Other Latin America, Nigeria, Other SubSaharan Africa, Egypt, Middle East and North Africa-oil producers, Middle East and North Africa-non-oil producers, India, Other South Asia, Other South-East Asia, Other East Asia, Other Asia, Rest of the world.	SO	Soybean oil
		OS	Other oilseeds c
		OM	Other meals d
		OO	Other oils e
		CT	Cotton
		SU	Sugar
		TB	Tobacco

a Additional country in the SWOPSIM model used in this study. b Barley, millet, mixed grains, oats, rye, sorghum. c Copra, cottonseed, flaxseed, palm kernels, peanuts, rapeseed, safflower, sesame. d Meals produced from copra, cottonseed, linseed, palm kernel, peanut, rapeseed, safflower, sesame. e Vegetable oils produced from copra, cottonseed, palm, olive, palm kernel, peanut, rapeseed, safflower, sesame.

(1989). The elasticities used in this model for Eastern Europe and the former Soviet Union were estimated using data from periods when the supply, demand and policy conditions were considerably different from those simulated in this study. Therefore, the analysis is confined to the effects of changes in eastern Germany only.

Incorporating the German Democratic Republic into the SWOPSIM model

In order to incorporate the German Democratic Republic into the basic SWOPSIM model, base period price and quantity (supply, demand and net trade) data and supply and demand elasticity estimates were required for each commodity. The sources of this information are discussed in the following sections. Numerous difficulties were encountered in assembling the data for the German Democratic Republic. These included missing data, contradictory data and poor documentation of data collection procedures.

Price and quantity data

Base period (1986) production and trade data for the German Democratic Republic were obtained from FAO (1989, 1990). Demand quantities for the German Democratic Republic were derived from production and net trade data. Supply, demand and net trade data for the German Democratic Republic are shown in table 3. Price data used in this study were obtained from Agra Europe (1990a) and United Nations (1989). Domestic prices in the former German Democratic Republic are expressed in Deutschemarks, rather than the now defunct ostmark (East German mark).

In expressing the domestic prices of agricultural commodities in Deutschemarks the 'official' exchange rate has been adjusted to take account of the apparent overvaluation of the former German Democratic Republic's currency. In the absence of empirical information on an unconstrained, legal equilibrium exchange rate, the procedure followed for China by Yang and Tyers (1989) and Gunasekera, Andrews, Haszler, Chapman, Tian and Zhao (1991) was used. The official exchange rate was adjusted by one-third of the difference between it and the prevailing 'open' (unofficial) market rate. Data on the official exchange rate for foreign trade transactions and the unofficial rate were obtained from Cowitt (1989).

Table 3: German Democratic Republic: production, consumption and net trade in 1986

	Production	Consumption	Net trade a
	kt	kt	kt
Beef	434	400	34
Pork	1 356	1 311	44
Sheep meat	17	18	−1
Poultry meat	156	157	−1
Milk	9 358	9 345	13
Butter	322	299	23
Cheese	264	268	−4
Milk powders	176	176	−
Wheat	4 195	4 327	−132
Corn	−	608	−608
Other coarse grains	7 365	8 570	−1 205
Soybeans	−	140	−140
Soybean meal	−	761	−761
Soybean oil	−	16	−16
Other oilseeds	446	491	−45
Other meals	−	77	−77
Cotton	−	107	−107
Sugar	790	749	41

a A negative value for net trade indicates that the German Democratic Republic was an net importer in 1986. − Negligible.
Sources: FAO (1989, 1990); Agra Europe (1990a).

Elasticity estimates

The price elasticities of supply and the price and income elasticities of demand which have been used for eastern Germany in this study are are those for the Eastern Europe region in the SWOPSIM database. These elasticities are reported in tables 4 and 5 (Gardiner et al). Prior to German reunification, the former German Democratic Republic was a centrally planned economy, with agricultural production determined largely by state plans. Under these conditions, there was very little opportunity for farmers to adjust their production in response to changes in the prices of agricultural commodities. As a result it is likely that price elasticities of supply for agricultural products in the former German Democratic Republic were low.

Table 4: Price elasticities of supply for agriculture in eastern Germany [a]

	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CG	OS	SU
BF	0.30	−0.05		−0.03		0.10				−0.01 b	−0.02 b		
PK	−0.02	0.45								−0.02 b	−0.05 b		
ML			0.35							−0.04 b	−0.13 b		
PM	−0.08			0.70						−0.03 b	−0.21 b		
PE					0.35					−0.02 b	−0.06 b		
DM	0.03					0.30					−0.01 b		
DB						−0.19	0.25	−0.26	0.25				
DC						−0.21	−0.24	0.73	−0.24				
DP						−0.40	0.47	−0.49	0.47				
WH	−0.01	−0.08		−0.01	−0.02					0.25	−0.05	−0.01	
CG	−0.02	−0.12	−0.01	−0.06	−0.03					−0.03	0.35	−0.02	
OS										−0.04	−0.13	0.30	
SU													0.20

a Product codes are defined in table 2. b The elasticity of supply for the relevant livestock product with respect to the consumer price of the relevant livestock feed.
Source: Gardiner et al. (1989).

Since reunification, however, farmers in eastern Germany have been free to respond to price incentives. As a result, it is likely that, over time, the responsiveness of agricultural supply in eastern Germany will increase — possibly to levels which apply currently in the European Community. Therefore, the higher European Community price elasticities of supply have also been considered in this study. These are reported in table 6. It is possible, given the problems that the east German agricultural industry must overcome, that the responsiveness of supply will not fully adjust to EC levels within the medium term period considered in this study.

As discussed earlier, the main policy intervention on the demand side in eastern Germany was that consumer prices were kept low through the use of government subsidies. As consumption in eastern Germany was less constrained by state controls, for example via rationing, consumers were able to alter their consumption levels in response to changes in prices or income. However, as the east German economy was relatively closed, the range of agricultural products available to east German consumers was limited. As a result, consumption patterns were considerably different from those in the European Community. Following reunification, and the implementation of the Common Agricultural Policy in eastern Germany, it is likely that east German incomes and consumption patterns will

Table 5: Price and income elasticities of demand for agricultural products in eastern Germany a

	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	Income
BF	−0.20	0.06																				0.39
PK	0.02	−0.50		0.02																		0.37
ML			−0.28																			0.40
PM		0.15		−0.25																		0.44
PE					−0.10																	0.45
DM						−0.11	0.03	0.02	0.02													0.31
DB							−0.15															0.46
DC								−0.16														0.43
DP									−0.40													0.41
WH										−0.30	0.03	0.06										0.04
CN										0.04	−0.30	0.09		0.01				0.01				−0.10
CG										0.10	0.10	−0.35		0.02								−0.06
RI													−0.15									0.22
SB														−0.38	0.24	0.09						−0.10
SM											0.04	0.06			−0.40			0.05				−0.10
SO																−0.40			0.10			0.53
OS																	−0.51	.11	0.34			−0.10
OM														0.12				−0.30				−0.10
OO																0.02			−0.15			0.53
CT																				−0.15		0.57
SU																					−0.30	0.26

a Product codes are defined in table 2.
Source: Ronongen and Dixit (1989).

Table 6: Price elasticities of supply for agriculture in the European Community a

	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CG	OS	SU
BF	0.56	-0.07				0.15				-0.01 b	-0.01 b		
PK	-0.06	0.89		-0.01						-0.06 b	-0.05 b		
ML			0.69			-0.07				-0.02 b	-0.03 b		
PM		-0.05		0.78	-0.04					-0.04 b	-0.07 b		
PE				-0.03	0.74					-0.05 b	-0.06 b		
DM	0.10		-0.01			0.65				-0.02 b	-0.02 b		
DB						-0.11	0.23	-0.31	0.23				
DC						-0.22	-0.19	0.64	-0.19				
DP						-0.16	0.31	-0.40	0.31				
WH	-0.02	-0.11		-0.02	-0.03	-0.04				0.52	-0.17	-0.05	
CG	-0.04	-0.21	-0.02	-0.07	-0.09	-0.10				-0.34	0.57	-0.03	-0.01
OS										-0.21	-0.06	0.71	
SU										-0.02	-0.02		0.17

a Product codes are defined in table 2. b The elasticity of supply for the relevant livestock product with respect to the consumer price of the relevant livestock feed.
Source: Gardiner et al. (1989).

change and become similar to those in the rest of the European Community. Consequently, the demand elasticities for the European Community have also been considered in this study. These are reported in table 7.

Economic effects of the application of the CAP to eastern Germany

Prior to reunification, the prices received by producers in the German Democratic Republic for cereals, rapeseed, sugar, eggs and milk were considerably lower than the equivalent producer prices in the Federal Republic of Germany and elsewhere in the European Community (table 8). However, the prices received by producers for beef, pork and poultry meat were higher than the equivalent prices in the Federal Republic. Therefore, a shift of resources away from the production of these livestock products toward the production of cereals, rapeseed and sugar can be expected to occur in eastern Germany as a result of reunification and the implementation of EC prices.

The consumption of most agricultural products was subsidised and, as a result, consumer prices were very low (table 1). Therefore the situation which prevailed in the former German

Table 7: Price and income elasticities of demand for agricultural products in the European Community a

	BF	PK	ML	PM	PE	DM	DB	DC	DP	WH	CN	CG	RI	SB	SM	SO	OS	OM	OO	CT	SU	Income
BF	−0.70	0.21	0.01	0.03																		0.21
PK	0.08	−0.77	0.01	0.04																		0.26
ML	0.10	0.40	−0.87	0.10																		0.22
PM	0.07	0.26	0.02	−0.88																		0.30
PE					−0.20																	0.28
DM						−0.19	0.08	0.03	0.09													0.06
DB						0.16	−0.43		0.01													0.19
DC						0.03		−0.40	0.02													0.35
DP						0.25	0.01	0.04	−0.39													0.33
WH										−0.28	0.03	0.08	0.01									−0.11
CN										0.23	−0.44	0.14			0.02			0.01				−0.06
CG										0.05	0.01	−0.35			0.02							−0.06
RI										0.26		0.03	−0.47									0.20
SB														−0.39								0.13
SM											0.01	0.07			−0.37			0.04				0.15
SO																−0.57		0.38				0.18
OS																	−0.85					0.16
OM											0.03	0.10				0.44		−0.68				0.19
OO																		0.14	−0.57			0.18
CT																				−0.51		0.28
SU																					−0.48	0.13

a Product codes are defined in table 2.

Source: Ronongen and Dixit (1989).

Table 8: **Producer prices, 1988**

	German Democratic Republic	Federal Republic of Germany
	DM/t a	DM/t
Wheat	231	385
Rye	247	367
Barley	216	344
Oats	246	362
Rapeseed b	569	932
Sugarbeet	55	90
Beef	3 444	2 862
Pork	2 694	2 027
Poultry meat	2 951	1 680
Eggs	2 270	2 473
Milk	581	635

a Since the Ostmark appears to have been overvalued, domestic prices are converted to Deutschemarks using an adjusted exchange rate. The official exchange rate is adjusted by one-third of the difference between the official and prevailing 'open' market rate in 1986, which results in an adjusted exchange rate of 2.92 mark/DM. b For the former GDR, rapeseed is the major commodity in the 'other oilseeds' category.
Sources: Agra Europe (1990a); Cowitt (1989); United Nations (1989).

Democratic Republic contrasts sharply with the situation which prevails in the European Community, where, as a result of the operation of the Common Agricultural Policy, agricultural production is highly protected while consumption is highly taxed. With the application of the Common Agricultural Policy to the agricultural sector in eastern Germany since reunification, both producers and consumers in eastern Germany will face higher prices for most agricultural products (major exceptions being producer prices for meats). Furthermore, as the state planning system which had prevailed in the German Democratic Republic prior to reunification ceased to exist when reunification took place, farmers in eastern Germany became free to respond to the price incentives provided through the Common Agricultural Policy. It is likely that as both producers and consumers of most agricultural commodities in eastern Germany respond to these higher prices, production will increase and consumption will decline. This has the potential to increase EC exportable surpluses or reduce EC import demand.

In addition to the price incentives provided through the Common Agricultural Policy, milk and sugar production in eastern Germany are subject to the quota systems which apply to

these products in the European Community. Milk production in eastern Germany is expected to contract as the quota allocation is 20 per cent below production at the time of reunification. In contrast, eastern Germany's quota allocation for sugar is approximately 25 per cent greater than the level of production prior to reunification. Whether sugar production in eastern Germany will expand to fill the available quota will depend, at least in part, on the relative price incentives and the capital constraints prevailing in eastern Germany. It is possible that sugar producers from western Germany or other EC countries will purchase land and move additional resources into eastern Germany for the purpose of growing sugar beet in order to take advantage of the generous quota allocation.

Furthermore, it is likely that reunification will lead to an increase in total disposable income in eastern Germany. The International Monetary Fund (1990) has recently presented an analysis of the economic effects of German reunification using two alternative scenarios. The GDP growth rates for eastern Germany in the first five years after reunification implicit in these scenarios have been revised using more recent data from the Department of Foreign Affairs and Trade (1991). The revised growth rates are presented in table 9.

An outcome midway between the two scenarios shown in table 9 would result in an average GDP growth rate of 4.4 per cent a year for the period 1991–95. This compares with the situation in East Germany immediately prior to reunification where net material product grew by 2 per cent in 1989 (International Monetary Fund 1990). This potential increase in income may lead to higher consumption levels in eastern Germany than would otherwise be the case. As a result, this income effect may offset part of the reduction in consumption (due to increases in prices paid by consumers) which is expected to arise from the application of the Common Agricultural Policy to eastern Germany.

Table 9: Alternate growth rates for gross domestic product in eastern Germany: IMF scenarios

	1991	1992	1993	1994	1995	1991–95 average
Scenario A	−15.0	10.0	14.5	14.5	11.0	7.0
Scenario B	−20.0	5.0	8.5	8.5	7.0	1.8

Sources: IMF (1990, pp. 83, 89); Department of Foreign Affairs and Trade (1991, p. 11).

Policy experiments

In order to incorporate the higher rate of economic growth in eastern Germany resulting from reunification, it was necessary to first establish a reference scenario. The policy experiments carried out in this study involved comparing the results of policy simulations with those of the reference scenario.

Reference scenario

The reference scenario was established by carrying out a five year projection from the base period. The five year projection was chosen in order to be consistent with the medium term basis of the analysis of policy changes inherent in the SWOPSIM framework. This reference scenario should not be interpreted as a forecast: it simply provides a base against which the results of the policy experiments can be compared. The reference scenario was based on the assumption that agricultural support in eastern Germany, the European Community and all other countries included in the model remain unchanged at their base period levels, together with plausible assumptions for income, population and agricultural supply growth rates for each country or country grouping and commodity included.

For eastern Germany, the assumptions used in the reference scenario include an annual average GDP growth rate of 2 per cent (based on International Monetary Fund 1990) and an annual population 'growth' rate of –0.1 per cent (based on population statistics provided in US Department of Agriculture 1988). Agricultural supply growth rates used for eastern Germany were calculated from agricultural production statistics provided in Agra Europe (1990a).

Experiments

The first policy experiment considered in this study (termed experiment 1) was designed to capture the effects of changes in both agricultural policy and income in eastern Germany resulting from reunification. In order to incorporate the agricultural policy changes which result from the application of the Common Agricultural Policy to east German agriculture, a five year projection was carried out in which east German producer and consumer prices were changed from the levels which prevailed in the former GDR to the West German price levels (see table 8). The income component of this experiment was introduced through an exogenous 4.4 per cent increase in income in eastern Germany. This increase in income is equal to the average of the GDP growth rates for the first five years after reunification implicit in the IMF analysis described earlier.
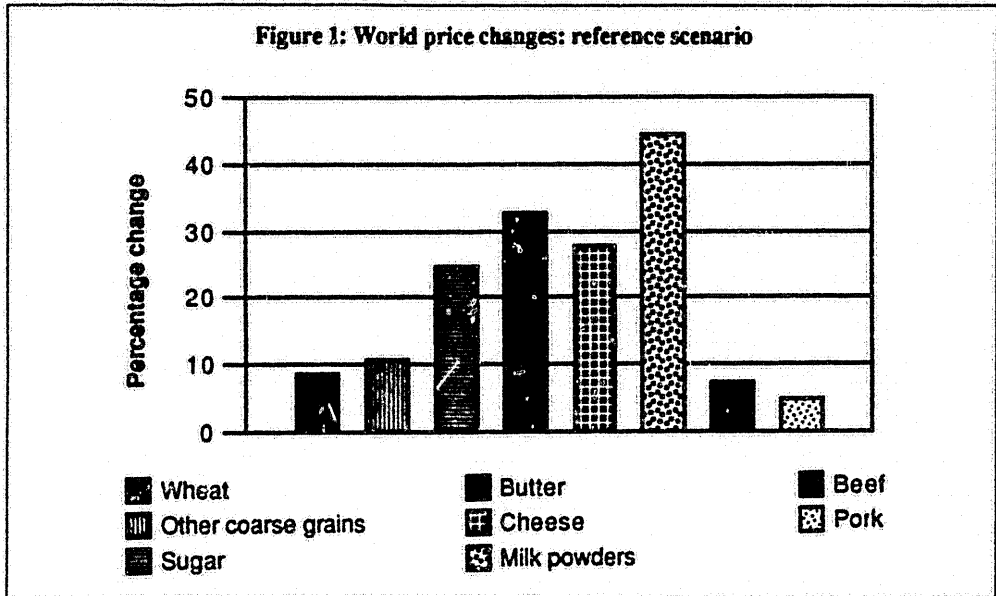
Experiment 1 was carried out using the supply and demand elasticities reported in tables 4 and 5 — that is, elasticities which reflect the relatively low level of response to price changes applicable in east German agriculture at the time of reunification. The elasticities used in this experiment are likely to be most relevant in the first few years after reunification. However, reunification also resulted in the termination of the previous state planning system. Therefore, over time it is expected that the responsiveness of production and consumption to changes in prices in eastern Germany will increase. In order to assess the impact of this change in responsiveness, experiment 1 was repeated with progressively higher elasticities of supply and demand — in experiment 2 the elasticities chosen were midway between those reported in tables 4 and 5 and those prevailing in the European Community (reported in tables 6 and 7), while in experiment 3 the EC elasticities were applied to eastern Germany. The elasticities used in experiment 2 are likely to be most relevant when east German agriculture has partly adjusted to a free market oriented system, while the elasticities used in experiment 3 are likely to be most relevant when east German agriculture has fully adjusted to such a system.

The model used in this study does not allow the movement of resources between countries. However, since reunification, it has been possible for west Germans, or other residents of the European Community, to purchase farm land in eastern Germany. Such land purchases are likely to be accompanied by a movement of resources, such as Western capital, specialised machinery and skilled farm management, into east German agriculture. Given that the quota allocation for east German sugar production is approximately 25 per cent above the east German production level immediately prior to reunification, it is likely that sugar production will be a prime objective of the west Europeans who purchase land in eastern Germany. Therefore, the above experiments have also been carried out under the assumption that sufficient resources shift into east German sugar production to enable the production quota to be filled. This is implemented in the model by imposing an exogenous increase in the supply schedule for sugar in eastern Germany.

Simulation results

Reference scenario

In general, world prices for agricultural commodities in the reference simulation are greater than in the base period (figure 1). This is due largely to the increase in demand associated with the rise in income and population assumed for many of the developing countries. The large price increase for dairy products is caused partly by the relatively small share of these commodities traded in world markets. If a relatively small share of a commodity's

Figure 1: World price changes: reference scenario

Wheat
Other coarse grains
Sugar

Butter
Cheese
Milk powders

Beef
Pork

production is traded in world markets, a larger price adjustment will be required to clear the market for any given change in demand and supply. Also, in many countries, changes in the world prices of dairy products are only partially transmitted to domestic markets and, for that reason also, relatively large world price adjustments are required to clear the market in response to changes in demand and supply in key markets.

Policy experiments

Prices received by producers for most of the products considered in this study increase as a result of the application of the Common Agricultural Policy to eastern Germany. At the same time, prices paid by consumers increase by more than 100 per cent for most of the agricultural products considered in this study. Increases in production are restricted to grains and sugar (table 10).

Production of beef and pork decline as a result of the reduced prices for these products. The 20 per cent fall in milk production occurs as a direct result of the introduction of the quota for milk. The falls in production of other dairy products in experiment 1 primarily result from the huge increase in the consumer price of milk. The large increase in the consumer price of fresh milk means that there is a substantial increase in the opportunity cost of producing butter, cheese and milk powders rather than selling it as fresh milk.
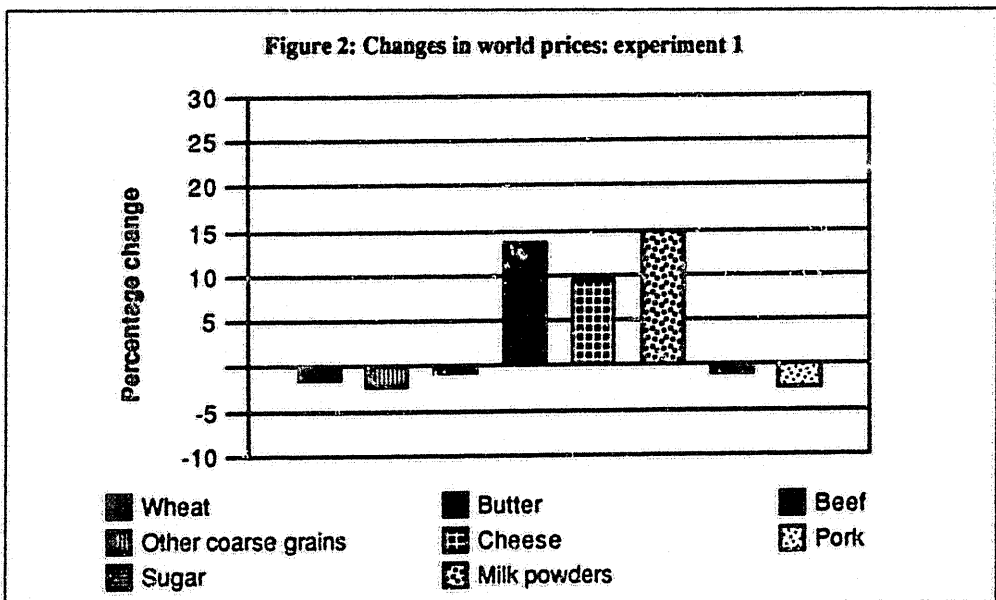
Table 10: Impact of reunification on eastern Germany a

	Change in producer price	Change in production	Change in consumer price	Change in consumption
	%	%	%	%
Experiment 1				
Beef	−17	−3	349	−16
Pork	−25	−18	311	−46
Milk	8	−20	414	−45
Butter	10	−24	48	−
Cheese	17	−26	17	3
Milk powders	23	−45	23	−3
Wheat	65	13	392	−39
Other coarse grains	53	21	134	−33
Sugar	61	10	296	−32
Sugar b	61	25	296	−32
Experiment 2				
Beef	−17	−7	349	−35
Pork	−25	−26	311	−54
Milk	8	−20	417	−34
Butter	10	−19	47	8
Cheese	16	−17	16	3
Milk powders	27	−37	27	16
Wheat	65	18	392	−38
Other coarse grains	53	27	135	−34
Sugar	61	9	296	−40
Sugar b	61	25	296	−40
Experiment 3				
Beef	−17	−10	349	−50
Pork	−25	−33	311	−59
Milk	9	−20	418	−20
Butter	10	−13	47	14
Cheese	17	−6	17	5
Milk powders	36	−28	36	35
Wheat	65	23	392	−39
Other coarse grains	53	33	135	−37
Sugar	61	7	296	−47
Sugar b	61	25	296	−47

a Changes relative to reference scenario. b Results for sugar when it is assumed that the sugar quota for eastern Germany is filled. − Less than 1 per cent in absolute value.

Production changes for meats and grains in experiments 2 and 3 are larger than those in experiment 1, reflecting the progressively higher price elasticities of supply which are used in these experiments. For dairy products, however, the declines in east German production in experiments 2 and 3 are progressively smaller than those in experiment 1. The progressively smaller declines reflect the progressively smaller elasticities of supply used in experiments 2 and 3. Sugar production in eastern Germany increases by between 7 and 10 per cent, and so under the conditions assumed in this experiment the sugar quota allocated to eastern Germany would not be fulfilled, unless it is assumed that sufficient additional resources would be forthcoming to the eastern German sugar industry.

The large increases in consumer prices for most agricultural products lead to large falls in consumption. As mentioned earlier, prior to reunification a large amount of food was wasted because of the very low consumer prices in eastern Germany. A considerable proportion of the consumption falls reported in table 10 is probably caused by reductions in food wastage by consumers rather than large declines in actual consumption.

The impact of German reunification on agricultural trade for the European Community as a whole (including eastern Germany) is shown in table 11. In experiment 1, reduced east German production of dairy products, particularly cheese, leads to a decline in the overall level of EC exports and an increase in the world prices of these products (figure 2).

Figure 2: Changes in world prices: experiment 1

Table 11: Impact of reunification on European Community trade a b

	Change in EC exports	
	kt	%
Experiment 1		
Beef	56	6
Pork	232	16
Butter	−81	−25
Cheese	−74	−22
Milk powders	−77	−22
Wheat	2537	13
Other coarse grains	4719	117
Sugar	319	8
Sugar c	439	11
Experiment 2		
Beef	118	12
Pork	211	14
Butter	−84	−26
Cheese	−50	−15
Milk powders	−91	−26
Wheat	2724	14
Other coarse grains	5219	130
Sugar	365	9
Sugar c	498	13
Experiment 3		
Beef	168	17
Pork	191	13
Butter	−84	−26
Cheese	−28	−8
Milk powders	−101	−29
Wheat	2996	15
Other coarse grains	5927	149
Sugar	405	10
Sugar c	550	14

a Including eastern Germany. b Changes relative to reference scenario. c Results for sugar when it is assumed that the sugar quota is filled. – Less than 1 per cent in absolute value.
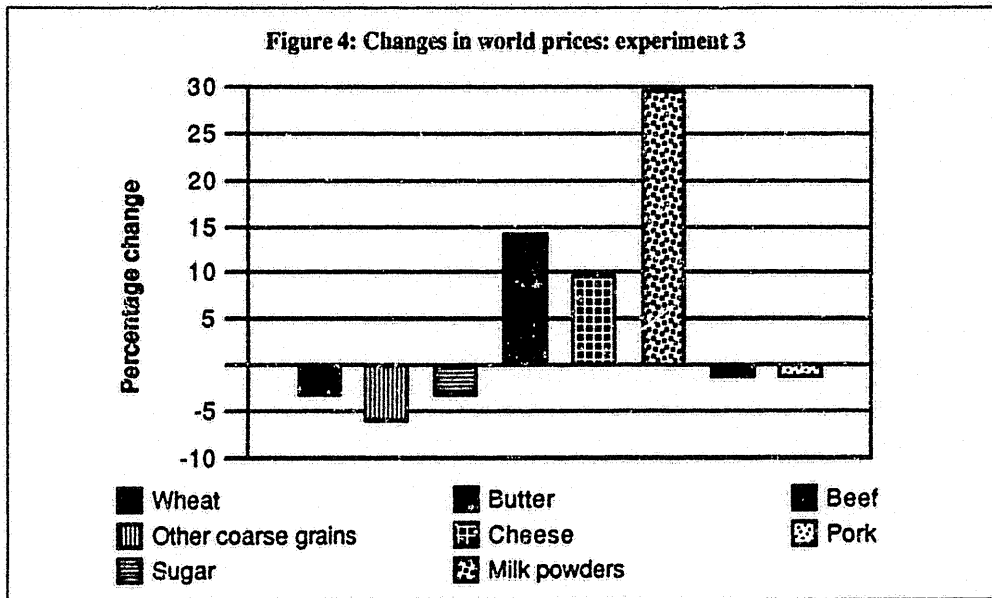
However, increases in production and declines in consumption of grains and sugar, and large declines in consumption of meats, in eastern Germany result in increased EC exports of these products. The most dramatic change is for other coarse grains, where overall EC exports increase by 117 per cent (4719 kt). EC exports of pork and wheat increased by 16 per cent and 13 per cent respectively, while there were smaller increases in exports of sugar and beef (8 and 6 per cent respectively). World prices of these products decline marginally as a result of these changes in the European Community's exportable surpluses (figure 2).

EC exports of wheat, other coarse grains and sugar are progressively greater in experiments 2 and 3 compared with experiment 1, reflecting the greater production of these commodities in eastern Germany, reported in table 10. EC exports of pork and beef are also progressively greater, despite lower production levels in eastern Germany, because the declines in consumption are larger than the declines in production of these products in eastern Germany. As a result, the declines in world prices for wheat, other coarse grains, sugar and beef are progressively greater in these two experiments (figures 3 and 4). The decline in EC cheese exports is progressively smaller in these experiments, and is the result of the progressively greater increase in east German production. Despite this, the change in world cheese prices remains much the same over the three experiments.

When these experiments are carried out under the assumption that the east German sugar quota is filled (in other words, sugar production increases by 25 per cent in each case) the

Figure 3: Changes in world prices: experiment 2

Figure 4: Changes in world prices: experiment 3

- Wheat
- Other coarse grains
- Sugar
- Butter
- Cheese
- Milk powders
- Beef
- Pork
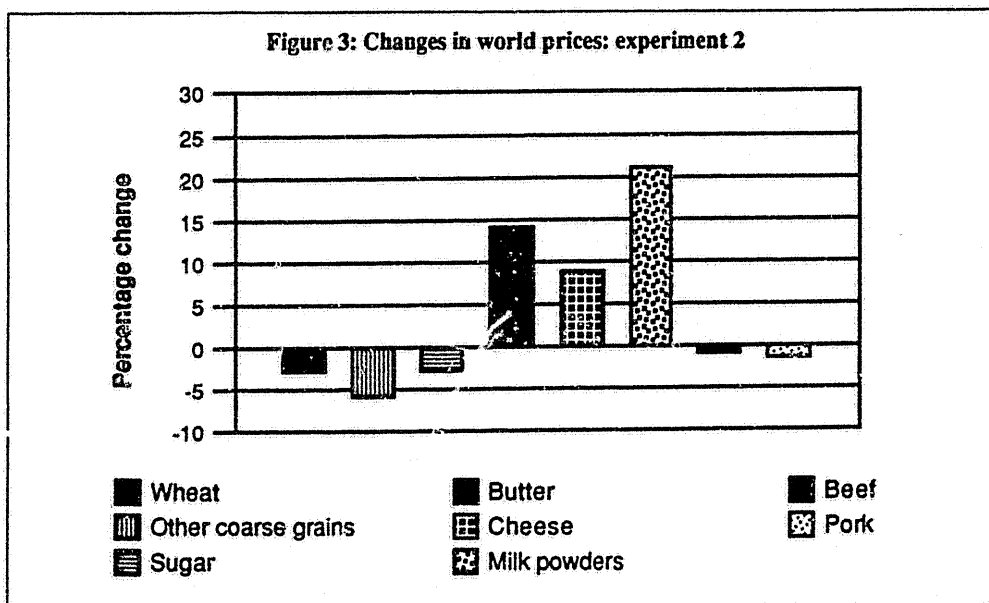
changes in sugar prices and consumption remain the same as previously (table 10). As a result of the assumed extra east German sugar production, overall EC sugar exports increase by between 11 and 14 per cent, rather than the increases in experiments 1–3 of between 8 and 10 per cent (table 11). The increased volume of EC sugar exports results in a decline in world sugar prices of 4–5 per cent (compared with 3–4 per cent previously).

Factors not modelled in this study

A number of points need to be borne in mind when interpreting the results in this study. First, the analysis employs a partial equilibrium modelling framework confined to the agricultural sector. Therefore, developments in other sectors of the economy are not taken into account. The widespread reforms that are occurring throughout the east German economy will affect eastern Germany's agricultural sector. Conversely, changes in the structure of farm production and in producer incomes resulting from agricultural policy changes may also affect the development of other sectors.

Second, in this study the various commodities were assumed to be homogeneous. Therefore, a factor not explicitly taken into account in the analysis is the inferior quality of east German agricultural products. As has been noted earlier, the prices of east German agricultural products have stayed below the levels that prevail in the rest of the European Community because of the poor quality of the products. However, over time the quality of each of the

commodities produced in eastern Germany will rise and eventually prices will become comparable with EC levels.

Third, within the time period examined in this study it is possible that the Common Agricultural Policy will be reformed as a result of either the reform proposals which are currently being considered within the Community or the implementation of any agricultural agreement obtained as a result of the Uruguay Round of multilateral trade negotiations. If changes to the Common Agricultural policy do occur the effects of reunification on world agricultural markets are likely to be different from those estimated in this study.

Fourth, the analysis is based on the assumption that the restructuring process in east German agriculture will be completed within the medium term period considered in this study. However, it is possible that the restructuring process will not be completed in the medium term.

Fifth, the analysis does not take account of any of the changes occurring in Eastern Europe, the former Soviet Union or any where else in the world other than in Germany. The widespread changes occurring in Eastern Europe may result in significantly different prices, elasticities and levels of production and consumption in Eastern Europe than those used in this study.

Impact on Australia

As discussed earlier, the results of the simulations indicate that world prices of dairy products are likely to increase as a result of reunification. The increase in world dairy prices is estimated to lead to an increase in the value of Australian exports of dairy products, over the five years following reunification, of between $A170 million and $A240 million (in 1986 values). However, for other agricultural products, reduced world prices as a result of German reunification could lead to lower prices to Australian farmers, particularly for wheat, coarse grains, sugar and beef. As a result, Australian production and exports of these products could fall. The model indicates that, in the initial stages after reunification, the value of Australian wheat, coarse grains and beef exports could fall by about $A60 million, $A20 million and $A45 million a year respectively (in 1986 values).

With greater responsiveness of supply in east German agriculture, overall increases in EC exports of beef and wheat could become larger, and as a result the decline in world prices and in the value of Australian exports of these products would become greater. When east

German agriculture has fully adjusted to a free market system it is estimated that this could lead to an annual reduction in the value of Australian exports of wheat, coarse grains and beef of about $A130 million, $A65 million and $A85 million respectively. In the initial stages after reunification the value of Australian exports of sugar is estimated to decline by about $A8 million a year, with the decline being about $A35 million a year after east German farmers and consumers have fully adjusted to the free market conditions. If east German sugar production increases to fill eastern Germany's allocation under the sugar quota, the reduction in the value of Australian sugar exports in the medium term is estimated to increase to $A47 million a year.

Concluding remarks

When the reunification of Germany took place in October 1990, the agricultural sector in eastern Germany immediately became supported by the European Community's Common Agricultural Policy. As a result, the state planning system which previously operated in eastern Germany was terminated, and producers now receive higher prices for a number of agricultural products. In addition, food consumption in eastern Germany, which had previously been subsidised, became highly taxed. The SWOPSIM model indicates that these changes in the nature of the policies facing the east German agricultural sector would result in a dramatic increase in overall EC exports of other coarse grains, while there would also be substantial increases in exports of wheat and pork, with smaller increases in exports of beef and sugar. These estimated increases in EC exports have a depressing effect on world prices — the world price of other coarse grains could fall by about 2–6 per cent, while the estimated reduction in world prices for beef, wheat, pork and sugar amount to about 1–3 per cent. On the other hand, overall EC exports of dairy products, particularly cheese, could decline as a result of the potential reduction in east German output of these products. The reduction in EC dairy exports could result in increases in world prices of 9–14 per cent for cheese and butter and 15–29 per cent for milk powders.

The results of the simulations undertaken in this study indicate that in the medium term German reunification is likely to lead to a reduction in the value of Australian agricultural production and trade, with the value of exports of wheat, coarse grains other than corn, sugar and beef declining by about $A150 million to $A315 million a year (in 1986 values). If the Dunkel proposals in the Uruguay Round are successfully implemented or if any significant reform of the CAP is undertaken, the implications of reunification for Australia's agricultural industries could be substantially different from those estimated in this study.

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