CEGE-SCHRIFTEN

Wolfgang Münch

Effects of EU Enlargement to the Central European Countries on Agricultural Markets

PETER LANG

CEGE-SCHRIFTEN

Wolfgang Münch

Effects of EU Enlargement to the Central European Countries on Agricultural Markets

Accession of the Central and Eastern European Countries is one of the biggest political projects for the European Union. As in all previous enlargements the agricultural chapter proves to be one of the most sensitive fields of the negotiations. This book examines the effects of enlargement on agricultural markets and government expenditure in the candidate countries as well as possible effects of different choices in the politically sensitive areas of direct payments and production quotas. The ten candidate countries have quite diverse economic and agricultural characteristics. Membership in the European Union, therefore, leads to varying macroeconomic effects. Two chapters specifically deal with these aspects and their effects on agriculture as well as likely country-specific developments in Hungary and in Slovenia. The quantitative tools developed and used for this analysis have also been more widely used by governments and institutions in analyses of questions related to enlargement. The book describes and documents these quantitative tools.

Wolfgang Münch studied agricultural economics at the University of Göttingen. With a background in development as well as international trade economics, he worked on several international research projects dealing with the consequences of enlargement of the European Union in the field of agriculture. Wolfgang Münch then joined the Federal Ministry of Consumer Protection in Germany and works currently as Expert to the European Commission.

Retrodigitization in 2018

Effects of EU Enlargement to the Central European Countries on Agricultural Markets

CeGE-Schriften

Center for Globalization and Europeanization of the Economy
Zentrum für Globalisierung und Europäisierung der Wirtschaft
Georg-August-Universität Göttingen

Band 4

PETER LANG
Frankfurt am Main · Berlin · Bern · Bruxelles · New York · Oxford · Wien

Wolfgang Münch

Effects of EU Enlargement to the Central European Countries on Agricultural Markets

PETER LANG
Europäischer Verlag der Wissenschaften

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Münch, Wolfgang:

Effects of EU enlargement to the central european countries on agricultural markets / Wolfgang Münch. - Frankfurt am Main ; Berlin ; Bern ; Bruxelles ; New York ; Oxford ; Wien : Lang, 2002
(CeGE-Schriften ; Vol. 4)
Zugl.: Göttingen, Univ., Diss., 2000
ISBN 3-631-39939-1

This book is available Open Access thanks to the kind support of ZBW – Leibniz-Informationszentrum Wirtschaft.

D 7
ISSN 1617-741X
ISBN 3-631-39939-1
US-ISBN 0-8204-6033-8
ISBN 978-3-631-75691-1 (eBook)

Printed in Germany 1 2 3 4 6 7

www.peterlang.de

Foreword

The European Union is currently engaged in one of its biggest political projects ever: Another round of enlargement to include twelve more member countries, ten of which will be from Central and Eastern Europe. Negotiations on the conditions for accession of future new member countries have always been complex and difficult, but the complexity of the current accession negotiations exceeds any past experience. Since the first round of enlargement in the 1970s, agriculture has been one of the most difficult items on the agenda for accession talks, and the ongoing negotiations with accession candidates from Central and Eastern Europe are no exception to this rule. The agricultural chapter of the negotiations has been taken up as one of the last items on the agenda, and at the time of writing it is obvious that negotiators are facing serious difficulties with this chapter.

The fundamental reason behind these difficulties is the fact that in agriculture there is a particularly pronounced intensity of policy intervention, in both the European Union and the accession countries. As a result, integration of new member countries does not simply imply the opening up of markets in agriculture and food, but the alignment of policies in the newcomer countries with those of the European Union. This requires technical adjustments of an often intricate nature, but, more importantly, also has significant economic implications for both the existing Union and the accession countries. After all, agricultural policies represent the largest single bloc in EU budget expenditure, and result in significant transfers among member countries.

Against this background, the study done by Wolfgang Münch assesses the major economic implications of integrating the accession countries from Central and Eastern Europe into the framework of the European Union's Common Agricultural Policy, under alternative policy scenarios. It therefore throws a highly welcome light on this most controversial component of the accession negotiations. Among other issues, the study also addresses the political mega-issue in the agricultural chapter, i.e. the extension of direct

payments under the Common Agricultural Policy to the future new member countries. Based on a well-designed analytical tool, Wolfgang Münch provides quantitative information on what alternative future policies may do to agricultural markets and economic welfare in an enlarged Union. His study is therefore another good example of the useful contributions agricultural economists can make to creating a solid base for decisive political decisions.

Stefan Tangermann
Paris, June 2002

Contents

List of Tables

List of Figures

Introduction

The simulations in this study were defined and carried out during the summer of 1999, before the Candidate Countries and the EU-15 defined their initial positions on the agricultural chapter. The policy assumptions on direct payments, cattle premiums, and quota quantities are broadly defined as in the Common Positions of the EU-15. Certainly, the position of the EU-15 would yield lower budgetary costs than those estimated in the present work. However, despite all the recent developments in negotiations, the identified general trends on agricultural markets and budget expenditure have remained valid.

Politically, the most sensitive outcome of the study is the estimate of budgetary expenditure. The reader should note that the largest part of the budgetary expenditure will be determined by the political agreements on direct payments and quotas, which surely will not be settled until the final hour of accession negotiations. Therefore, the study also reviews the sensitivity of budgetary expenditure concerning these important parameters.

In the early 1990s, membership in the European Union (EU) became a definite prospect for Central and Eastern European countries (CECs). Since then, the issues of EU membership and transition of the CECs to Western market economies have been a focal point for the creativity and imagination of the agricultural economic profession. This has led not only to a better understanding of the underlying economics, but also to development of powerful tools to assess the effects of CEC-EU accession on agriculture in general and agricultural markets in particular.

One of the major empirical and methodological questions of CEC-EU accession is the assessment of effects on agricultural markets. In methodological terms, such an analysis should take into account the characteristics of transition economies as well as the relative complexity of EU agricultural policies. In empirical terms, a number of markets, which are most affected by the CAP, should be included in such an analysis. Thus, this very relevant topic could be examined in detail.

A large number of analyses have already been undertaken, which are referred to in detail in Chapter 1. For the present study, Tangermann and Josling (1994) laid the foundation in numerous respects. Their study marked a turning point in thinking; it demonstrated that the integration of the CECs into the EU is not similar to any previous EU enlargements thus far. They clearly demonstrated the complexity and enormity of the task and drew conclusions that are still valid. They also presented for the first time the application of a new modeling tool, which resulted from a cooperation with the USDA/ERS. This tool, the European Simulation Model (ESIM) was further developed for use in this analysis. Without those initial research projects this study would not have been possible. My special thanks, therefore, go to Stefan Tangermann for his continuous support and critical survey of the results.

The Joint Research Project *Agricultural Implications of CEEC Accession to the EU*, financed by the European Commission from 1996 to 1999, in which researchers from Bonn University, Wye College, Catholic University of Leuven, and University of Göttingen collaborated, provided significant resources for the present research. The financial contributions from the European Commission and the Polish, German, British, and Hungarian Ministries of Agriculture were highly appreciated.

A network of ESIM users came together to contribute to the modeling work by supplying data, giving critical comments, and other highly useful contributions to the present work. This network of researchers and civil servants contributed to developing and, finally, delivering ESIM to ten CECs and the EU-15. Contributors were Wladislaw Piskorz, Jerzy Plewa, Andrezij Kwiesinki, Waldemar Guba, Jorge Nunez-Ferrer, Alan Buckwell, Dirk Ahner, Jens Schaps, Sandor Meszaros, Gyula Varga, Marian Boszik, Geeza Blaas, Maya Andreeva, Tomas Doucha, Tomas Ratinger, Susan Leetma, David Kelch, and Pete Liapis. Thanks to the USDA/ERS for making possible the first and only meeting of the network in Jablonna/Poland in 1998. The cooperation and help received through this network are much appreciated.

I must also thank the staff of the Institute of Agricultural Economics/ University of Göttingen for the unique environment, which helped accomplish the research. Here my thanks go to Martin Banse, Henning Twesten, Ferdinand Nölle, Andrea Wälzholz, and Petra Geile. Not least I have to thank Ann and Jason Hartell for their highly competent work on editing the present study. However, all remaining errors are my responsibility.

A number of publications resulted from this research project in the form of working papers, articles, chapters in books, and contributions to conferences. The publications dealt not only with the modeling work, but also aspects of measuring competitiveness. The present study combines the various strands of my research work.

The work is organized as follows. A chapter describing the developments of agricultural policies and agricultural prices in the CECs and the EU serves as an extended introduction as well as an explanation of the developments and characteristics in the CECs. It includes a review of literature. The next chapter describes the ESIM and reviews the literature on modeling. The assessment of CEC-EU integration effects for agricultural markets follows in three chapters. Chapter 3 assesses results from accession simulation for ten CECs in a conventional partial equilibrium analysis, addressing market, budget, and welfare effects. The next chapter addresses the specifics of transition economies in macroeconomic developments by linking the partial equilibrium model to four Computable General Equilibrium Models for the Czech Republic, Hungary, Poland, and Slovenia. Chapter 5 deals with two case studies and sheds some light on the effects of downstream sector adjustment on agricultural production for Slovenia and on increased technical progress of Hungary's crop production. The study concludes with a summary and some interpretations.

1 Economic Aspects of CEC-EU Integration

The collapse of communist rule has triggered an intense process of economic restructuring in the CECs. The transition process in Central Europe can be separated into two phases: (i) economic liberalization and (ii) stabilization and institutional reform. The first phase was generally complete by 1993 when the CECs returned to a period of strong economic growth after an initial phase of contraction. The second phase of transition policies, though, is an ongoing process.

During the early phase of transition from central-planned to market economies, the Europe Agreements began the gradual process of EU integration. The preamble of the so-called Association Agreements between the EU and ten CECs stated the commitment of the EU to help the associated countries eventually gain EU membership. The second legal milestone in the process of preparing for EU membership was the start of accession negotiations in 1998 with Estonia, the Czech Republic, Hungary, Poland, and Slovenia. The Helsinki summit opened the door for negotiations with Bulgaria, Latvia, Lithuania, Romania, and Slovak Republic, the second wave, or Helsinki Group countries, as they are sometimes called. A fast track procedure has been implemented for the second wave countries, which will allow individual countries to catch up to the first wave countries if the negotiation of the 31 chapters proceed quickly.

The EU itself has followed the path of internal integration since the late 1950s. The economic cornerstone of the EU is the customs union, which was established in 1968 and included agricultural products. A customs union allows for free movement of goods between member countries and applies common external border measures for trade with third countries. The next step of internal integration was the establishment of the Single Market in 1993. The properties of the Single Market were previously outlined in Article 3 of the Treaty of Rome:

> The elimination, as between member states, of customs duties and quantitative restrictions on import and export of goods,

> and all other measures having equivalent effects; the abolition, as between member states, of obstacles to freedom of movements for persons, services and capital.

The Single Market inherits the freedom to move goods from the customs union and adds the freedom of workers to move between countries, the freedom to exercise a trade or profession, and the freedom to move payments and capital. Therefore, the Single Market is a customs union plus free movement of production factors. Moreover, mutually recognized national production standards and established common production standards have increased transparency and removed barriers to trade. The dynamic effects of the Single Market are summarized in the literature as having three major effects: reducing monopoly power, reducing levels of x-inefficiency (overstaffing, excessive inventories, and other slack management practices), and finally, reaping economies of scale and learning effects (McDonald, 1999). Thus far the final step of internal integration is the European Monetary Union (EMU), which led to the introduction of a common currency in 1999.

The EU is a highly integrated political and economic framework in which the CECs have sought to be included. One of the preconditions of EU membership is the complete implementation of the Acquis Communautaire, the Common Legislation, into national law. While this process assures institutional compatibility of new member countries with the EU, the lengthy process of accession negotiations determine the political terms of integration. In particular, the negotiations determine specific and temporary exemptions from the Acquis Communautaire. The agricultural chapter is one of the most sensitive subjects of the negotiations.

Agricultural policies are a traditional focal point for the EU both in respect to integration as well as of budgetary costs. The CAP is a highly sophisticated set of policies that delivers considerable protection for domestic producers with the aim of raising agricultural income via high agricultural prices and, since 1992, by direct payments. The EU is one of the largest agricultural trading nations in the world and the CAP has been a continuous subject of international concern especially among other important agricultural exporting nations. This, coupled with tighter budgets, has led to several reforms, the latest in 1999 which is to define the CAP until 2006.

Agriculture has always been a sensitive sector when countries have sought integration with the EU. This is also the case in CEC-EU integration. In the Europe Agreements, which aim at a free trade zone between the

EU and CECs, agriculture and food products are mostly excluded from bilateral trade liberalization. The concessions granted for market access are tightly constrained by preferential quotas (see Overberg, 1996; Buckwell and Tangermann, 1997). The special importance of agriculture in CEC economies, the need for CECs to pursue economic reforms, the extraordinary complexity of the CAP, and the production potential of CEC agriculture add up to an enormous entanglement, which the accession negotiations on agriculture must resolve for the EU as well as for the CECs.

The following sections describe some of the characteristics of CEC agriculture, the development of agricultural policies in the CECs, their characteristics vis-á-vis the CAP, and some key developments on agricultural markets relevant for the later analysis.

1.1 Agriculture in the CECs and the EU-15

A simple comparison of basic data for the CECs and the EU-15 shows the scope of the enlargement process. Based on current data (mostly 1999), the EU-25 (EU-15 plus first and second wave countries) would have 28 percent more population, 32 percent more agricultural area, and GDP in Purchasing Power Standards would be 10.7 percent higher than the current EU-15 (see Table 1.1). The income levels in the CECs measured as GDP in purchasing power standards per capita are roughly 40 percent of the average level in the EU-15. The highest income levels in the CECs were observed in Slovenia, the Czech and Slovak Republics, Hungary, Poland, and Estonia ranging from 70 to 39 percent of the average EU level. Bulgaria, Romania, Latvia, and Lithuania have the lowest income levels, between 24 and 30 percent of the EU-15 income level.

Reflecting this low income level, CEC households devote a higher share of income to food purchases than those in the EU-15. The food expenditure share in the CECs is consistently above 20 percent. Bulgarians and Romanians pay the highest share of their income for food at 49 and 55 percent. Compared to this, Czech citizens use only 23 percent of their income for food, the closest to the EU level.

Currently, agriculture represents 1.6 percent of GDP in the EU-15. Food industries contribute an additional 1.8 percent. In the CECs, agriculture plays a far more significant role. On average, agriculture contributes 7 percent and the food industries 3.1 percent to the GDP. Again however,

Table 1.1: Importance of the Agri-Food Sector in the CECs.

	Population	GDP in Purchasing Power Standards		Food Expenditure	Agricultural Area	GDP Share (1999)	
	Mill.	Bill. PPS	PPS/Capita	% of Total	('000 ha)	Agriculture	Food Industries
Bulgaria	8.2	39.0	4749	49.6	5696	21.1	
Czech Rep.	10.3	128.5	12498	23.3	4285	3.7	2.6
Estonia	1.4	11.1	7676	34.2	1043	5.7	4.7
Hungary	10.1	107.8	10705	38.0	6186	5.5	3.5
Latvia	2.4	14.1	5786	42.1	2488	4.0	3.0
Lithuania	3.7	22.8	6169	41.4	3496	8.8	5.8
Poland	38.7	299.1	7737	33.7	18222	3.9	3.5
Romania	22.5	127.6	5682	55.3	14784	15.5	2.3
Slovak Rep.	5.4	53.0	9825	28.4	2444	4.5	2.6
Slovenia	2.0	29.7	14964	22.0	491	3.6	3.0
CEC-10	104.7	832.7	7951	36.3	43308	7.0	3.1*
EU-15	369.7	7770.2	20097	17.4	134261	1.6	1.8
Ratio of CEC-10 to EU-15	28.3	10.7	39.5		32.2		

Table 1.1: *Continued.*

	Employment Share (1999)		Agricultural Trade in Total Trade (1997)†		Agri-Food Trade Balance (Mill. EUR)(1997)†		
	Agriculture	Food Industries	% of Exports	% of Imports	1989	1993	1997
Bulgaria	26.2	6.0	15	10	1242.6	267.8	187.9
Czech Rep.	5.5	1.8	6	8	−561.9	−503.4	−568.9
Estonia	9.5	4.0	17	18		43.6	−217.0
Hungary	7.5	4.0	15	6	1329.7	906.5	1560.3
Latvia	18.8	7.4	15	15		77.3	−119.1
Lithuania	21.0	8.9	17	12		193.5	−6.2
Poland	19.1	6.0	13	10	382.6	−465.9	−414.5
Romania	40.0	5.8	7	7	−964.2	−488.1	−88.2
Slovak Rep.	8.2	4.2	5	8	−99.9	−183.6	−346.6
Slovenia	11.4	4.6	4	9	−72.6	−233.3	−398.7
CEC-10	21.3	5.3			1256.2	−385.6	−411.0
EU-15	5.0	1.6	8	11	−20246.6	−11258.5	−16303.8

* Without Bulgaria.

†EU-15: only extra trade.

Source: Eurostat (2000a); National Statistics.

significant country differences can be observed. Bulgaria and Romania have the highest portions of GDP from agriculture and the agri-food industries with 26.8 and 21.3 percent, followed by Lithuania with 14.6 percent. At the lower end of this scale are the Czech and Slovak Republics, Slovenia, and Latvia with contributions between 6.3 and 7.1 percent.

In terms of employment in agriculture and the agri-food industries, the picture is similar. According to labor force survey data, agriculture in the EU employs 5 percent of the work force plus 1.6 percent working in the food industries. Compared to this, the CECs employ 21.3 percent in agriculture and 5.3 percent in food industries. Romania with a 40 percent share of agriculture in employment, Bulgaria with 26.6 percent, and Poland with 19.1 percent dominate this average number. Lithuania and Latvia also add to this picture with employment in agriculture at 21 and 18.8 percent. Again at the lower end of the scale are the Czech and Slovak Republics, and Estonia.

In the CECs, agriculture also contributes more than in the EU-15 to exports and imports, except for Slovenia, the Czech and Slovak Republics, and, surprisingly, Romania. The latter, however, only recently introduced a policy of less restrictive import and export licensing (see OECD, 2000c).

In 1989 the CEC-10 were net exporters of agri-food products. The net exporting nations were Hungary, Bulgaria, and Poland. Beginning in the early 1990s, transition reforms changed the trade surplus in agriculture to an increasing deficit. Poland became a net importer and Bulgaria had its trade surplus reduced to 267 Mill. EUR from 1.2 Bill. EUR in 1989. The downturn of agriculture led to a general increase of imports in the CECs. This downturn is illustrated in Figure 1.1. Agricultural output decreased until around 1994, slightly stabilizing since, except in the Czech Republic and Estonia. On the other hand, Slovenia follows a different pattern reflecting consistently high protection throughout the period (see Section 5.1.1).

In 1997 the trade deficit of the CEC-10 slightly increased from 385 Mill. EUR to 411 Mill. EUR. However, net imports where reduced; in Hungary by increasing net exports and in Romania by agricultural policies. The only continuously net exporting countries over the last decade were Hungary and Bulgaria.

Agriculture and the food industry in the CECs are an important part of the economy in terms of contribution to GDP, employment, and foreign trade. In these respects agriculture plays a more important role than in

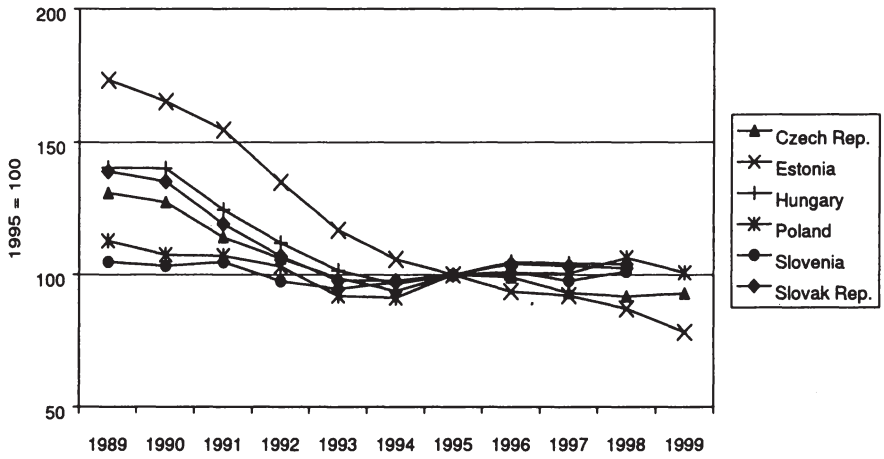

Figure 1.1: Development of Agricultural Output in CECs. Source: OECD (2000b).

the EU-15. Especially the level of employment in agriculture is remarkable, which might serve as a social buffer in countries where small-scale operations prevail in the agricultural sector, e.g. Romania, Bulgaria, Poland, and Lithuania. However, this role of agriculture has increasingly diminished, especially in countries with sufficient economic growth. In Poland, for example, agricultural employment declined from 24.5 percent of overall employment in 1995 to 19.1 percent in 1999 (see Eurostat, 2000b).

1.2 Development of Agricultural Policies in the CECs and the EU-15

After the initial liberalization of price and trade policies in the early 1990s, government interventions in agricultural and food markets have gradually been re-introduced in CECs. Initially, policy interventions were rather ad hoc, trying to address the urgent demands of both consumers and producers for protection against short-term negative impacts of liberalization. While these first policies were meant to curtail market failures, since 1992 governments have begun to introduce more consistent and more protective

agricultural policies. Since then the CAP has been the model for policy instrumentation. A main feature of agricultural legislation is how it explicitly includes a commitment to provide continuing long-term support to and intervention in the agricultural sector. The initial market intervention instruments, such as guaranteed minimum prices and intervention purchases, changed from providing a safety net to increasing agricultural prices (Hartell and Swinnen, 1997). However, budget constraints have prevented export- and intervention-related policies of becoming the dominant instruments of transfer to agri-food producers and most CECs have become substantial net importers of agricultural products (see Table 1.1). Unlike the pre-1992 CAP, under which the majority of transfers to producers related to expensive export and intervention policies, the majority of CECs increased support by gradually increasing import measures. In this way non-tariff barriers were reintroduced including restrictive import licensing (see Table 1.2).

Hungary, the only consistent net exporter, stepped up export support. However, budget and WTO restrictions prevented the extensive use of these measures (OECD, 1994a). Therefore, Hungarian agricultural protection remains low, while protection in the other countries increased (see Figure 1.2).

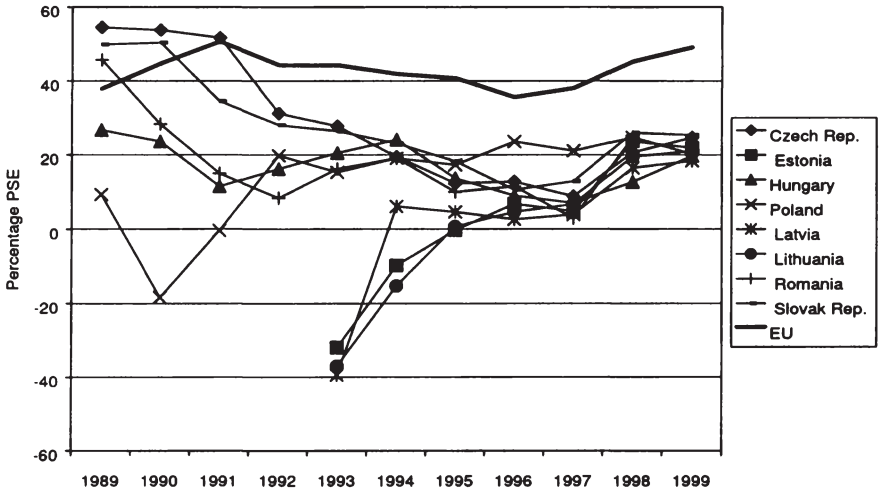

Figure 1.2: Development of Producer Subsidy Estimate in the CECs and the EU. Source: OECD (2000a); OECD (2000b).

Table 1.2: Patterns of Trade and Price Policy Among CECs, 1989–96.

Instrument	Country	Commodity	Date
Import Tariffs	All	All	1990
Non-Tariff Barriers (NTBs)			
Removal or substantial reduction of import and export NTBs	Poland	Most	1990
	Hungary	Most	1991
	Bulgaria	Most	1991
	Romania	Most	1991
	Czech Rep.	Most	1991
	Slovak Rep.	Most	1991
Reintroduction of import NTBs	Hungary	Grains and sugar	1992
	Poland	Most including processed food, fruit juice, dairy products	1992
	Bulgaria	Most agri-food products and some inputs	1992
	Czech Rep.	Temperate zone agricultural products	1992
	Slovak Rep.		1992
Reintroduction of export NTBs	Hungary	Milling wheat, meat, sugar	1992
	Poland	Grains, oilseeds, poultry, bovine animals	1992
	Bulgaria	Grains, flour, seeds, livestock, sunflower oil	1992
	Romania	Grains, flour, sugar, milk, animals	1992
	Czech Rep.	Important food commodities	1993
Appearance of variable import levies	Poland	Meat, dairy, cereals, eggs, etc.	1994
	Czech Rep.	Oilseeds, sugar, wine, live animals, beef, poultry, butter, starch	1992
	Slovak Rep.		1992
Credit Subsidies	All	Current inputs, capital investment, processing, and storage	1989
Minimum and guaranteed prices via purchases market price support		Various commodities often on an ad-hoc basis	1990–1996
	Bulgaria	Wheat, tobacco	
	Czech Rep.	Wheat	
	Hungary	Milk, wheat, beef, pork	
	Poland	Wheat, rye, milk and dairy products, pork, sugar	
	Romania	Wheat, milk	
	Slovak Rep.	Cereals, milk, beef	
Export Subsidies	All	Various commodities often on an ad-hoc basis	1989–1996
Production Quota	Poland	Sugar	1994*
	Slovak Rep.	Milk	1994
	Hungary	Milk	1996

Source: Hartell and Swinnen (1997), pp. 20–21.
* Regulation announced; put into effect 1997.

Figure 1.2 summarizes the development of agricultural policies in the CECs. With liberalization, protection as measured by the Producer Subsidy Estimate (PSE) dropped from levels at or close to those of the EU. Protection became negative in Poland and the Baltics, while in the other countries surveyed by the OECD it significantly declined but remained positive. The turning point of this development is between 1992 and 1995. High world market prices in 1996 and 1997 led to a decline of protection which increased again as world market prices declined. In 1998 and 1999, PSEs in the CECs remained 25 to 30 percentage points below those in the EU.

The PSE comprises all kinds of measurements of support policies, among them market price support (MPS), direct payments, input subsidies, and general services. MPS is comprised of all measures related to agricultural price and trade policies. In the EU the importance of MPS has declined with the introduction of direct payments in 1992; the share of MPS in total support decreases from 80 percent of total support in 1992 to 66 percent in 1999 (OECD, 2000b). In the CECs the share of MPS varies considerably from country to country.

Market and trade policies are especially important measures in the net importing countries. For example, in 1998 and 1999, 86 percent of Poland's transfers to agriculture were market price supports, in Romania this figure is even higher at 88 percent. For net exporter Hungary, the share of MPS in total support is considerably lower: 35 percent in 1998 and 51 percent in 1999. The year 1999 marked a sharp increase of support for Hungarian agriculture, mainly due to the increase of market prices support (see Figure 1.3).

Most of the increases in PSE levels starting in 1996 have in fact been comprised of market price supports, as direct payments, the other important CAP instrument for transfers to producers, have been only reluctantly introduced in the CECs (e.g. the Czech and Slovak Republics, Slovenia). In terms of government budgets, market price support through import measures is the preferable choice as the costs of these policies are invisible in annual government budgets. Net importing countries, therefore, were able to increase support in their pre-accession policies more easily than net exporting ones.

When comparing the CEC policies with the CAP, many instruments are similar but have a different level of intensity. Most countries had already introduced market intervention mechanisms like purchases, storage, and intervention prices, though usually not at the intensity and not on all markets

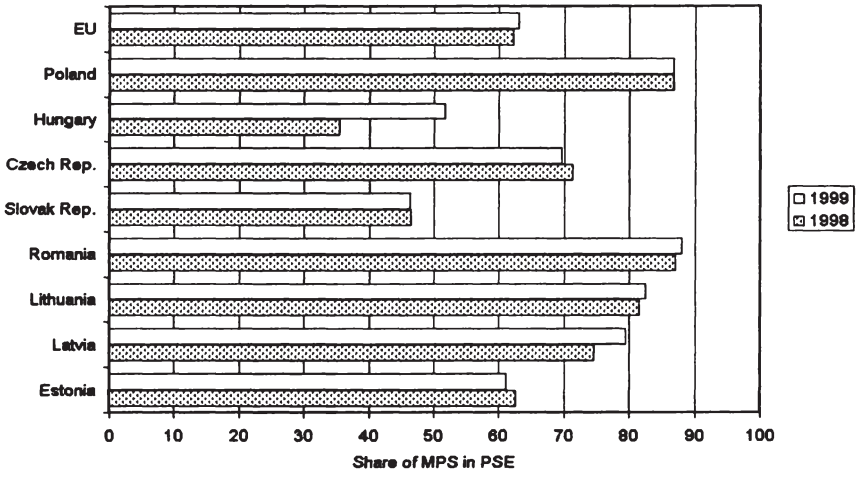

Figure 1.3: Share of Market Price Support in Total PSE in the CECs and the EU. Source: OECD (2000a); OECD (2000b).

as in the CAP. That some governments even introduced some kinds of supply quotas schemes demonstrates the far-reaching influence of the CAP on policy design in the CECs. In technical terms, the most successful examples are the sugar quota in Poland and the milk quota in the Slovak Republic, although their strictness in restricting actual supply is far lower than similar quotas in the CAP and production frequently exceeds the predefined levels. Recently some CECs also began to introduce direct payments, though mostly in the form of payments for disadvantaged regions (e.g. Czech and Slovak Republics and Slovenia).

1.3 Development of Agricultural Prices in the CECs and the EU-15

One of the questions determining the impact of CEC-EU accession effects on agricultural markets are the gaps between EU-15 and CEC producer prices. The size of the gap gives some idea about movements of CEC producer prices when CECs become EU members. The following section discusses

the development of price gaps between EU and CEC producer prices and world reference prices in the last decade for key markets. The graphs include selected countries and commodities; more complete data is presented in Appendix A (see Table A.1).

For common wheat the price gap between the EU and the CECs narrowed considerably in the observed period. Starting from producer prices, which were about 60 percent lower in 1990, CEC prices considerably narrowed the gap and moved with increasing world market prices up to levels close to or higher than those in the EU in 1995. Decreasing world market prices in the following years widened the gap again. In Slovenia, however, producer prices were higher than those of the EU between 1993 and 1998 and dropped to EU levels in 1999. Slovenia then introduced direct payments for wheat. In recent years, Polish prices were closest to those of the EU. Hungary and the Slovak Republic had the lowest producer prices compared to the EU, usually below EU world market reference prices.

A second interesting development took place at the beginning of 2000, when the devaluation of the EUR against CEC currencies narrowed the gap considerably. In that period, Polish producer prices became roughly 20 percent higher than those of the EU.

Roughly the same patterns of development can be observed for other commodities. Especially where EU prices are less affected by world market prices, rye, sugar, and milk for example, a large gap can be observed. For sugar the price gap was between 30 percent (Poland) and 80 percent (Slovak Republic). Slovene sugar prices dropped from levels slightly above EU prices in 1991 to roughly 28 percent below in 1993 and then returned to old levels.

For milk a slightly different pattern can be observed. The gap between EU and world reference prices, though still at 60 percent, slightly decreased over the period. Following these developments, CEC prices caught up such that the CEC-EU price gap diminished.

Generally the price gaps between EU and CEC producer prices decrease even for commodities highly protected under the CAP like sugar and milk. A second general pattern shows that the more advanced CECs already narrowed the gap considerably more than the others (see Table A.1).

Despite the difference in level, however, a common pattern of price developments can be derived for wheat from Figure 1.4, but in a similar way also for other products. The development of producer prices followed that

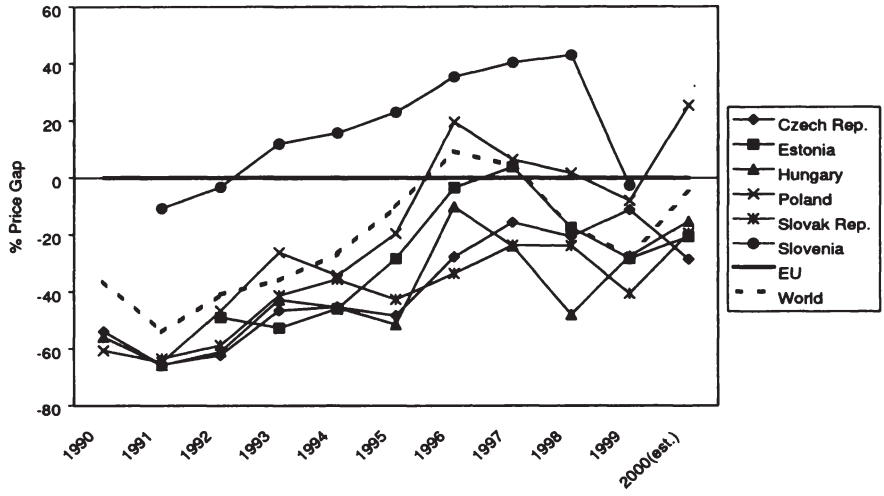

Figure 1.4: Common Wheat: Price Gap between EU and CEC Producer Prices and World Reference Prices (EU = 0). Source: National Statistics; OECD (2000a); Eurostat (2000a); ZMP.

of the world markets, while the EU producer price is relatively less affected by world market price developments.

With the implementation of CAP instruments, the pattern of producer price developments might considerably change when referring to past trends in the EU. Particularly CAP intervention price systems would be expected to diminish the importance of world market price developments for domestic producer prices in the CECs, especially for the highly protected commodities like coarse grains, sugar, and milk.

A comparison of Figures 1.4–1.6 reveals that on accession, relative prices for agricultural commodities will change. For example, wheat prices in Poland might fall while sugar and milk prices increase. This will affect production as well as consumption.

When comparing producer prices, an important part of the agricultural markets is left out of consideration. Before agricultural commodities become tradable, wholesalers or first stage processors have to handle them. According to 1997 data, the wholesale and processing margins in the EU-15

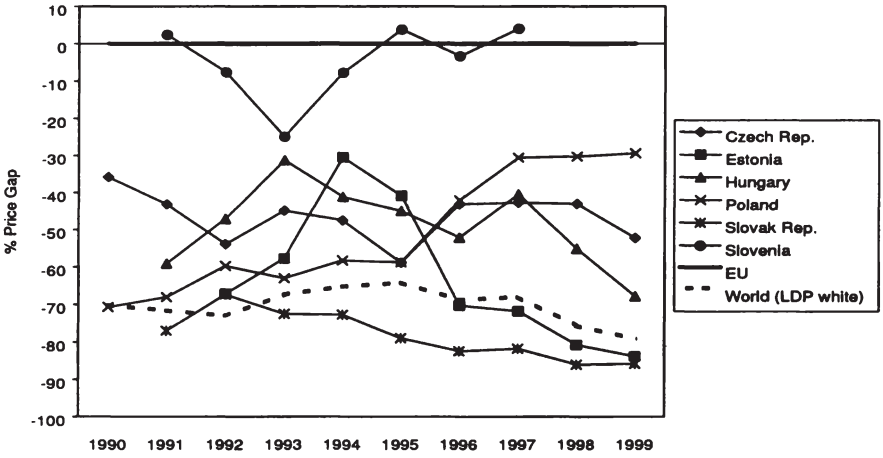

Figure 1.5: Sugar: Price Gap between EU and CEC Producer Prices and World Reference Prices (EU = 0). Source: National Statistics; OECD (2000a); Eurostat (2000a); ZMP.

and the CECs differ widely.[1] For cereals, the margin ranges from 20 percent in Slovenia to 9.5 percent in Poland. Comparing wholesale and first stage processing prices in the CECs and the EU for 1999, prices alter the pattern of price gaps for wheat. The price gap between wholesale prices is lower than that of producer prices in the majority of countries; in the Czech Republic and Slovenia wholesale prices for wheat are higher than those in the EU (see Figure 1.7).

The CAP price and trade policy instruments aim at the wholesale and first stage processing level (e.g. intervention is connected to carcasses not cattle). The efficiency of this sector determines how much of the protection actually is transmitted to agriculture. The theory of the Single Market suggests that a long term effect of integration would be the disappearance of some of the inefficiencies in the downstream sector in the CECs, basically as a result of increased competition. However, that process may take considerable time to materialize.

[1]The wholesale and processing margins describe the difference between farmgate and wholesale/factory price as a percentage of the farmgate price.

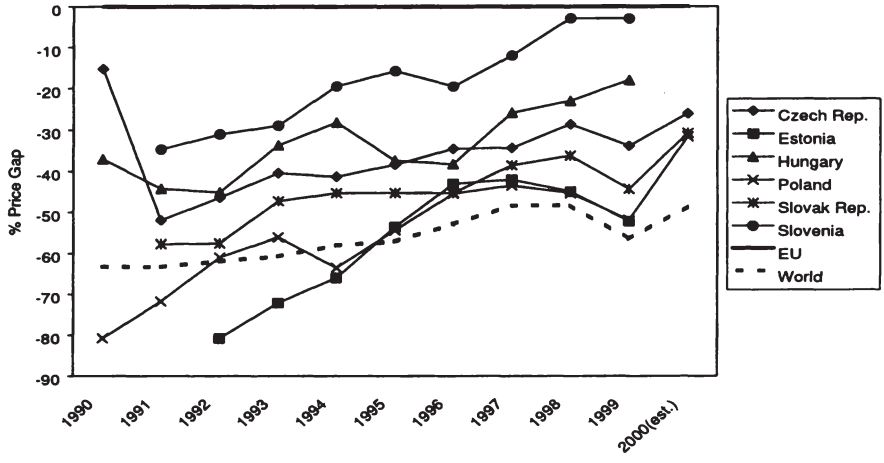

Figure 1.6: Milk: Price Gap between EU and CEC Producer Prices and World Reference Prices (EU = 0). Source: National Statistics; OECD (2000b); Eurostat (2000a); ZMP. Note: The world market price for milk is the OECD reference price for milk for the EU.

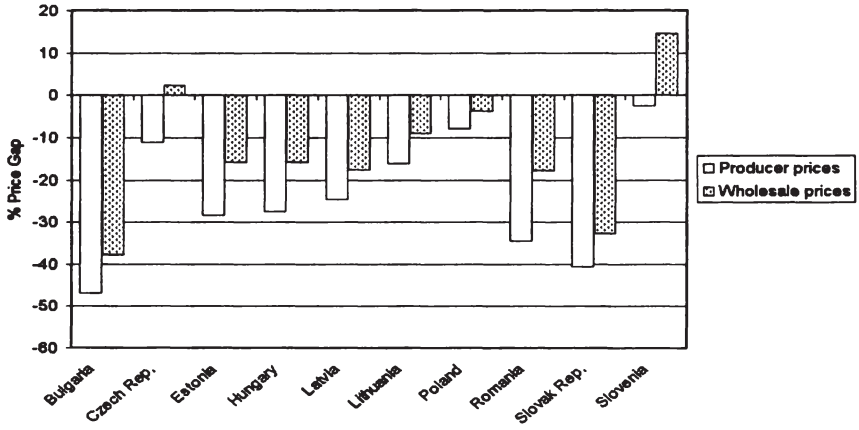

Figure 1.7: The CEC-EU Price Gap for Producer and Wholesale Prices for Common Wheat, 1999 (EU-15 = 0). Source: National Statistics; OECD (2000b); Eurostat (2000a); ZMP.

Along with lagging adjustment of the downstream sector, upon accession CEC producer prices may develop differently than a pure comparison of EU and CEC producer prices would suggest. Only with total adjustment of downstream sector efficiency, would producer prices in the CECs come close to those in EU-15. If greater differences in efficiency continue to prevail, producer prices in the enlarged EU would not converge. This has implications for agricultural production, as supply incentives of the CAP would be different among countries.

1.4 Exchange Rates and Protection

For cross-country economic analyses, the choice of the appropriate exchange rate is crucial for calculating economic effects. In theory one should always use the equilibrium exchange rate (EER). The EER, in very general terms, is what ensures the simultaneous attainment of internal and external (general) equilibrium. Internal equilibrium means that markets for non-tradable goods clear in the current period and are expected to do so in the future. External equilibrium is attained when current account balances are compatible with sustainable capital flows (Williamson, 1994). Generally, changes of the EER affect relative prices of tradable versus non-tradable commodities and inputs in a country.

Under central planning, exchange rates in CECs were tightly controlled and usually maintained at highly overvalued rates. Upon achieving (often restricted) internal convertibility, nearly all currencies underwent a massive real devaluation. Afterwards, CEC currencies embarked on a path of real appreciation, sometimes by impressive amounts. This pattern of real exchange rates in CECs is persistent regardless of the measure for real exchange rates (see Halpern and Wyplosz, 1996; Bojnec, Münch, and Swinnen, 1998).

The choice of exchange rate used for economic analyses is especially important for CECs as real exchange rates are much more volatile than in stabilized market economies such as the EU (see Bojnec, Münch, and Swinnen, 1998). Tangermann (1994) shows that the assumption on exchange rates is the most important factor determining the results of pre-1993 OECD and USDA analyses of CEC agricultural protection rates. Bojnec, Münch, and Swinnen (1998) showed the potentially large effects of exchange rate assumptions on projected CEC-EU accession effects as well as on estimated protection levels.

Table 1.3: Development of Real Exchange Rates in the CEC-10 Relative to the EU (NC/EUR), 1995=100.

	1993	1994	1995	1996	1997	1998	1999	2000*
Bulgaria	110	115	100	119	89	80	78	
Czech Rep.	111	104	100	94	92	85	86	76
Estonia	185	129	100	85	80	74	72	71
Hungary	94	95	100	98	92	93	90	83
Latvia	184	116	100	88	78	76	72	65
Lithuania	219	122	100	80	67	64	61	57
Poland	114	103	100	92	89	85	87	72
Romania	99	95	100	109	88	69	81	71
Slovak Rep.	109	104	100	97	92	90	95	81
Slovenia	111	109	100	103	103	99	99	98
EU	100	100	100	100	100	100	100	100

Source: Eurostat (2000a).
* May 2000.

Table 1.3 summarizes the developments of real exchange rates in the CECs between 1993 and 2000. The nominal exchange rates have been deflated by the respective GDP price index. A common pattern is the strong real appreciation of the CEC currencies against the EUR. Since 1995, most CEC currencies appreciated 39 percent (Lithuania) to 5 percent (Slovak Republic); the real value of Slovenia's currency closely followed the EUR. Notably, in the year 2000 the EUR strongly depreciated followed (by 23 percent) against the USD. This depreciation also affected the CEC currencies, increasing their real value against the EUR from 14 percent in the Slovak Republic to 1 percent in Estonia.

The development of exchange rates affects protection in several ways. World market prices transmit to domestic prices constrained by price and trade policies. The applied instruments that determine how much the markets are sheltered from world markets depend on the applied instruments in a market regime. Exchange rates directly enter the price transmission mechanisms when world market prices are converted into national currencies. Indirectly they come into effect through policy measures defined in national currencies (administrative prices and specific tariffs).

In a tariff-based system, domestic prices move with world market prices, with the ad valorem tariff maintaining the difference. Under these instru-

ments exchange rate movements directly shift domestic prices without affecting the relative difference to world market prices. Therefore, exchange rates do not influence the degree of protection in a tariff-based system.

In intervention systems, the converted world market price also enters into the equation. This directly affects the price gap between administrative and world market prices, as well as the level of import protection. Thus, appreciating currencies widen the price gap and increase import protection, while a depreciating currency lowers protection levels.

In the CAP administrative price, specific tariffs and direct payments are defined in EUR. These instruments have an important role in agricultural policies. CEC agricultural policies are increasingly modeled after the CAP. With the appearance of more administrative prices and other measures defined in domestic monetary terms, the resulting level of agricultural protection is more affected by exchange rate developments than in the early phase of transition. With real appreciating currencies, agricultural policies in the CECs tend to become more protective.

Changing real values of the CEC currencies against the EUR also have consequences for the expected effects of CEC-EU accession. A real appreciation of CEC currencies against the EUR decreases the level of protection that CAP instruments will generate after accession, while depreciation increases it. Real exchange rate movements have simultaneous consequences for the internal and external competitiveness of agriculture. However, capital and labor costs as well as prices for inputs also influence competitiveness of agriculture. Decreasing capital costs and input prices could offset some exchange rate effects. For example, with real appreciation, the value of CAP measures declines in national currency. At the same time, however, imported inputs become cheaper. Depending on the cost shares of production, lower input prices partly offset the exchange rate effect.[2]

[2]If CECs become members of the EMU, the initial value of the CECs' currencies in EUR determines the degree of initial protection of CAP instruments. Then other macroeconomic variables like capital and labor costs would influence competitiveness on the Single Market.

1.5 Conclusions for the Study

The analysis of CEC-EU accession effects is an important question in respect to methodological requirements because economic patterns in transition economies differ from those in settled market economies and because CEC markets become subject to the complex CAP once the countries become members of the EU. The political relevance of such an analysis requires a comprehensive scope in terms of empirical results.

The developments of policies in the CECs suggest that more and more CAP instruments like intervention mechanisms and policies have been introduced. Protection for agriculture increased considerably often starting from negative protection at the beginning of transition, though it has generally stayed below that of the EU. The development of agricultural prices suggests that CEC prices are much more affected by world market price movements than those in the EU.

For the investigation of CEC-EU accession effects on agricultural markets, the specific patterns of CAP instruments for price formation have to be considered. Moreover, other CAP instruments like quotas, and set-asides have to be integrated into a quantitative assessment tool. Assessing quantitative effects, therefore, requires a tool, one which is able to model the CAP in detail and is also able to capture future changes in the CAP.

The likely price developments, as suggested by the price gaps of recent years, show that relative agricultural prices in the new member countries might change considerably between close substitutes in production, e.g. between cereals or between livestock. To handle this, a commodity model has to consider rich cross-commodity relationships. Another important feature for transition economies is the development of macroeconomic variables such as costs and exchange rates. That is, unlike agriculture in settled market economies, the CEC sector must rapidly adjust to changing equilibria. Accession would bring such changes. With integration into the Single Market, effects on downstream efficiency can be expected.

A quantitative analysis of CEC-EU accession effects on agricultural markets must consider these main effects, and requires a tool of considerable scope and complexity in terms of commodities, countries, and policies. For this purpose the ESIM was chosen and further developed to serve as a partial equilibrium model. The partial equilibrium analysis has been accomplished by simultaneous analyses with Computable General Equilibrium Models

(CGEs) developed by Banse (1997b; 2000). Numerous simulations are designed to show the scope of some of the effects previously discussed.

1.6 Analysis of CEC-EU Accession Effects on Agricultural Markets in the Literature

A body of literature is developing which deals with quantitative analyses of impacts of CEC-EU accession on agricultural markets, government budgets, and welfare effects. Of the numerous studies, a few have been selected and presented in Table 1.4. The earliest studies using a partial equilibrium model were Anderson and Tyers (1993; 1995) and Tangermann and Josling (1994).

Anderson and Tyers used their World Food Model calibrated on 1990 data for seven commodities and groups of commodities, assuming accession in 2000. In the scenarios, Poland, Hungary, and the Czech and Slovak Republics adopt the CAP of 1992. They projected a moderate increase in cereal production and a huge increase in dairy production, as no quotas constrain the supply of milk. As a result of corresponding increases of net exports, government expenditure for agriculture reaches 37.6 bill. ECU or 47.4 Bill. USD.

Tangermann and Josling used ESIM for the first time in a three-country version based on data from 1989 to 1991. In these scenarios the CECs gradually adopt the CAP in a harmonization period up to 2000, modeled on the example of Spain and Portugal's accession. The results yield more details on commodities compared to Anderson and Tyers. Additionally, they simulated a quick return of the CECs to their pre-transition potentials. They project a strong increase of coarse grain production, along with milk, beef, and pork. As a result, the CECs would become net exporters of all major agricultural commodities. Their budget projection of 19.3 Bill. ECU includes Bulgaria and Romania and commodity regimes not represented in the model. Another important result of the study shows that the CECs would not be able to meet their Uruguay Round commitments if they pursue a path of aligning their policies with the EU as a pre-accession agricultural policy.

The work of Tangermann and Josling formed a starting point for numerous analyses pursued with ESIM. Among them, the EU-Commission (1995) which used a further developed ESIM version as the basis for their strategy paper on EU enlargement. The strategy paper marked a turning point in the thinking of the European Commission. For the first time it was officially recognized that the 1992 CAP might produce problems for enlargement. The model calculations for four countries, including the first separate modules for the Czech and Slovak Republics, are based on 1991–93 data. The supply response is lower than in Tangermann and Josling, which corresponds to lower estimates of budgetary outlays of 12 Bill. ECU.

Bojnec, Münch, and Swinnen (1998) applied ESIM in showing the sensitivity of accession simulations under different real equilibrium exchange rate assumptions. Their application of ESIM considered seven CECs, which adopt Agenda 2000 and the 1992 CAP, and used 1994–96 averaged data. The analysis shows the sensitivity of market reactions and corresponding budgetary spending towards appreciating real exchange rates. Market reactions were considerably lower, since appreciating real exchange rates diminish the price gap between the EU and the CECs. As a result, budgetary expenditure decreases from 15 Bill. ECU to 9 Bill. ECU under real appreciating exchange rates. This study was the first to explicitly address the importance of macroeconomic indicators for assessing the effects of agricultural accession for the CECs, though it lacked other variables to include other macroeconomic forces, which may offset some of the exchange rate effects.

Frohberg et al. (1998), using the Central European Agricultural Simulations Model (CEASIM), simulated accession effects for seven CECs under two different policy scenarios, i.e. Agenda 2000 and the 1992 CAP. The model, which is more theoretically advanced and less policy-detailed than ESIM, simulates little production change and, therefore, only limited spending for market guarantee of 2.4 Bill. ECU and 0.6 Bill. ECU under the unreformed and the reformed CAP, respectively. The simulations were based on data from 1995.

A comparison of all these results shows that despite different methodologies, the newer the study, the less visible the effects on markets and the amount of government expenditure. At the beginning of the 1990s, many researchers assumed a quick recovery for CECs. This view was supported by the recognition of the vast production potential of the CECs before the transition and the rapid decline of agricultural production under early transition reforms.

Table 1.4: Comparison of CEC-EU Accession Studies.

Author	Base Data CECs Included Simulation Horizon	Commodity Aggregation	Scenarios	Main Market and Budget Results	Budgetary Results
Anderson and Tyers (1993;1995)	1990 POL, HUN, CZR, SLR 2000	7 commodities of which 4 are aggregates	CECs gradually adopt the 1992 CAP. No URA constraints included.	Production increases between 12 percent (cereals) to 69 percent (dairy). Corresponding expansion of net exports.	47.7 Bill. USD
Tangerman and Josling (1994)	1989–91 POL, HUN, Czechoslovakia 1993–04	27 commodities of which 9 are processed commodities	CECs gradually adopt the 1992 CAP. Return to pre-transition production potentials. No URA constraints included.	Strong increase in production of coarse grains, milk, beef, pork. CECs become net exporters of all major commodities. URA implications addressed.	19.3 Bill. ECU (including estimates for Romania and Bulgaria as well as non-model commodities)
European Commission (1995)	1989–91 POL, HUN, CZR, SLR 1995–07	27 commodities of which 9 are processed commodities	CEC gradually adopt the 1992 CAP. No URA constraints taken into account.	Cereal net exports double, beef exports increase, milk surplus increases. Results obtained with ESIM and estimates.	12 Bill. ECU

Bojnec, Münch and Swinnen (1998)	1994–96 POL, HUN, CZR, SLR, EST, BUL, SLO 2000–12	27 commodities of which 9 are processed commodities	CECs adopt the Agenda 2000. Different real exchange rate developments. No URA constraints included.	Real exchange rate appreciation dampens the expansion of production under CAP conditions.	Constant real exchange rates: 15 Bill. ECU. Appreciation to PPP levels: 9 Bill. ECU.
Froberg et. al. (1998)	1995 BUL, CZR, EST, HUN, LAT, LIT, POL, SLR 2005	17 commodities	CECs adopt CAP market price support of 1995/96 and assume Agenda 2000 market price support; no direct payments. No URA constraints taken into account.	Intensive livestock production decreases, little change in production for other products.	CAP 1995/96: 2.4 Bill. ECU. Agenda 2000: 0.6 Bill. ECU.

Source: Adapted from Pohl-Nielson (1999).

Without necessary institutions and market transparency, CEC domestic prices often remained below world market prices despite liberalization of policies. Thus, there was a large gap between EU and CEC prices for most products. Earlier research made overly optimistic projections for the potential to recover and of the supply reaction. The latter overestimation was related to the data used to calibrate the models causing supply reactions to be overestimated in the simulations compared to actual agricultural prices, which have approached EU levels.

This reveals one of the weaknesses of all the quantitative analyses of CEC-EU accession: None of the models estimate the elasticities of supply. This stems from estimations developed for other countries, which are then adapted for use in the CEC simulations. A sufficiently long time series without structural breaks is still not available for carrying out meaningful estimates for the CECs.

In conclusion, the literature displays a changing perception of developments on markets in the CECs. Having in mind the large agricultural potential, the early analyses assumed that freeing agriculture from the restrictions of central planning would soon lead to a recovery and expansion of agriculture in the CECs. At that time CEC prices were significantly lower than in the EU, often below comparable world market prices such that agriculture was expected to react to the foreseen price increases. Examples of these optimistic views on agriculture in the CECs are Anderson and Tyers (1993; 1995) and Tangermann and Josling (1994).

Despite a gradual alignment of important agricultural prices between CECs and the EU, the stagnation of agricultural production observed in the second half of the 1990s has continued. The analyses became less optimistic and the lack of functioning institutions were emphasized. With the gradual implementation of the Acquis Communautaire in preparation of accession, CEC and EU institutions have increasingly aligned and integration of CEC agriculture and food industries with European markets has continued. However, despite increasing market integration and institutional development, agricultural production is not foreseen to expand significantly.

A newer strain of literature examines the causes of the slow pace of restructuring, especially the structure of production technologies and costs, and macroeconomic developments, which affect internal and external competitiveness. Bojnec and Swinnen (1997) and Bojnec, Münch, and Swinnen (1999) show that macroeconomic developments (exchange rates) largely offset the increasing protection of agricultural policies in the CECs. Usually

such competitive pressures are offset by structural change (in the long run) and changes in production technologies (in the short run). However, the development of agriculture in the CECs is characterized by slow structural change and low investments.

Despite some differences between the studies, some common conclusions can be drawn. The increase of prices induces a faster growing supply and a stagnating or slightly declining domestic use. Inevitably the result is higher market surpluses than currently observed, most of which have to be disposed of by government intervention or prevented in advance by tight supply control measures. All studies clearly identify the sensitive products under accession: coarse grains, dairy, sugar, and beef. All studies show that the potential burden of extending the CAP to new EU members is significant and thus call the design of such agricultural policies into question.

2 Structure of the European Simulation Model

Accession of CECs to the EU fundamentally affects the economics of CEC agricultural markets. The CAP introduces new instruments to the joining members, which change the level of protection as well as the price transmission from world to domestic markets. Under the European Single Market, agricultural markets are more shielded from influences of world markets, although indirectly exposed to competition on the Single Market once applicants are fully integrated into the customs union. All these effects alter levels as well as the relationships of agricultural prices. A partial equilibrium model has been used to assess the effects of agricultural accession.

The European Simulation Model (ESIM) was developed by the USDA/ERS in cooperation with Josling and Tangermann and first used in Tangermann and Josling (1994). Thereafter, the development of ESIM has taken separate paths. The USDA/ERS developed ESIM to further their pursuit of forecasts and policy analyses for numerous countries covered in their Production, Supply, and Demand Database. For Europe, ESIM was further developed in Tangermann and Münch (1995), Münch (1995) and expanded country coverage by Münch (1997). The model is expanded in several areas, such as the inclusion of production costs and linkages to Computable General Equilibrium Models (CGEs). However, despite modifications and new developments, the current model is strongly indebted to the original cooperation by Josling, Tangermann, and the USDA/ERS.

This chapter describes the structure of the model and summarizes recent development of the ESIM model for the purpose of quantifying EU accession effects.[1] The first part describes the structure of the model. The other sections refer to the economic mechanisms as well as welfare and budgetary calculations in detail. The chapter concludes with a comparison with other partial equilibrium models.

[1] A version of ESIM is used in the USDA/ERS for their baseline projections which differs from this version in structure and functional form as well as scope of products, countries, and technical realization.

2.1 An Overview of the Model Structure

The analysis of CEC accession to the EU focuses on the introduction of the CAP in the CECs and the resulting implications for agricultural markets and government expenditure. The CAP market regimes consist of sophisticated sets of instruments designed to elevate domestic prices above world market levels and simultaneously contain production by supply control. Moreover, as the market price support declines, direct payments for area and cattle gain emphasis. Regarding the importance of the expected effects on CEC markets during accession (see Section 1.2), the modeling effort concentrates on the representation of CAP policies in a model with sufficient commodity and country detail. The modeling of behavior is pragmatic and relies on proven concepts.

ESIM is a price- and policy-driven comparative static agricultural world model with rich cross-commodity relations and the potential to model price and trade policy instruments in great detail. It is a partial equilibrium model, i.e. macroeconomic variables (income, exchange rates) are exogenous. As a world model it includes all countries, though in greatly varying degrees of disaggregation. Typically one chooses between countries that are explicitly modeled and others that are combined in an aggregate, or the rest of the world (ROW). The model used for the analyses presented in this study includes ten CECs (Bulgaria, the Czech and Slovak Republics, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia) and the EU-15. All other countries are aggregated to the ROW. The agricultural sector is modeled by sixteen agricultural commodities, nine processed goods, and six other commodities and production factors (see Table 2.1).

2.1.1 The Structure of the Model

Table 2.2 summarizes the general forms of major equations for supply, demand, and processing as well as price transmission. In this table the variables are in capital, exogenous variables in small letters.

Supply activities in ESIM are modeled for agricultural commodities as well as for selected processed goods. Crop and livestock supply functions are separated into two parts: capacity (area, herd) and yield. This basically assumes separable supply activities. Equations 2.1 to 2.3 describe crop supply, which depends on prices, costs, policies, and technical progress. A similar system exists for livestock supply in Equations 2.4 to 2.6.

Table 2.1: Commodities in ESIM.

Agricultural Commodities	
Crops	Wheat, barely, corn, other grains, rapeseed, sunflower seed, soybeans, sugar.
Livestock	Milk, beef and veal, pork, poultry, eggs.
Processed Commodities	
Oils and cakes	Rapeseed oil and cake, sunflower seed oil and cake, soybean oil and cake.
Dairy	Butter, skimmed milk powder, cheese.
Others	
Factors and inputs	Labor, capital, non-agricultural intermediates, feeds.
Residual tradable feeds	Other energy rich feeds, other protein rich feeds.
Residual consumer goods	Other commodities.

Apart from effective producer prices or shadow prices (PPE), costs are a major determinant for supply. Costs are separated into components related to the factors capital (*capc*) and labor (*wagc*) as well as non-agricultural intermediates (*intc*). Feed costs (CF) are the only endogenous cost component. These factors and inputs represent tradable (CF, *capc*) and non-tradable (*wagc*) components. The effects of changes of relative prices between tradable and non-tradable factors and inputs on agricultural supply can be analyzed, as they occur with shifts of the real exchange rate. This is an especially important issue in transition economies (see Macours and Swinnen, 1997).

In economies in transition, macroeconomic equilibrium conditions are subject to rapid change, the more so with integration into the EU. Therefore, key macroeconomic indicators are affected, i.e. exchange rates, costs, and incomes. Two versions of the model exist which take a different approach in treating the macroeconomic linkages. The stand-alone version represents the classic partial equilibrium approach by basing the exogenously assumed development of these key economic indicators on literature. In the recursive version, these variables become indirectly endogenous by linking ESIM to single country CGEs developed by Banse (1997a, 2000). There are no structural differences between these two versions; only the treatment of macroeconomic indicators differs.

Table 2.2: Modeled Activities.

I. Supply in country c		
Crop area	$EA_{cr.c} = f(PP_{cr,c}, EDP_{cr,c}, capc_c, wagc_c, sa_c, ta_c)$	(2.1)
Crop yield	$Y_{cr,c} = f(PP_{cr,c}, intc_c, sa_c, tp_{cr,c})$	(2.2)
Crop supply	$S_{cr,c} = EA_{cr,c} \cdot Y_{cr,c}$	(2.3)
Livestock herd	$H_{lvst,c} = f(PP_{lvst,c}, EDP_{lvst,c}, capc_c, wagc_c)$	(2.4)
Livestock yield	$Y_{lvst,c} = f(PP_{lvst,c}, CF_{lvst,c}, tp_{lvst,c})$	(2.5)
Livestock supply	$S_{lvst,c} = H_{lvst,c} \cdot Y_{lvst,c}$	(2.6)
Rest of the world	$S_{i,ROW} = f(PW_{i,ROW}, tp_{i,ROW})$	(2.7)
II. Demand in country c		
Human demand	$DH_{i,c} = f(PD_{i,c}, ginc_c, gpop_c)$	(2.8)
Feed demand	$DF_{i,c} = f(PD_{i,c}, S_{lvst,c}, tpf_{f,lvst,c})$	(2.9)
Seed demand	$DS_{cr,c} = f(EA_{cr,c})$	(2.10)
Processing demand	$DC_{proc,c} = f(PD_{i,c}, PD_{proc,c}, cs_{i,c})$	(2.11)
Total domestic use	$DT_{i,c} = DH_{i,c} + DF_{i,c} + DS_{i,c} + DC_{i,c}$	(2.12)
III. Processing of oilseeds and milk		
Processing supply	$S_{proc,c} = f(DC_{proc,c})$	(2.13)
IV. Trade		
Net exports	$NX_{i,c} = S_{i,c} - DT_{i,c}$	(2.14)
V. Domestic price transmission		
Wholesale prices	$PD_{i,c} = f(PW_i, pol_{i,c}, maxex_{i,c}, er_c, NX_{i,c})$	(2.15)
Producer prices	$PP_{i,c} = f(PD_{i,c}, mm_{i,c})$	(2.16)
Effective producer price	$PPE_{q,c} = f(PP_{i,c}, qu_{i,c})$	(2.17)
VI. Closure rules		
World markets (tradables)	$\sum_c NX_{it,c} \approx 0$	(2.18)
Domestic market (non-tradables)	$NX_{nt,c} \approx 0$	(2.19)

Table 2.2: *Continued.*

Sets	List of Variables		List of Parameters	
Counties: c	CF	Index feed costs	$capc$	Capital cost index
Products: i	DF	Total demand for feed	cs	Capacity shifter for processing
Crops: $cr \in i$	DH	Human demand	er	Real exchange rate domestic/USD
Feed: $f \in i$	DC	Processing demand	inc	Income (index)
Livestock: $lvst \in i$	DS	Seed demand	pop	Population (index)
Processed goods: $proc \in i$	DT	Total domestic use	$intc$	Cost index non-ag. intermediates
Tradables: $it \in i$	EA	Effective area	mm	Marketing and processing margin
Non-tradables: $nt \in i$	EDP	Effective direct payments	$maxex$	Maximum net exports
Quota products: $q \in i$	H	Herd	pol	Trade and price policies
	NX	Net exports	qu	Supply quota
	PD	Domestic price	sa	Effective set-aside
	PP	Producer price	ta	Total area
	PPE	Effective producer price	tp	Supply shifter
	PW	World market price	tpf	Shifter feeding efficiency
	S	Supply	$wagc$	Wage index
	Y	Yield		

Total domestic use (DT) consists of human demand (2.8), feed demand (2.9), processing demand (2.11), and seed demand (2.10). While the latter is a transformation of the effective area (EA), the other domestic use components are directly modeled.

Processing involves oilseeds and milk as raw materials. Purchase and distribution of raw material among the processing activities, which depends on prices of raw materials and processed commodities, are described in 2.11. The actual processing activity in 2.12 is a transformation relying on technical coefficients, which defines the yield of processed goods out of raw materials.

Price and trade policies influence the price transmission from world to domestic markets in Equation 2.15. Direct payments and supply quotas directly affect supply. These instruments are closely modeled on actual EU regulations as well as those proposed for the Agenda 2000. Table 2.3 summarizes the different policy instruments modeled for the commodities.

To better incorporate price and trade policies, four different prices are defined for two price levels: World market (PW) and domestic market prices (PD) are wholesale prices. This price level is relevant for domestic use and processing. Moreover, the CAP trade and price policy instruments actually apply at this level. The producer or farmgate price (PP) is derived in Equation 2.16 from PD by deducting the marketing and processing margin. The farmgate price, therefore, depends on the transaction costs of the downstream sector. The fourth price in Equation 2.17, the effective producer price (PPE) or shadow price, incorporates the effects of quota regimes for sugar and milk.

The activities in the fully modeled countries are formulated in detail especially for agricultural products. For the ROW, however, activities are simplified. While this part is also price driven, supply is modeled through direct functions, consequently neglecting area, herds, and yields. Moreover, policies are of limited specificity. Therefore, the ability of the model to project agricultural activities on a global scale is restricted, although it is capable of identifying the effects of European agricultural policies on world markets.

Foreign trade is the residual of domestic supply and total domestic use, i.e. trade flows are net figures.[2] Following a common approach well established

[2]Gross trade models (most CGEs) relax this assumption by distinguishing between domestic and exportable goods via the Armington approach (Banse, 1997a).

Table 2.3: CAP Policy Instruments in ESIM.

	Price Policies	Trade Policies	Supply Management	Income Policies
Cereals	Minimum price	Variable export subsidies, variable export tax, variable import tariffs	Obligatory set-aside	Direct payments coupled to area
Oilseeds			Obligatory set-aside	Direct payments coupled to area
Sugar	Minimum price	Variable import tariffs	Quota	
Milk			Quota	Direct payment coupled to dairy cattle
Dairy Products	Minimum price	Variable export subsidies, import tariffs		
Beef and veal	Minimum price	Variable export subsidies, import tariffs		Direct payments coupled to beef cattle
Other meats		Maximum export quantities, import tariffs (prohibitive in case of the EU)		
Other products		Tariffs		

in literature, the model is numerically solved for the equilibrium prices on world markets (e.g. Roningen and Dixit, 1989; Anderson and Tyers, 1993). The equilibrium condition for tradables is world market clearing, i.e. the sum of all net exports of the i^{th} commodity over the countries has to be very close to zero. For non-tradables, domestic markets are required to clear (see Equations 2.16 and 2.17). The vector of equilibrium world market prices, therefore, simultaneously clears aggregated supply and demand. The solving algorithm calculates world market prices in response to the changes of aggregated net exports for the i^{th} product. In order to distinguish between small and large agricultural world markets, i.e. determining the size of the necessary price change, net exports are set in relation to world production in the base.

Changes in domestic policies alter world market prices to varying degree, depending on the share of a particular country in world net exports. Therefore, a policy change in a small country in agricultural terms, e.g., Slovenia, alters world market prices less than a new policy in a large country, e.g. the EU-15. Nevertheless, even policies in small Slovenia affect world market prices.

In the absence of policies and market distortions, domestic prices equal world market prices. Price and trade policies, however, drive wedges between world market and domestic prices. Additionally, they decouple domestic prices from world market prices to differing degrees (see Section 1.2). Therefore, domestic price levels as well as development of price ratios differ from those on world markets. This, in turn, also affects world market prices.

Another important aspect is the development of real exchange rates. These affect relative prices in two main ways. First, if price and trade policy instruments are defined in monetary terms (e.g. intervention prices, specific tariffs), the gap between domestic and world market prices alters. Second, fluctuations in exchange rates change relative prices of tradable and non-tradable commodities and factors.

2.1.2 Functional Forms

The assumption of perfect markets, on which the model is based, implies price-taking behavior of economic agents. Since no price expectation and time lags of production are included, supply and demand adjust immediately to the respective market prices in this deterministic model. The behavioral

functions are of the isoelastic type. The human demand function (DH) is defined as:

$$DH_{i,c} = dhint_{i,c} \cdot \prod_j PD_{j,c}^{\varepsilon_{i,j,c}} \cdot inc_c^{\eta_{i,c}} \cdot pop_c \tag{2.20}$$

where

$DH_{i,c}$	is human demand,
$dhint_{i,c}$	is the human demand intercept,
$PD_{j,c}$	is domestic prices,
$\varepsilon_{i,j,c}$	is elasticities of demand with respect to prices,
inc_c	is income growth per capita,
$\eta_{i,c}$	is elasticities of demand with respect to income,
pop_c	represents population growth.

For reasons of calculation efficiency the implemented functions are log linear:

$$DH_{i,c} = \exp\left(\ln dhint_{i,c} + \sum_j \varepsilon_{i,j,c} \cdot \ln PD_{j,c} + \eta_{i,c} \cdot \ln inc_c + \ln pop_c\right) \tag{2.21}$$

The human demand equation includes three types of parameters: elasticities, intercepts, and shifters, i.e. income and population growth. All of these are determined outside the model. The intercepts are calculated by calibrating the model on the base data, i.e. assigning base values to all variables (e.g. prices, quantities).

This functional form imposes the following properties for demand:[3]

1. Homogenous of degree $\sum_j \varepsilon_{i,j,c} + \eta_{i,c}$ in prices and income.
2. Continuously differentiable and quasi-convex for any non-negative price and income. This property is independent of the degree of homogeneity and the level of aggregation.
3. The shifters, which are positive multipliers, introduce time-related change to the functions. These represent population and income growth in the demand functions. A one percent change of population shifters leads to a one percent change in the functional value without changing any of the properties of (1) and (2).

[3]For the mathematical properties of isoelastic functions, see Chiang (1984, p. 387 and p. 410).

The structures of the supply functions are similar in functional form, only supply splits into capacity (herd, area) and yield, and of course the shifters are of a different nature. Since the response of supply and demand to price changes is the same, the comparative static nature of the model becomes clear, i.e. each year of a projected period is a single comparative static equilibrium, totally independent of solutions for other years except the base period. Supply functions of that type are homogeneous of the degree given as the sum of supply elasticities in respect to own and cross-prices and to input and factor prices. They are also quasi-concave for positive prices and costs, and similar to (3) in that neutral technical progress shifts supply.

From (2) and (3) follow important implications for the equilibrium of the model. The sets of country and world supply and demand satisfy the conditions of strict quasi-convexity and strict quasi-concavity respectively on the positive orthant. These properties prevail for expansions of values through time. In the presence of convex constraints, the model is solved for a unique equilibrium for any positive prices and costs.[4]

Supply and demand functions are required to fulfill the basic laws of supply and demand. These are imposed on the functions by the matrices of elasticities, i.e. by parameter restrictions.

As consumers are expected to act rationally, three conditions restrict the demand system: the symmetry of cross-substitution effects $\left(\frac{\partial DH_i}{\partial P_j}\right)_{\bar{u}} = \left(\frac{\partial DH_j}{\partial P_i}\right)_{\bar{u}}$, the non-positive compensated own price effect $\left(\frac{\partial DH_i}{\partial P_i}\right)_{\bar{u}} \leq 0$ and, finally, homogeneity of degree zero in price and incomes $\sum_j \varepsilon_{ij} + \eta_{i,m} = 1$. From the budget constraint follows the adding up property $\sum_i \nu_i \eta_{i,m} = 1$. As food is only a part of human consumption, the calculation of elasticities also takes the aggregate "other products" and their share of expenditure (ν_i) into account.

The system of supply elasticities requires the fulfillment of similar necessary conditions. These are the symmetry of cross-price effects and the non-negative own price effect for output prices. The latter implies that the supply curve is positively sloped in PP_i. The homogeneity condition

[4]Samuelson (1952) shows that market equilibrium can be achieved by maximizing the net social payoff (NSP) function, given by the adjusted sum of producer and consumer surplus. In a world model, an aggregate NSP function is obtained by summing the NSP function across commodities and countries. For a recent application and theoretical implications of this alternative way of optimization, see Waquil and Cox (1995) and Chavas and Cox (1996).

requires the sum of elasticities of output prices and costs to be zero, which satisfies the non-profit condition of competitive firms in perfect markets and the condition of constant returns to scale in production.

Isoelastic functions are one type of functional forms ubiquitous in large-scale agricultural trade models. Other common functions are standard linear functions and, increasingly, supply and demand systems derived from flexible profit and expenditure functions.

Compared to linear and standard Cobb-Douglas functional forms, the isoelastic type has the ability to include a wider scale of behavioral parameters, e.g. cross-price elasticities. The condition of homogeneity as well as negativity of the own substitution effect in demand are globally satisfied, because elasticities are kept constant. The conditions of symmetry and adding up are fulfilled locally, at the point of base data.

An alternative approach to modeling would have been to use a model based on completely consistent systems of supply and demand, using for example, profit and expenditure functions. Globally flexible functional forms, such as the Generalized Symmetric McFadden for profit and related expenditure functions (Brosig, 1999; Frohberg et al. 1998; Feger and Müller, 1999), assure global fulfillment of all neoclassical assumptions for any price vector and give modeling a theoretically and empirically strong base. The general restriction of models based strictly on flexible functional forms is the inflexibility in representing separable activities (see Chambers, 1988, p. 178). This imposes constraints on modeling policies, such as the CAP, which work at different levels of agricultural supply activities (e.g. area restrictions, direct payments per head of cattle or per unit of area). Moreover, these models are highly demanding in terms of quality and scope of the data, which is especially relevant in the CEC context (see Jackson and Swinnen, 1994; Brosig, 1999).

2.2 The Modeling of Supply and Domestic Use

Following the broad overview of properties and structure, the functional details of supply and domestic use are further illuminated. This section, hence, broadens the description in the previous pages and adds some discussion on benefits and drawbacks of the implementation of the economic relationships into the model.

2.2.1 Supply of Grandes Cultures

The supply of cereals and oilseeds consists of two separable activities, i.e. the allocation of area and the determination of yields. Both components are price-, cost-, and policy-driven.

Area allocation depends on effective producer prices, set-aside, direct payments, costs, and total area (see Equation 2.1). The latter constrains the allocation mechanism to the given amount of total area for the selected crops. The allocation of area takes place in two steps. First, the unconstrained area for each individual crop is determined by:

$$UA_{cr,c} = \exp\Big(\ln cint_{cr,c} = \sum_j \Big(\varepsilon_{cr,j,c} \cdot \ln\big(PP_{j,c} + EDP_{j,c}\big)\Big) + \theta_{cr,c} \cdot \ln capc_c + \varpi_{cr,c} \cdot \ln wagc_c\Big) \quad (2.22)$$

where

$UA_{cr,c}$	is area unconstrained,
$cint_{cr,c}$	is the area intercept,
$\varepsilon_{cr,j,c}$	is the elasticity of area allocation with respect to prices,
$PP_{j,c}$	is the producer price or shadow price for quota products,
$EDP_{j,c}$	is the effective direct payment per ton of produce,
$\theta_{cr,c}$	is the elasticity of area allocation with respect to costs capital,
$capc_c$	is capital costs,
$\varpi_{cr,c}$	is the elasticity of area allocation with respect to wages,
$wagc_c$	is wages.

As stated above, for these equations the elasticities are set such that this function is homogenous of degree zero in prices and costs and is, as a part of the supply activity, positively sloped in PP_i. Hence, only relative prices, including direct payments related to area and costs, matter for the allocation of areas to crops.[5]

In a second step the area allocation is constrained by the effective total area available (eta) to the selected crops:

$$EA_{cr,c} = \frac{UA_{cr,c}}{\sum_{cr} UA_{cr,c}} \cdot eta_c \quad (2.23)$$

[5]For quota products, shadow price of the activity is calculated and used.

where

$EA_{cr,c}$	is effective area,
$UA_{cr,c}$	is unconstrained area,
eta_c	is total effective area.

The function determines effective area out of the relative distribution of unconstrained area in 2.23 and total effective area. The parameter eta is total area available minus the set-aside obligation. The determination of the magnitude of set-aside includes the politically defined set-aside obligation, the amount of area harvested by small producers, and area slippage.[6] While the first and second parameters are defined by policy, the last one is obtained from EU data of the base period.

Besides restrictions in area use, the second important aspect of CAP regulations for crops are direct payments, which is an instrument of increasing importance in the future CAP (see EU-Commission, 1997a; 1998; 1999). According to 1992 and 1999 regulations the grandes cultures, i.e. cereals, oilseeds, and protein crops, are eligible. Farmers qualify for direct payments only if they actually grow these crops on their registered area. The payments are, therefore, coupled to area allocation, i.e. partially coupled to production (see CAP Monitor). As farmers directly receive them, direct payments are not visible in market prices.

The direct payments (*dpc*) are defined as an amount of ECU per ton of base yield for cereals (*byc*), which is the average weighted cereal yield of 1989–91 of the EU-15.[7] For the CECs, the base yield is obtained by averaging the yields of three years prior to accession. The payment per hectare is the simple product out of these two factors. For modeling purposes the original formula as applied in the CAP is adjusted for the actual yield, i.e. actual payments per ton of produce are applied:

$$EDP_{cereals,c} = dpc_{EU} \frac{er_{EU}}{er_c} \cdot \frac{byc_c}{Y_{cereals,c}} \tag{2.24}$$

[6]This political or administrative slippage captures the difference of the supposed area and the actual area under set-aside in the EU-15 for the base period.

[7]The EU-15 is modeled as one country. The model abstracts for national or regional base yields which are currently used to determine the payments in the EU.

where

$EDP_{cereals,c}$	is direct payment per ton of actual produce per hectare,
dpc_{EU}	is direct payment for cereals per ton of base yield,
er_{EU}	is the $\frac{USD}{EUR}$ exchange rate,
er_c	is the exchange rate of country c,
byc_c	is the base yield,
$Y_{cereals,c}$	is the actual yield.

The calculation of direct payments for oilseeds differs in the 1992 CAP regulations. Moreover, the Blair House Agreement foresees a maximum area eligible for direct payments. The formulae include these aspects.[8] However, with the Agenda reforms these payments will be reduced to the level of cereal payments by the year 2003. Consequently, the area restriction as set forth in the Blair House Agreement will be phased out.

Economically, the effective direct payments are relevant only for the area allocation and not for yields as the payments are based on historical yields, which are below actual yields.

The second component of crop supply is yields. These depend on own prices and costs of non-agricultural intermediates as well as neutral technical progress. The generalized formula for yields is:

$$Y_{cr,c} = \exp\Big(\ln yint_{cr,c} + \beta_{cr,c} \cdot \ln PP_{cr,c} + o_{cr,c} \cdot \ln intc_{cr,c}\Big) \cdot tp_{cr,c} \quad (2.25)$$

where

$Y_{cr,c}$	is yield,
$yint_{cr,c}$	is the yield intercept,
$\beta_{cr,c}$	is the elasticity of yield with respect to prices,
$PP_{cr,c}$	is the producer price or shadow price for quota products,
$o_{cr,c}$	is the elasticity of yield with respect to costs of non-agricultural intermediates,
$intc_{cr,c}$	is the cost index of non-agricultural intermediates,
$tp_{cr,c}$	is technical progress.

Cereal and oilseed supply consists of effective area and yields (see Equation 2.3 in Table 2.2). Both parts of the supply function are homogenous of degree zero in prices and costs ($-\beta_{cr,c} = \theta_{cr,c}$) and are positively sloped.

[8]The calculation of direct payments for oilseeds is based, as in the regulations, on a reference cereal price, the adjustment factor of 2.1, a historical world market price, and the reference yield for oilseeds.

Cross-price relations are not included in the yield equations because farmers decide production in two stages. Initially, they allocate the area in which the relative competitiveness of each crop is considered. Then with this decision, the intensity of production (yields) depends only on the price of the commodity and the costs.[9] Area allocation directly takes into account those policies, which affect area. In the CAP these are set-asides and direct payments for cereals and oilseeds as well as, indirectly, supply quotas.

Though most of the CAP policies affecting area use are included, limits arise from the confined selection or usage of area. Yet the selection ensures that those crops included usually have strong cross-commodity relationships in production as well as in consumption. However, effects such as moving an area between arable and permanent crops or grassland is not an endogenous result of simulations, but can only be integrated by shifting the parameter total area. This effect might be of considerable importance in accession countries where farmers optimize area use envisioning direct payments by turning grazing or idle areas to the production of grandes cultures.

A restriction in interpretation of the model results stems from the non-modeled land markets. Distribution effects of the CAP related to land ownership could not possibly be captured in such a system. This issue is of particular importance at the sectoral level, if large sections of the landowners are not members of the agricultural sector, as in some CECs.

2.2.2 Livestock Supply

The livestock sector comprises cattle, pork, poultry, and eggs. The supply function consists of two parts: herd size and yield. Similar to the acreage allocation function, herd size is determined by commodity prices, costs, and policies. As for crops, the underlying assumption is that an increase of capacity requires additional investments and labor. The general form of the function determining the size of the national herd (H) is:

[9]Earlier versions of the model contained an economic slippage factor. This factor related the amount of set-aside to yields by assuming more factors of production (mainly labor) would be available and increase production. Though this might be the case if set-aside area is left totally idle, current EU regulations leave farmers the opportunity to grow non-food crops as well as committing them to care for the area. Therefore, in reality the additional factors of production available to increase intensities of production seem to be rather marginal.

$$H_{lvst,c} = \exp\Big(\ln cint_{lvst,c} + \sum_j \varepsilon_{lvst,j,c} \cdot \ln\big(PP_{j,c} + EDP_{j,c}\big) + \theta_{lvst,c} \cdot \ln capc_c + \varpi_{lvst,c} \cdot \ln wagc_c\Big) \quad (2.26)$$

where

$cint_{lvst,c}$	is the herd size intercept,
$\varepsilon_{lvst,j,c}$	is the elasticity of herd size with respect to effective producer prices,
$PP_{j,c}$	is the producer price or shadow price for quota products,
$EDP_{j,c}$	is the effective direct payment per ton of produce,
$\theta_{lvst,c}$	is the elasticity of herd size with respect to capital costs,
$capc_c$	is the index of capital costs,
$\varpi_{lvst,c}$	is the elasticity of herd size with respect to labor costs,
$wagc_c$	is the index of labor costs.

For beef cattle production in the EU, and especially in the CEC context, dual use cattle breeds predominate national herds. The assumption is that beef cattle is a highly complimentary good to dairy cattle, i.e. the respective cross-price elasticities of herd size with respect to prices are positively valued.

Similar to crops, livestock yields (Y) per unit are defined as:

$$Y_{lvst,c} = \exp\big(\ln yint_{lvst,c} + \beta_{lvst,c} \cdot \ln PP_{lvst,c} + o_{lvst,c} \cdot \ln CF_{lvst,c}\big) \cdot tp_{lvst,c} \quad (2.27)$$

where

$yint_{lvst,c}$	is the intercept of cattle product yield,
$\beta_{lvst,c}$	is the elasticity of yield with respect to prices,
$PP_{lvst,c}$	is the producer price or shadow price for quota products,
$o_{lvst,c}$	is the elasticity of yield with respect to feed costs,
$CF_{lvst,c}$	is feed cost,
$tp_{lvst,c}$	is the actual yield.

The simple product of yields and herd size determines supply (see Equation 2.6 in Table 2.2). For quota products, the shadow price of the economic activity is used for herd and yield functions instead of the market price and the effective direct payment. The calculation of effective direct payment adjusts the policy parameter bound to heads, to a payment per ton of actual produce.

2.2.3 Supply Quotas

Supply quotas remain important in the model of European agriculture. The CECs, on the other hand, have increasingly introduced them into their agricultural policies. The CAP foresees farm level supply quotas for milk and sugar. Several CECs have already introduced a farm level supply quota for sugar (e.g. Poland); however, their regulations usually have been more flexible in quantity shifts than those of the EU.

The sugar quota comprises an A- and a B-quota. This part of sugar production benefits from high domestic prices. A third category of sugar, the so-called C-quota sugar is produced outside the quota. It is left without any direct subsidies and has to be exported subject to world market conditions.[10] Production in the model distinguishes between two types of sugar: quota sugar and sugar outside the quota. For milk a similar system exists, enforced by fines, which leads to a significantly lower producer price outside the quota.

Figure 2.1 shows the stylized supply effects of introducing a binding supply quota. Under given market price P_{int}, and supply curve S, domestic supply is Q. The government introduces a binding quota of the amount Q_{quota}. This leads to a reduction of net exports from $Q - Q_d$ to $Q_{quota} - Q_d$. At the same time the need for export subsidies diminishes from $(Q - Qd) \cdot (P_{int} - P_w)$ to $(Q_{quota} - Q_d) \cdot (P_{int} - P_w)$.

However, Q_{quota} was also to be produced under the price P_s. This price is, therefore, the shadow price of the economic activity as this producer price would lead to exactly the same supply as the quota. The producer rent under the quota constraint is therefore the crosshatched area marked by P_w, P_s, and Q_{quota}. Additionally, producers receive the quota rent marked by P_s, P_{int}, and Q_{quota}. With technical progress the supply curve shifts to S' which decreases the shadow price, decreases the producer surplus, but increases the quota rent such that producers actually gain more quota rent than they lose producer surplus, i.e. the black triangle. This nicely illustrates the supply incentives under a quota system as producers gain twice by increasing efficiency.

[10] Formally the CAP does not provide any direct subsidies for C-quota sugar. However, C-quota beet prices are usually higher than converted world market sugar prices. For a further elaboration on the purchase policy of the German sugar industries, see Schmidt (1991).

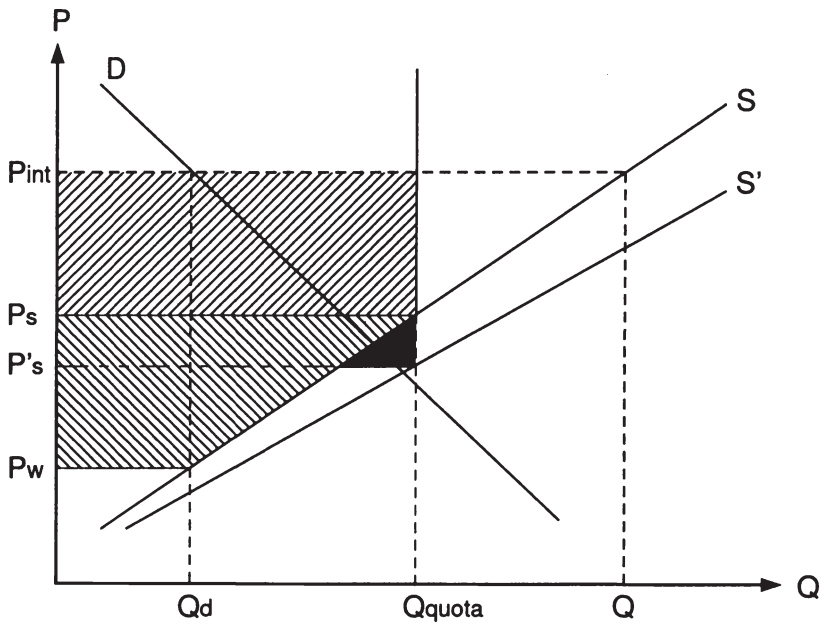

Figure 2.1: Effects of a Supply Quota.

Consumers, on the other hand, do not benefit from a supply quota system. Their losses stay constant because market prices remain unchanged. They represent the losers of such a system. The beneficiaries are taxpayers and producers who are partly compensated by the quota rent.

In the model, the shadow price, or effective producer price (PPE), is calculated by solving the supply function (capacity times yield) for the price of the respective commodity, and substituting the supply quantity by the quota (if the quota is binding):[11]

[11]The area of sugar is, as in EU regulations, not included in the base area for grandes cultures. Therefore, area for sugar production is not scaled to the maximum area available (see 2.24), which allows for directly calculating shadow prices instead of calculating shadow prices by area allocation for all crops.

$$PPE_{i,c} = \exp\Bigg(\frac{qu_{i,c}}{\varepsilon_{i,i,c} + \beta_{i,c}} - \Big[\Big(\frac{1}{\varepsilon_{i,i,c} + \beta_{i,c}} \Big) \Big(\ln int_{i,c} + \sum_{j \neq 1} \varepsilon_{i,j,c} \cdot \ln\big(PP_{j,c} + EDP_{j,c}\big) + \varepsilon_{i,j,c} \cdot \ln EDP_{i,c} + COSTS_{i,c} \Big) \Big] \cdot tp_{i,c} \Bigg) \quad (2.28)$$

where

$$\ln int_{i,c} = \ln cint_{i,c} + \ln yint_{i,c} \quad (2.29)$$

$$COSTS_{i,c} = \theta_{i,c} \cdot \ln capc_c + \varpi_{i,c} \cdot \ln wagc_c + o_{i,c} \cdot \ln CF_{i,c} + o_{i,c} \cdot \ln intc_{i,c} \quad (2.30)$$

The shadow price is used in the supply system for capacity allocation and for yield to ensure the conditions of symmetry and quasi-convexity of supply. Moreover, it enables the precise calculation of the producer welfare effects for introducing this kind of regulation. In this way the model fully captures effects of newly introduced supply quotas to markets, i.e. sugar and milk quotas on CEC markets. The full effects of an already introduced quota, as in the EU, can only be captured if the shadow price of the activity is known and the model is calibrated on it. That part captured with unknown shadow prices is, however, the effect of technical progress, which leads to more efficient supply curves. In this process market and shadow prices deviate from each other over time.

2.2.4 Demand

The use side of the model consists of four components: human demand, seed demand, feed demand, and demand of processing industries. Human demand was already discussed in Section 2.1.2. Seed demand is a function of effective area (see Equation 2.10). This section, therefore, concentrates on the remaining part of domestic use, i.e. feed demand and processing demand.

The concept for feed demand is similar to that implemented in the OECD's Ministerial Trade Mandate Model (see OECD, 1987; 1989). The formulation ensures that feed demand responds directly to changes in relative feed prices and the size and structure of livestock production. Feed demand is determined in two equations. The first equation describes the component demand of a feed for a livestock product (DFR):

$$DFR_{i,lvst,c} = \exp\left(\ln fdint_{i,lvst,c} + \sum_{j} \varepsilon_{i,j,lvst,c} \cdot \ln PD_{i,c}\right) \cdot tpf_{i,lvst,c} \quad (2.31)$$

where

$fdint_{i,lvst,c}$	is the intercept of feed component demand,
$\varepsilon_{i,j,lvst,c}$	is the elasticity of feed component demand with respect to feed prices,
$PD_{i,c}$	is feed price,
$tpf_{i,lvst,c}$	is the feed efficiency shifter.

This equation takes into account the changes of relative price and the assumed development of feeding efficiency for calculating the component demand. The elasticities $\varepsilon_{i,j,lvst,c}$ are chosen such that feed component demand is homogenous of degree zero in prices. Moreover, they reflect the symmetry conditions. The second function simply aggregates the feed components over livestock production to calculate total feed demand (DF):

$$DF_{i,c} = \sum_{lvst} \left(DFR_{i,lvst,c} \cdot S_{lvst,c}\right) \quad (2.32)$$

where

$DFR_{i,lvst,c}$	is feed component demand,
$S_{lvst,c}$	is livestock supply.

Livestock production itself responds to developments of feed costs, which are derived from component demand valued with the respective market price. The feed demand system as modeled in ESIM captures the substitution as well as the capacity effect of changes of feed prices. The first effect relates to changing structures of components in livestock feed due to price changes. The second captures the level and structure of livestock production.

2.2.5 Processing

The model contains two processing activities: oilseed crushing and dairy. The demand of agricultural raw materials (oilseeds) for processing activities depends on prices of raw materials and of processed goods. The processing demand for oilseeds (DC) is determined by the following functions, which are homogenous of degree zero in prices:

$$DC_{i,c} = \exp\left(\ln crint_{i,c} + \varepsilon_{i,c} \cdot PD_{i,c} + \sum_{proc} \kappa_{i,proc,c} \cdot PD_{proc,c}\right) \cdot cs_{i,c} \quad (2.33)$$

where

$crint_{i,c}$	is the intercept of processing demand,
$\varepsilon_{i,c}$	is the elasticity of processing demand with respect to raw material prices,
$PD_{i,c}$	is market prices of raw materials,
$\kappa_{i,proc,c}$	elasticity of crushing demand with respect to oilseed product prices,
$PD_{proc,c}$	is market prices of processed products,
$cs_{i,c}$	is a capacity shifter for processing industries.

The supply of oils and meals is a linear transformation of the above demand function. It is modeled by technical coefficients that represent the relevant yield coefficients:

$$S_{crprod,c} = sint_{crprod,c} + \sum_{crprod} cy_{i,crprod,c} \cdot DC_{i,c} \tag{2.34}$$

where

$S_{crprod,c}$	is the supply of processed products,
$sint_{crprod,c}$	is the intercept of processing supply,
$cy_{i,crprod,c}$	is a processing yield factor,
$DC_{i,c}$	is processing demand.

Generally the model of the processing sector contains fewer details than the agricultural sector. Raw material and product prices determine the allocation of raw materials. The scope of ESIM to model food processing activities is very limited, as important aspects such as costs and capacity changes of processing industries are not endogenous elements.

The dairy component, however, contains important differences. The central assumption is that storable dairy products, i.e. skimmed milk powder, butter, and cheese serve as a residual use for milk that is not used for value-added products such as fresh milk and fresh milk products. The demand of the latter is combined in the human demand for milk. The supply of storable dairy products changes in response to the residual quantity of milk as well as to the prices of those products and the milk price. The reference price for milk is calculated in a CAP fashion out of butter and skimmed milk powder prices.

Considering the multitude of different dairy products within each product category represented in the model, and the complexity of dairy production, the scope of modeling dairy production in ESIM is at most only a very rough approximation of reality.

2.2.6 Elasticities and Calibration

The matrices of elasticities determine the reaction of market agents in ESIM to price, cost, and income changes. For the CECs little literature exists on estimations of supply systems, as structural breaks and deficiencies of the statistical system during the early phase of transition limit the usability of the data and restrict the length of the time series available for econometric estimates (see Jackson and Swinnen, 1994). For food demand, however, a body of literature is beginning to develop (see Brosig, 1999, p.3).

More recent estimates serve as sources for human demand elasticities: Brosig (1999) estimated demand systems for Polish households for the period 1990–96 and from 1991–96 for Czech households. These highly disaggregated estimates are carried out with a normalized quadratic demand system based on monthly data (see Brosig, 1999, pp. 39, 51–58). Banse (1994) estimates demand elasticities for Hungary from 1970–91 with a LA-AIDS model for six food aggregates. Finally the elasticities for eleven food aggregates based on an LA-AIDS model in Erjavec et al. (1997) are used for generating the human demand elasticities in Slovenia.

In this model, the demand elasticities have been adjusted for empirical reasons, i.e. the sample of commodities and the aggregation differ between model and estimates. A more important restriction preventing direct use is the conceptual difference between demand in the model, which is in physical terms, and demand in the estimates, which is related to expenditure.

The initial elasticities are constrained and then modified so as to be consistent with the constraints imposed by homogeneity and symmetry conditions as well as the negative own substitution effect and adding up. While the latter is imposed on the income elasticities valued by the respective expenditure share in an isolated way, the matrix of uncompensated price and income elasticities is simultaneously constrained for symmetry, homogeneity, and the negative own substitution effect.

The theoretical background for these matrix operations is the Slutzky-Hicks decomposition $\varepsilon_{i,j} = (\varepsilon_{i,j})_{\bar{u}} - \nu_j \cdot \eta_{i,m}$, which yields compensated price elasticities $(\varepsilon_{i,j})_{\bar{u}}$ from the initial values of ordinary price elasticities. Symmetry then is imposed on the matrix of elasticities by the concept of Allen's elasticities of substitution, which are derived from the compensated elasticities $\sigma_{i,j} = \frac{(\varepsilon_{i,j})_{\bar{u}}}{\nu_j} = \frac{(\varepsilon_{j,i})_{\bar{u}}}{\nu_i} = \sigma_{j,i}$ (see Layard and Walters, 1987, p. 142).

By constraining the elasticities for symmetry in this way, the structure of expenditure is included into the matrices of demand. As described above, the functional form assures global homogeneity of all other conditions, fulfilled only locally at the point of calibration.

In a similar way as for demand, homogeneity and symmetry are imposed on the supply elasticities and with that these are adjusted to the structure of production of an individual country.

The procedure to impose the microeconomic conditions has been programmed as an optimization, which minimizes the deviation of the sum of elasticities from zero. In this process the upper triangular part of the matrix of elasticities is subject to changes while the lower triangular part is determined through the symmetry conditions. In an iterative process the matrices have been tested for sensitivity as well as adjusted to expert judgments in light of simulation results, i.e. on the changeable part of the matrices, restrictions have been imposed. The lack of directly estimated elasticities for model purposes requires this ad-hoc procedure.

The lack of individual country feed demand and of agricultural supply elasticities made it necessary to base these elasticities on those estimated for the EU (OECD, 1995; Roningen and Dixit, 1989). Appendix B shows the elasticities for Poland.

The model is calibrated on all parameter and base data. The parameters describing economic behavior are the elasticities of supply and demand, and the transformation coefficients for seed demand and oilseed processing. The base data is comprised of all quantity components of supply and domestic use, wholesale prices, and wholesale and processing margins for the countries as well as for the ROW. In calibration, the behavioral functions are shifted with the intercepts such that model results exactly match the base values of prices and quantities. Therefore, each behavioral function contains an intercept or an equivalent parameter.

2.3 Modeling of Price and Trade Policies under CAP

For modeling purposes, price and trade policy instruments in the acceding countries of Central Europe have been assumed to be of the CAP type, though at different levels of intensity. Therefore, policy instruments in the CECs and in the EU-15 are the same. This step is partly a technical con-

cession to harmonization periods modeled after the example of Spain and Portugal. However, it also reflects real developments as most CECs gradually introduce CAP policy instruments.

The CAP consists of a set of sophisticated instruments to elevate prices of agricultural raw materials above world market levels and substantially above related prices in the CECs. The market and price policy instruments aim at wholesaling and first stage food processing industries. The downstream sector, therefore, plays a crucial role in transmitting the support to agriculture. In order to distinguish between all these influences, two price levels have been introduced to the model. Wholesaling and processing margins separate the price levels: Wholesale prices, which consist of domestic and the world market prices (PD and PW), and farmgate prices (PP).[12] The latter category drives agricultural supply while the first determines processing and domestic use.

Price and trade policies influence prices on the wholesale level. For the analysis, three main types of CAP market regimes are modeled. The first type relies on low or zero tariffs. According to the CAP design of 1999 this applies for oilseeds, most oilseed products, as well as grain substitutes (manioc and corn gluten feed). This system is even more relevant for the CECs as most of the agricultural markets benefit only from import protection.

The second type of market regime, the intervention system, establishes a minimum price on markets. For cereals the EU supports market prices by intervention prices and entry prices. On markets for beef, storable dairy products (except most hard cheeses), and sugar a similar system exists that enforces minimum prices through intervention and export subsidies. In addition to the minimum (intervention) price, these market regimes also have an implicit maximum price resulting from import protection. For cereals this is 155 percent of the intervention price; for the other products such a price is approximated by a combination of specific and ad valorem tariffs.

The third type of market regulation, the restraint export system, shields markets from imports, but domestic prices are allowed to vary significantly. Other than in the intervention system, the main government actions are limited export subsidies and private storage aid. This system is currently applied to pork, poultry, and egg markets and might be a future model for the beef and veal markets of the EU under Agenda 2000.

[12]For quota products, the shadow price (PPE) is included.

Section 1.1 discusses the economic implications of the most common market, trade, and price policy instruments. This part shows the implementation of these different trade and price policy instruments in a non-spatial net trade model.

2.3.1 Tariff-Based Price and Trade Policies

In this regime the only trade policy instrument is a specific or ad valorem tariff. These market regulations do not provide for export subsidies and other direct market interventions.[13] For a net importer the domestic prices are a function of world market prices and tariffs. In the presence of non-prohibitive ad valorem tariffs this is:

$$PD_{i,c} = \frac{PW_i}{er_c} \cdot (1 + t_{i,c}) \tag{2.35}$$

where

$PD_{i,c}$	is domestic price,
PW_i	is world market prices in USD,
er_c	is exchange rates (USD/domestic currency),
$t_{i,c}$	is ad valorem tariffs.

In a net importing country any positive ad valorem tariff leads to an increase of domestic prices above world market prices. The world market price transmits to the domestic market. This kind of price transmission function is ubiquitous in simulation models. Often the policy parameters used instead of tariff rates are Nominal Protection Rates (NPRs), or in some models, subsidy equivalents, i.e. PSE or CSE (see Banse, 1997b; Roningen, Sollivan and Dixit, 1991; Frohberg, 1998).

2.3.2 Intervention System

The intervention system is a key ingredient of the CAP. Shortly after the beginning of transition reforms, the CECs introduced intervention systems to provide a safety net for farmers. Such intervention systems have been increasingly introduced for products that are not subject to intervention in the EU. Poland and the Slovak Republic, for example, introduced an

[13] Note that for some products, support is delivered through direct payments, which are coupled to production.

intervention system for pork. Moreover, the intervention systems expanded from just providing a safety net to lifting market prices above world market levels.

Figure 2.2 presents the effects of intervention systems. The intervention price P_{min} lifts market prices above the world market price P_w. As a result, supply expands from Q_{SW} to Q_S and demand declines from Q_{DW} to Q_D. The resulting higher net exports of $Q_S - Q_D$ require refunds of the shaded area. In such a system, technical progress, which shifts S to S', directly translates to higher export refunds of the crosshatched area while demand stays constant. The amount of export subsidies varies directly with the domestic-world market price difference. Domestic prices remain unaffected if the world market price stays below domestic prices. In cases where it is above domestic prices the intervention price is non-binding, if no other measures like export taxes are put into effect. If interventions change from unlimited to a system with limited intervention, market prices usually are below the nominal intervention price.

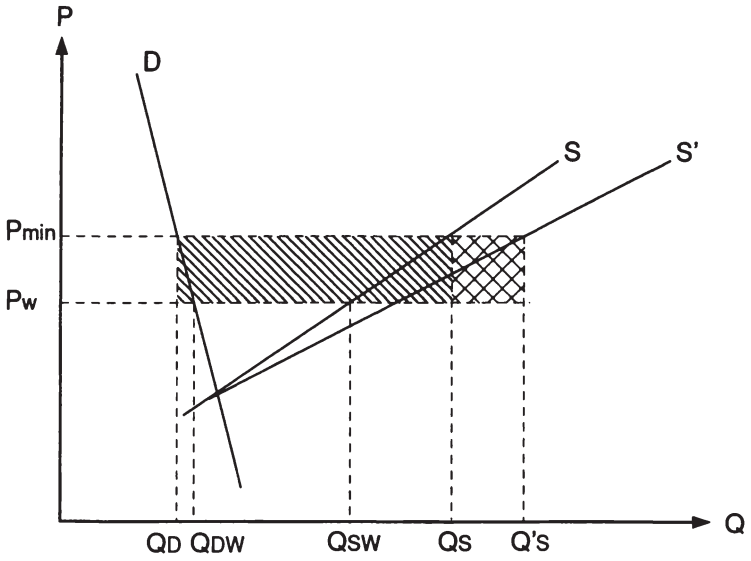

Figure 2.2: Effects of a Simple Intervention Price System.

Often combined with intervention-related measures are import-related measures such as entry price systems (e.g. for cereal in the EU). In the CECs, entry price systems have been introduced for a variety of products; however, due to the implementation of the Uruguay Round Agreement on Agriculture (URA) in 1995, these systems have been modified such that they comply with the URA.

The entry price represents the maximum price for the imports, i.e. the difference between maximum prices and world market prices is bridged by a variable levy (see Figure 2.3). With technical progress, additional supply is directly translated into lower net imports. However, such a graph only applies if the entry price is non-prohibitive, i.e. imports take place.

This intervention model must be extended by another factor. In reality we see exports and imports of commodities happen at the same time. One of the reasons for this effect is differences in quality that make commodity groups distinguishable. In the ideal CAP regime, imports enter the market

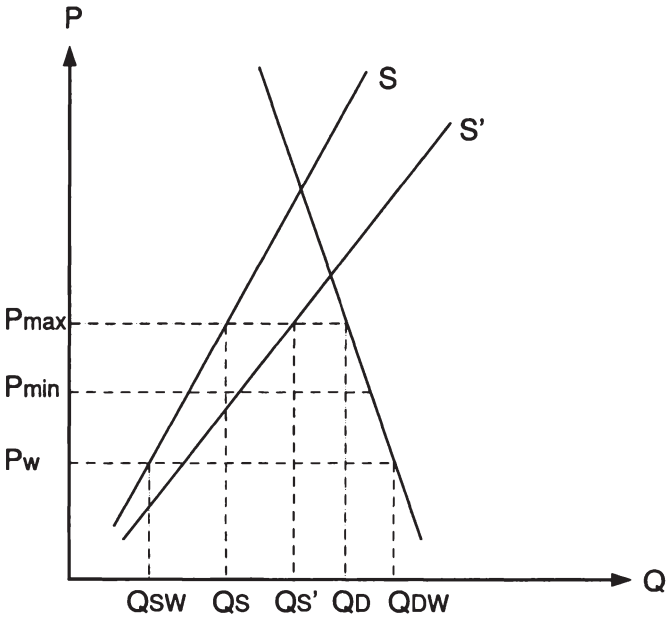

Figure 2.3: Entry Price System.

at the maximum price while exports leave the market at the minimum price. As world market prices are decoupled from domestic prices, the amount of imports and exports relative to the market size determines, among other things, the average domestic price level between the upper and the lower price bounds.

This ideal intervention price system with variable export subsidies and entry prices is applied to cereals in the EU. The intervention systems for dairy, beef, and sugar vary the instruments. Especially on the import side, do the instruments differ. With the implementation of the URA, variable levies have been tariffied (see Josling and Tangermann, 1994). These provide for high import barriers, often higher than in 1986–88, the base period for tariff bounds within the URA framework. Hathaway and Ingco (1995) concluded that "...the EU declared base tariffs which were higher than the level in 1986–88 for eight out of the nine products...". These tariffs often include an high prohibitive part, which Gerken (1997, p. 232) demonstrated for non-annex II products.

Prohibitive tariffs mean that no imports occur in their presence as prices for imports and domestic products differ so hugely that lower-priced domestic products of comparable quality substitute them in consumption. This principle of the so-called community preference is one of the fundamentals of most CAP commodity regimes. However, the EU grants preferential tariffs in numerous bilateral trade agreements such as in the Europe Agreements and the African-Caribbean-Pacific Agreement (see Overberg, 1996; CAP Monitor). These regulations provide for a small quantity of imports even in presence of prohibitive Most-Favored-Nations tariffs. Because of the positive supply effect of increasing prices, one could expect that domestic prices reach only import prices, if imports have a high share of domestic consumption.

The algebraic representation of the CAP intervention system has to consider export and import policies. A gross trade model might be able to separately capture policy details for export supply and import demand functions as well as the transmission of export and import prices to the domestic market. A net trade model of the ESIM type, however, has to combine these elements in one price transmission function. For this reason some simplifying assumptions are made:

1. Price formation on domestic markets is restricted to taking place between upper and lower boundaries.

2. The net export status and the share of net imports in total domestic use is the main determinant for the level of prices on the market.

3. The world market price only transmits to domestic markets if the lower and/or the upper bounds are below actual world market prices.

The first and the last assumptions can be directly deducted from Figure 2.2 and 2.3. The second assumption is necessary to simplify the price formation for the purpose of a net trade model. As a result, the price transmission function contains sections for three different price intervals, which make the function non-smooth.

The first section of the function describes the relationship between domestic price and the enforced minimum price:

$$PD_{i,c} = pmin_{i,c} \quad \text{if} \quad NX_{i,c} \leq 0 \tag{2.36}$$

where

$PD_{i,c}$	is the domestic price,
$pmin_{i,c}$	is the minimum price,
$NX_{i,c}$	is net exports.

The second section calculates the domestic price under the condition of negative net exports, i.e. net import status:

$$PD_{i,c}^{\alpha} = PD_{i,c}^{\alpha-1} - \frac{NX_{i,c}}{S_{i,c}} \cdot damp_{i,c}$$
$$\text{if} \quad NX_{i,c} < 0 \cap p\min_{i,c} < PD_{i,c}^{\alpha} \leq p\max_{i,c} \tag{2.37}$$

where

α	is an iteration index,
$PD_{i,c}$	is the domestic market price in the net import situation,
$NX_{i,c}$	is net exports,
$S_{i,c}$	is supply use,
$damp_{i,c}$	is a damping factor,
$p\min_{i,c}$	is the intervention price,
$p\max_{i,c}$	is the entry price.

The main technical problem to overcome in these types of price transmission functions is to avoid jumps between the minimum and maximum price once net exports reach zero. For this reason domestic prices move relative to the importance of net imports in terms of market size. Domestic prices change

less, if net exports are small compared to domestic supply and change more if imports are an important part of the market.

The fourth part of the function takes care of the price transmission of world market prices to domestic markets:

$$PD_{i,c} = \frac{PW_{i,c}}{er_c} \quad \text{if} \quad \frac{PW_{i,c}}{er_c} > p\min_{i,c} \tag{2.38}$$

This part of the price transmission can be varied in the presence of variable export taxes or market deficiencies, which leave comparable domestic market prices below world market price levels.[14]

The price transmission function includes most of the ingredients of the CAP intervention system on the import and export side, though with some necessary simplifications. Such a function is especially important if countries such as some CECs reverse their net trade status and face different levels of import or export protection that is impossible to model with a price transmission function of the NPR type.

2.3.3 Restraint Export System

These CAP market regimes comprise high import tariffs, export subsidies and some private storage aid. In comparison to the intervention system, the quantities of subsidized exports are less variable than those of the intervention system.[15] This type of market regime primarily shields the markets of pork, poultry, and eggs from imports with some export subsidies providing a modest amount of price support. As any stochastic element is missing in ESIM the analysis of storage policies would be only of limited scope. The modeling effort therefore concentrates on the remaining instrument, i.e. subsidized exports. These are supposed to be pre-fixed for a given period.

[14]The technical realization of the intervention system within the model framework takes place with a series of minimum and maximum conditions in the functions.

[15]For pork, the Management Committee fixes poultry and eggs export subsidies for three months, in practice, however, subsidies and quantities of exports remain unchanged for longer periods. Quantities in particular are oriented to the WTO ceilings which are subject to reduction until 2000 (see CAP Monitor; ZMP, 1997, pp. 141, 157, 171).

Such a system does not impose a certain price on the market, but leaves an outlet of a constant quantity of subsidized exports. Figure 2.4 shows the basic mechanism. The amount of the predetermined exports $S_D - Q_D$, which might represent the maximum quantity of subsidized exports allowed under the URA, leads under demand of Q_D and a supply of S_D to the market P_D. In case supply expands, due to,for example, technical progress and decreasing feed costs, domestic prices fall to P'_D because the additional amount produced has to be consumed by demand, such that $Q'_D - Q_D$ equals $S'_D - S_D$ and subsidized exports stay constant. Contrary to the intervention system, consumers benefit from increasing supply efficiency through lower prices.

With such an instrumental setting, domestic prices have to be found which determine supply and demand at those levels that net exports exactly match the given level, if domestic prices are higher than world market prices.

A major part of production costs for intensive livestock products is feed costs, especially cereal prices. Once these prices change, pork, poultry, and egg supply respond. In case feed costs decline, supply expands. This

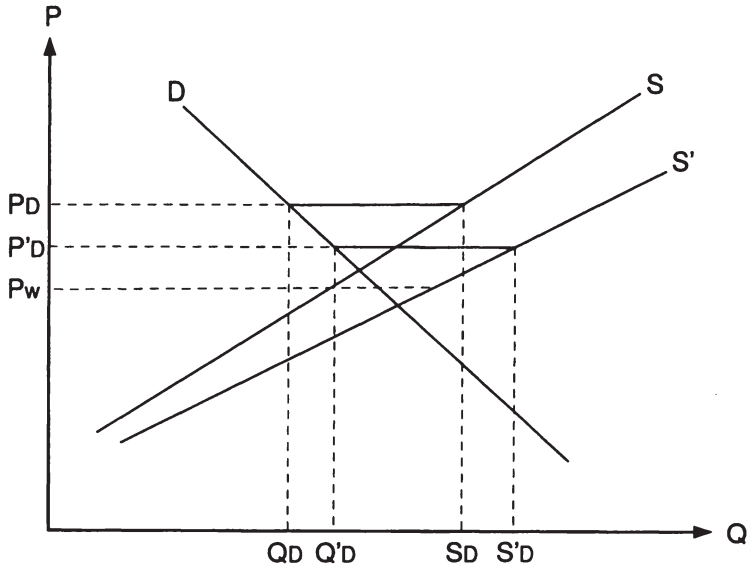

Figure 2.4: The Restraint Export System.

increased supply puts pressure on domestic prices as the level of net exports is fixed for these products and domestic use has to adjust. In this process domestic prices might reach world market levels. In this case exports can take place free of a need for subsidies.

$$PD_{i,c}^{\alpha} = PD_{i,c}^{\alpha-1} - \frac{NX_{i,c}^{\alpha} - maxex_{i,c}}{S_{i,c}^{\alpha}} \cdot damp_{i,c} \quad \text{if} \quad PD_{i,c}^{\alpha} > \frac{PW_{i,c}^{\alpha}}{er_c} \tag{2.39}$$

where

α	is an iteration index,
$PD_{i,c}$	is the domestic price,
$NX_{i,c}$	is net exports,
$maxex_{i,c}$	is maximum net exports.

In (2.40) the difference between the $NX_{i,c}$ and $maxex_{i,c}$ is set relative to supply quantities, which determine the size of price changes. By defining $maxex_{i,c}$ as a positive number, import tariffs are assumed to be prohibitive. By slightly modifying this function, the spending for export subsidies can be used as the determinant for domestic price formation; however, this has not been done for the analyses presented in this study. Markets are allowed to export freely, if domestic prices reach world market level. This part of the price transmission function assures that domestic prices are not below world market prices.

2.4 Modeling of Accession

Accession of new member countries to the EU has several implications. For the framework of this analysis the two most important ones are the harmonization of agricultural policies of the new member with those of the EU, and the integration of their markets into the Single Market. Two role models of EU integration exist. The first, Spain and Portugal, had a long transition period during which the countries gradually adjusted to the CAP. These countries were only recently fully integrated into the Single Market. Though these countries adjusted domestic policies to the instruments of the CAP, several mechanisms assured that administrative price levels only gradually adjusted to those of the rest of the EU. For this purpose, border

controls had to remain in effect, though for other sectors the rules of the Single Market applied.

The second model was the accession of Austria, Finland, and Sweden, which were immediately integrated on January 1, 1995, into both the CAP framework and the Single Market. The question of which model will be applied to the applicant countries of Central Europe depends on the outcome of the accession negotiations. To evaluate effects of EU integration, it is fairly important for the methodology to be able to capture these different types of accession policies.

2.4.1 The Harmonization of Agricultural Policies

In a gradual adjustment, CAP policies are introduced stepwise in the acceding country. In reality this happens in two ways. First by implementing the Acquis Communautaire the necessary institutions are formed and the policy instruments are put into effect. Then in a second step, the intensities of policies are gradually adjusted to CAP levels. This is generally true for price policies, if we take the example of Portugal and Spain. However, the analysis also takes into account other policies, i.e. income support (direct payments) and direct supply-constraining policies (set-aside, supply quotas). From the technical point of view, direct payments and set-aside may also be implemented gradually. Supply quotas, on the other hand, only make sense if their implementation takes place in one step, although an adjustment of quota levels might be an option for a harmonization period.

The process of adjusting domestic policies to the CAP in the acceding country is simplified in the model, especially for the intervention and export quota regimes. Here we assume that the CECs have already put these policies into effect though on a different level than in the EU. This is true for some of the commodities, but not for all (see Hartell and Swinnen, 1997). Therefore, in the loosely defined harmonization period, administrative prices are adjusted to EU levels.

The main instrument of gradual adjustment of Portuguese and Spanish agricultural policies to CAP levels was the Accession Compensatory Amount (ACA). The end of the transition period for Spain and Portugal was fixed at ten years after accession (seven years for some products). During that time, administrative prices gradually adjusted to EU levels at a predetermined pace. The ACA was applied in order to bridge the price gap between the

EU-10 and the acceding countries' prices. For regimes with an intervention system, the references for their calculations were the administrative prices; for other products, the market prices were used (see CAP Monitor, 1990). ACAs also adjusted export refunds and to certain extent, variable levies. In general terms, import measures were immediately set at the EU level when the two countries joined the customs union.

For modeling the ACAs, it is important to define the beginning and the end date of the transition or adjustment period. At the end of the adjustment period the intervention prices equal those of the EU, while entry prices and specific tariffs are adjusted in one step. Direct payments and set-aside can be implemented in one or several steps. Quotas, on the other hand, come into effect in one step at the beginning of a transition period, though their level can be further adjusted.

2.4.2 The Single Market

When the new member country is eventually integrated into the Single Market, the bilateral trade between the EU and the country is totally liberalized. The size of commodity markets in the EU expands by supply and domestic use of that country. Referring again to the principle of community preference, which shields most EU markets from third country imports, excess supply and consumption of member countries or regions of the Union first equalize on the Single Market.

An analysis of trade diversion in an expanding customs union cannot really be satisfactorily solved within the framework of a net trade model. The biggest Single Market effects, though, are integrated. These can be expected for markets in acceding countries which have a different net trade status than the EU. Consider for example, the case of Poland, a net importer of wheat, while the EU is a net exporter. If the same price and trade policy instruments are applied, the domestic price in the acceding country is driven by the entry price, while in the EU, export policies (intervention, export subsidies) determine the EU price. As a result domestic prices within the Union could be very different. With integration in the Single Market, prices decline in the acceding country as exports from the rest of the EU enter the market.

The same example holds for a strongly net-exporting acceding country on markets where the EU is net importing or largely self-sufficient (e.g. Hun-

gary and corn), where additional supplied quantities could lead to a decline of prices in the rest of the EU. Integration into the Single Market, therefore, can lead to price changes in the countries concerned.

2.5 Welfare Calculations

The welfare effects of a policy change are measured compared to a reference situation. This could be total liberalization, or an alternative second best situation. The reference situation in previous studies has been continuing domestic policies without integration into the EU. Here also, a scenario of total liberalization has been introduced which mainly serves to determine the welfare effects when compared to EU integration and non-integration. Welfare effects are one of the fundamental economic results of the evaluation of policies.

Two levels of domestic prices exist in the model: producer prices and wholesale prices. These are separated by a relative margin. During accession it is assumed that one effect of integration into the Single Markets is the averaging of margins to those of the EU-15. Under total liberalization the margins in the CECs also move to those of the EU-15, as EU food processing and wholesaling, other than the farm sector, is assumed to be highly efficient. Another complication arises from the fact that government expenditure related to market guarantee is adjusted to reflect the actual expenditure under CAP conditions, i.e. including storage and administrative costs.

Figure 2.5 shows the graphic analysis of welfare effects for a commodity market. Due to the model specification the graphical analysis is slightly more complex than the textbook examples. Under world market conditions with perfect price transmission, the country produces S_W at the producer price PP_W and consumes C_W at the wholesale price PD_W and exports NX_W. With agricultural policies the supply is S_D and consumption is C_D. The resulting net exports are NX_D.

Wholesale prices determine domestic consumption, therefore, the area PD_W, C_W, PD_D, C_D is the loss in consumer rent. Producer prices induce supply, thus the gain in producer rent is then the area PP_W, S_W, PP_D, S_D.

In this scenario of protective market and trade policy, government intervention at the wholesale level results in export subsidies of the crosshatched rectangle marked by PD_D, PD_W, C_D, and S_D. Other measures, which are

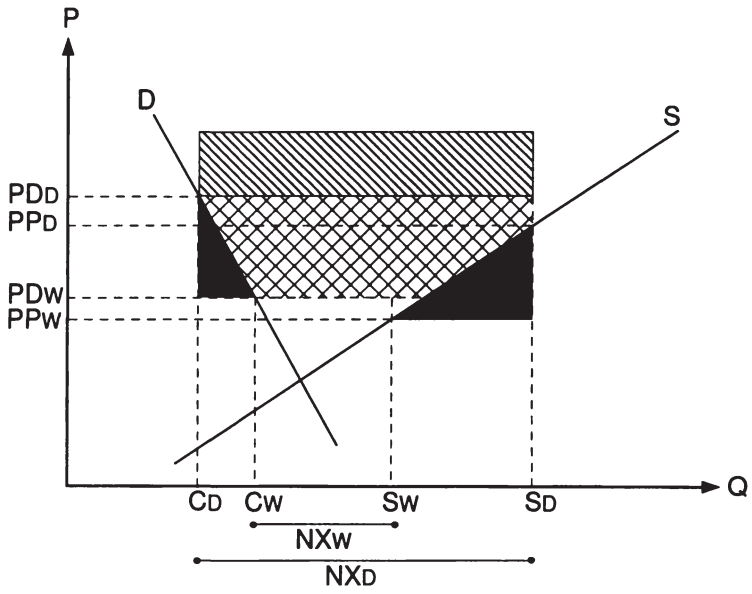

Figure 2.5: Welfare Effects of Agricultural Policies in ESIM.

not represented in ESIM, such as storage and administrative costs result in budgetary expenditure of the crosshatched rectangle. The exact size is determined from the model results by applying coefficients estimated from actual budget figures of the EU (see Section 2.6). In welfare terms this spending represents a loss in net exports and a gain in the net import situation. The black triangles represent the trade and specialization loss.

During transition the CECs often underwent periods where producer and consumer prices were below world market prices, such that liberalization results in a gain in welfare as domestic markets integrate into world markets. Other CECs, like Bulgaria and Romania, until recently maintained price controls by which the agricultural sector was actively taxed to reduce food prices.

Producer welfare is measured by producer surplus. This simple measurement has been chosen because the area distribution for most of the crops is constrained by the base area (except for sugar). This scaling of area constrains the part of the supply function that distributes the area. The

calculation of the producer welfare with more sophisticated measures, like determining integrals below supply curves, does not provide any meaningful results as long as base area is effectively restricting the total amount of area for oilseed and cereals.

On the consumption side, consumer surplus and the compensating variation alternatively measure consumer welfare. The results of both calculations are compared later in Section 3.4. The compensating variation, i.e. the area below the compensated demand curve, is a precise measurement for consumer surplus. The definite integral of the compensated demand curve DH_i^* between the prices PD_i^0 and PD_i^1 for $\varepsilon_{i,i}^* \neq -1$ is:

$$\int_{PD_i^0}^{PD_i^1} dhint_i^* \cdot PD_i^{\varepsilon_{i,i}^*} \cdot \prod_j PD_j^{\varepsilon_{i,j}^*} dPD_i = \frac{1}{\varepsilon_{i,i}^* + 1} \cdot \left(PD_i^1 \cdot DH_i^{*1} - PD_i^0 \cdot DH_i^{*0} \right) \quad (2.40)$$

where

$dhint_i^*$	is the intercept of the compensated demand curve,
PD	is domestic price,
$\varepsilon_{i,i}^*$	is the compensated own-price demand elasticity,
DH	is the compensated demand function.

The necessary parameter for the compensated demand curve can be generated from the model resources. The elasticities of substitution can be obtained out of ordinary elasticities with respect to prices via the general Slutzky equation $\varepsilon_{i,j}^* = \varepsilon_{i,j} + \nu_j^0 \cdot \eta_{i,m}$. From demand theory we know that compensated demand curves are homogenous of degree $\sum_j \varepsilon_{i,j}^* = 0$. The third important parameter of the compensated demand curve is the intercept $dhint_i^*$, which is obtained by calibrating the function on prices and quantities of the subsequent years.

Theory tells us that the calculation of the compensated variation is independent from the direction of calculation, i.e. the sequence of introducing the changes of own- and cross-prices.[16] Additionally, for each year price changes have been included by introducing them in a stepwise manner, i.e. the first price is allowed to change to that of the period $t+1$; in a second calculation the next price, until all prices have been changed to that of $t+1$.

[16] See Layards and Walters (1987).

The main conceptual drawback for this partial approach is the confined selection of consumer goods with agricultural products explicitly modeled and the aggregated rest implicitly included via the matrices of elasticities. As food is only a part of the expenditure, expenditure for the aggregate must either be assumed or obtained in a more rigorous way, i.e. as model solutions of CGEs.

2.6 Budgetary Calculations

As far as budget implications are concerned, ESIM generates projections only for net expenditure on trade measures, i.e. export subsidies minus tariff revenues, as well as compensatory and headage payments. To make the model results comparable to FEOGA guarantee spending, conversion factors have been applied to include expenditure on administration and storage.

The calculations of conversion factors proceed in three steps: First, average actual spending for market guarantee for the model products are calculated. Second, average spending is calculated per ton of net exports in the base period. Third, spending is set relative to the endogenous results of the model. These conversion factors apply for the calculation of government spending for the further simulations. The portion of dairy products and beef not supported by export subsidies has a high share of government spending for supports.

The budget reports of the European Commission do not show the revenues customs duties per commodity (European Commission, 1997). This data restriction prevents more sophisticated calculations using net spending for the model results. However, most of the imports of agricultural and food products are still prohibitive such that only preferential imports enter the EU. For other products, such as wheat, import barriers are lowered. However, even here imports are usually comprised of high quality commodities such as Hard Red Winter, which are of higher quality than the EU average. The introduced bias in these calculations for the EU is, therefore, limited.

The calculations for adjusted direct payments proceed in a similar way. This is less problematic for area but more for cattle payments, which are subject to several restrictions such as such as the maximum ceiling of ninety head per farm and global ceilings on regional and national levels. Here the model is less precise than for area (see Table 2.3).

The advantage of applying these budgetary adjustments for the CECs is in the comparability of model results to more realistic government expenditures. However, by applying the coefficients, the CECs are assumed to have the same structure of storage and other costs related to their net exports than that of the EU-15.

The calculation of total welfare effects includes the determination of producer and consumer surpluses, quota effects, and budgetary expenditure. The total welfare effects are determined by aggregating the effects over the markets for agricultural commodities.

2.7 Macroeconomic Linkages

Partial equilibrium models that concentrate on a particular sector of an economy rely on assumptions of the development of macroeconomic key indicators. For ESIM, these variables are the real equilibrium exchange rate, income, capital costs, labor costs, and costs of non-agricultural intermediates as well as the price developments of non-food consumer goods.

Two alternative approaches to these assumptions have been chosen. In the stand-alone version, the development of these variables is set exogenously, while in the recursive structure ESIM is linked to country CGEs, which provide the variables concerning macroeconomic and input price indicators. Exchange rate effects on relative output and input prices as well as their conceptual implementation are discussed in this section. Moreover, the recursive link to CGEs is shown in this part.

Banse (1997a; 1997b) based his CGE models on structures developed by Adelman and Robinson (1978), which have been further developed and extended by country- and transition-specific elements. Among other things, the models have a recursive-dynamic structure of capital allocation with a one period time lag for the installment of new capital. The new investments are treated as sector specific, i.e. installed capital is immobile and is depreciated at sector-specific rates. Labor, on the other hand, is perfectly mobile across all eight sectors (heavy industry, agriculture, food, chemical, machine and consumable industries, construction, and services). The third type of input is the intermediates. Production activities in the CGE are modeled by production functions of the Constant Elasticity of Substitution (CES) for labor and capital and Leontief for intermediate inputs.

The final demand component of the CGEs includes government consumption, which is kept constant in real terms within each period. Between years, government demand is adjusted relative to the GDP of the previous period. Private household demand is modeled with a Linear Expenditure System (LES) for three types of households. Demand for investment goods by sector, the last part of final demand, is derived from sectoral investment decisions (destination of investments) by coefficients fixed for the base period in the Social Accounting Matrix.

Bilateral foreign trade is modeled by the Armington approach, i.e. commodities of domestic and foreign origin are imperfect substitutes. Two-stage Constant Elasticities of Transformation (CET) and CES functions split commodities into domestic and imports and exports, respectively. Foreign trade is split in a second step into trade with the ROW and the EU. The closure rule is the constant current account balance, leaving the model to calculate the real equilibrium exchange rate to bring markets of tradables and non-tradables into equilibrium.

In the CGE model, all sectors are represented as a one-firm-one-commodity activity. Sector-specific policies are equally highly aggregated as ad valorem tariffs on imports and ad valorem subsidies on exports. Other policies are taxes on capital profits for sectors and households as well as production taxes or subsidies, respectively. The gradual implementation of the CAP is modeled by a stepwise increase in ad valorem import tariffs and export subsidies for agricultural and food products within a given period.

Contrary to ESIM, financing of agricultural policies plays an important role in the endogenous process of the CGEs. With EU membership, the financial solidarity needed for trade and price policies is realized. The FEOGA guarantee budget pays for export subsidies, but also receives the revenues from import tariffs. This is technically implemented in the CGEs by increasing the c.i.f. and f.o.b. prices to EU levels while at the same time removing export subsidies and import tariffs for agricultural and food products.

As structural funds and direct payments are not taken into account, small, net-importing countries, such as Slovenia, tend to receive less than large, net-exporting countries such as Hungary. The level of GDP and the importance of the agricultural and food sectors are substantial factors and determine the size of the effects on macroeconomic feedback and equilibrium exchange rates.

The conceptual differences between the CGEs and ESIM are manifested on all levels of the model. First of all, the levels of aggregation are different. While ESIM, as a partial model, focuses on individual markets of agricultural products and a few selected processed goods with numerous commodity-specific policies, the CGE analyzes economy-wide effects on a much higher level of aggregation with a necessary simplification of sector policies. Second, the behavioral functions are of a different nature. And finally, the CGEs are country models while ESIM is a world model. Therefore, a complete integration of ESIM into the macroeconomic framework the CGEs provide for is not possible without almost completely changing the nature of the ESIM.

The evaluation of macroeconomic developments caused by changing agricultural policies and financial flows is the specific strength of a CGE. ESIM, on the other hand, models commodities and policies in great detail. The combination of both models enables one to overcome the bottleneck of the partial equilibrium model, i.e. to include the macroeconomic repercussions of changing agricultural policies. On the other hand, the CGEs integrate agricultural protection measured as weighted average NPR on the sectoral level as a result of detailed simulation of agricultural markets and policies.

The combination of both models in simulations has been applied in Banse and Tangermann (1998) and in Banse and Münch (1998). This approach is further developed by including input prices into ESIM. The models are not formally linked, however, a recursive structure of simulations enables the use of results of ESIM in the CGEs and vice versa. In a first step ESIM simulates the policy scenarios. Then derived NPRs are used in the CGEs for a simulation of agricultural policies. In a third step, macroeconomic indicators and input prices from the CGE are used in ESIM for the final partial analysis. Chapter 4 explains the recursive simulation structure in detail.

2.8 Data

ESIM relies on numerous data and parameters for calibration and parameters for simulation. The database for calibration contains three categories: market balances, price data, and policy data. Besides the data, other parameters, most notably elasticities, are necessary to define economic behavior. For simulations, the development of key macroeconomic figures, population

growth, technical progress, and policies describe the economic framework in which the market agents operate.

Contrary to econometric models, elasticities and intercepts are not direct estimates. In this type of model, elasticities are predetermined and the intercepts, which serve as parameters of levels, are found in the calibration. The base data covers all endogenous variables, the only undetermined parameter of the behavioral functions is the intercept. In the calibration, the matrix of intercepts is calculated such that the calculation value of the functions exactly matches the base data.

The market balances contain data for every variable concerning supply and domestic use. For supply, these are area, national herds, and yields. Use, on the other hand, requires data for human demand, feed demand, seed demand, and processing demand. As twelve countries and twenty-seven products are modeled, several sources provide the huge amount of market data. The main national sources are statistical yearbooks, agricultural yearbooks, and monthly statistical bulletins. Good market overviews give frequent market reports published by the respective national institutes of agricultural economics, which do most of the market surveys. The international data sources are mainly the EU-Commission, the FAO, the OECD, the USDA, and WTO Schedules. These sources also serve as sources for policy data.

In order to better distinguish between effects of price and trade policies and those of downstream efficiency, farmgate and wholesale/processing level prices are explicit price variables. All sources mentioned above, especially publications of the national institutes of agricultural economics, provide price data. Recently, wholesale and processing prices have been published, as the wholesale level becomes a more important player on markets in CECs. Notable additional sources are studies, literature, and expert estimates from OECD (see OECD, 1994a; 1994b; 1995; 1996a; 1996b; 1996c; 1997; Gorton, Buckwell and Davidova, 2000; Münch, 1997a; Tangermann and Münch, 1997).[17]

[17]The data set used for this study is available on request from the author.

2.9 Model Validation

The usual way to validate a simulation model is by the sensitivity analysis of the elasticities. Such an analysis shows how far the results remain stable when the elasticities are varied by, say, ten percent. Naturally, interpretations of the results remain limited in respect to the ability of the model to trace reality. This aspect is particularly important for the numerous simulation models, which, like the present one, base their elasticities on literature. A more meaningful test, therefore, is a simulation of a past period and a comparison of model results and actual data.

Nölle (2000) validated the EU module of ESIM by calibrating the model on a base period of 1989–91, pursued a simulation of the period 1993–97, and compared the results with statistical data for the EU. This analysis is also very relevant for the analyses of CEC-EU accession effects on agricultural markets as the elasticities for the CECs are based on those of the EU (see Section 2.2.6).

One of the scenarios in Nölle uses exogenous EU market prices of the period 1992–97. The scenarios show a surprising accuracy of the model results compared to the actual development of area allocation and herd sizes in the EU in this period. For arable crops, Nölle showed that ESIM elasticities slightly underestimate the development of wheat area (by 4 to 5 percent) and overestimate the barley area (2 to 13 percent), while the ESIM figures for other grains, rice, and sugar match reality (see Appendix C Figures C.1 and C.2).

On the livestock side, the simulation of the national herd of the EU and the real development are also quite close. However, some higher differences exist for laying hens (see Nölle, 2000, p. 39; Appendix C Figures C.3 and C.4). Human demand in the EU is also well traced in the ESIM simulations with some overestimation of butter and skimmed milk powder demand (see Nölle, 2000, pp. 42–50). Nölle concludes that ESIM elasticities in general closely trace the developments of supply and demand.

2.10 Properties and Limits of ESIM and Comparison to Other Models

ESIM is a multi-country, multi-commodity, comparative, static, non-spatial, price-based, partial equilibrium model. This section summarizes the properties and limits of this simulation framework and compares it with related large-scale partial equilibrium models. The characteristics of several models are summarized in Table 2.4 and 2.5. The Central European Agricultural Simulation Model (CEASIM) was recently developed and is based on flexible functional forms (Frohberg et al., 1998). Also included in the comparison are the Static World Policy Simulation Modeling (SWOPSIM), the OECD's Ministerial Trade Mandate Model (MTM), and its successor, AGLINK.

All compared models are based on standard neoclassical assumptions of perfect markets, i.e. no country or economic agent can exploit market power, where commodities are homogeneous and perfect information is available at no cost. The assumption of perfect competition is a clear simplification of the oligopolistic behavior found on domestic and world markets. For example, EU sugar markets are characterized by cooperative behavior (see Schmidt, 1991) and trade policy instruments such as variable export subsidies, which when combined with restrictive licensing might invite large countries to act strategically on world markets. Among the models, only CEASIM has included monopsonistic behavior on milk markets.

The most commonly chosen way to include transport costs in net trade models is to impose mark-up coefficients on domestic price transmission functions, as has been done in AGLINK. This methodology distinguishes world market prices according to geographical regions, which makes budgetary calculations more precise.[18] However, limits arise in simulations of trade flows as world markets are still point markets. For this reason, and because of the limited ability of partial models to include markets for transport services, ESIM does not recognize transport costs.

The third aspect, closely linked to transport costs in a conceptual way, is the assumption of homogenous commodities. As in all the other listed models, ESIM commodities are treated as being perfect substitutes regardless of their origin and destination. Reality, again, is more complex. The ubiqui-

[18] In fact AGLINK takes a step further by distinguishing several world markets for beef and pork–logical if different trends on these markets prevail in the model simulations.

tous general way to model bilateral trade is the Armington approach which assumes domestic and foreign goods to be imperfect substitutes by applying CET functions for producing domestic and exportable goods, and CES functions to determine consumption of imported and domestic goods.[19] Though widely used, especially in CGEs, this concept brings with it strong empirical problems (see Banse, 1997a). An alternative is a modified demand system, such as the Almost Ideal Demand System (AIDS), which has been recently applied for modeling bilateral trade (see Weyerbrock, 1996). Though the latter concept provides for an empirically and theoretically sound base, it lacks the depth needed for a detailed trade policy analysis.

ESIM is a comparative static model. Though capable of simulating a time series, every equilibrium produced is independent from that of prior years. Only the World Food Model and AGLINK contain a dynamic component, i.e. a lagged adjustment of production of the Nerlovian type. Prices and costs of previous years determine production, usually with decreasing impact the further in the past the respective year lies. This lagged adjustment makes sense if prices considerably fluctuate between years within the simulation period. This is the case in the World Food Model, which includes stochastic elements to model effects of weather and other related exogenous influences on production and storage. Most of the ESIM commodities, except for pork, poultry, and eggs, are characterized by highly regulated markets in the EU and, at least after their accession, in the CECs such that this element has not been recognized.

As listed in Table 2.4, all models except CEASIM and MTM are based on types of constant elasticity functions. This functional form guarantees the condition of homogeneity globally. The other neoclassical conditions, such as symmetry, are kept locally. Of the compared models, only CEASIM is based on a functional form that guarantees the global fulfillment of all supply and demand conditions.

The implemented policies differ between the compared models according to their analytical objective (see Table 2.5). The World Food Model aims at analyzing global effects and extends its view to stabilization policies and effects of storage. Country- and commodity-specific policies are reflected by price transmission elasticities. SWOPSIM, on the other hand, uses CSE and PSE percentage protection measures and imposes them on the price transmission functions, which is done in a similar way in CEASIM. Both

[19]Global CGEs provide a good framework to include transport costs as one determinant of bilateral trade (see Hertel and Tsigas, 1997).

Table 2.4: Properties and Structural Differences of Partial Equilibrium Models.

	ESIM	SWOPSIM	MTM	AGLINK	CEASIM	World Food Model
		Roningen and Dixit, 1989	OECD, 1987 OECD, 1989	OECD, 1992	Frohberg et al. 1999	Anderson and Tyers, 1993
Countries	12	36	Selected OECD	OECD plus selected countries	Single country	30
Commodities	27	22	21	9		7
Homogeneous goods, perfect markets	Yes	Yes	Yes	Yes	Yes, monopsonistic behavior in some markets	Yes
Spatial Transport costs	No	No	No	No Parameters to calculate local c.i.f. and f.o.b. prices	No	No
Macroeconomic linkages	Assumptions (stand alone version), CGE (recursive version)	Assumptions	Assumptions	Assumptions	Assumptions	Assumptions
Price levels	Wholesale, farmgate	Farmgate	Farmgate	Farmgate, consumer	Farmgate	Producer, consumer

BEHAVIOR						
Functional Form	Constant elasticities	Constant elasticities	Linear (MTM-Model), Constant elasticities (MTM-Input)	Constant elasticities	Flexible functional forms	Constant elasticities
Nature	Comparative static	Comparative static	Comparative static	Dynamic	Comparative static	Comparative static/ stochastic and dynamic
Adjustment	Immediate	Immediate	Immediate	Lagged	Immediate	Lagged
Supply*	Indirect	Direct	Indirect	Indirect	Direct	Direct
Trade	Net trade	Net trade	Net trade	Net trade	Net trade	Net trade
Storage		Exogenous		Exogenous		Exogenous (stochastic version)
INPUTS						
Feed	Price dependent input-output coefficients	direct feed demand	Price dependent input-output coefficients	Price dependent input-output coefficients		Fixed input-output coefficients
Area	Part of supply	None	Yes	Yes	None	None
Other inputs	Exogenous, CGE	None	Labor,capital	Labor,capital		

* Indirect supply functions distinguish between capacities and yields; direct supply functions combine the two elements in one equation.

Table 2.5: Modeling of Agricultural Policies.

	ESIM	SWOPSIM	MTM	AGLINK	CEASIM	World Food Model
		Roningen et al., 1991	OECD, 1987 OECD, 1989	OECD, 1992	Frohberg et al. 1999	Anderson and Tyers, 1993
Supply constraining	Quotas, set-aside, direct payments	Set-aside	Set-aside	Quotas, set-aside, direct payments	Quotas	Set-aside
Non-tariff	Minimum and entry prices, prohibitive tariffs, variable and specific export subsidies, export constraints	Indirectly with transmission elasticities		Minimum and maximum prices		Indirectly with transmission elasticities
Tariffs	Specific and ad valorem tariffs	Percentage CSE and PSE	NPR	NPR	NPR, percentage PSE	NPR

models also provide for the scope of simulating direct supply constraints such as set-aside and quotas. MTM and especially AGLINK are modeled in a more detailed way to better reflect the policies of individual OECD countries.

Analyzing the effects of introducing the CAP in Central and Eastern Europe requires the detailed modeling of EU agricultural policies for tariff and non-tariff based trade and price policies as well as for direct supply constraints and coupled and non-coupled direct payments. Policies are mirrored in a very detailed way in ESIM compared to the other partial equilibrium models. As a multi-country model, it is capable of simulating effects of the European Single Market. As a result, ESIM is a flexible tool to assess accession policies.

3 Market and Budgetary Effects of Accession of the Ten Central European Countries to the EU-15

All of the applicant countries from Central Europe are in the process of introducing the Common Legislation, or Acquis Communautaire, in order to be able to adopt EU policies once they join the Union. Consequently, institutions and markets in the CECs are becoming increasingly compatible with those of the EU-15. Some of this alignment has also taken place in the area of agricultural policy. This process mostly concerns institutions and standards, but also influences market and trade policies. In recent years the level of agricultural protection increased in most of the acceding CECs, which might be interpreted as a pre-accession policy.

From 2000 onwards the EU will introduce gradual changes to its agricultural policy as set forth in the Agenda 2000 legislation of the Berlin Council of March 1999. Earlier analyses have already shown the potential effects of the pre-Agenda CAP on agricultural markets and budgets in the CECs (see Tangermann and Josling, 1994). Other work has compared accession effects under the CAP of 1992 with those that could be expected under the EU-Commission's Agenda proposals (see Münch, 1997; Banse, Münch and Tangermann, 2000; Banse and Münch, 1998; Münch, 2000).

3.1 Scenarios and Main Assumptions

Building on this work, several scenarios of CEC-EU accession are considered. Two of these hinge on the structure of the CAP reform, i.e. how much different are the effects on agricultural markets, government spending, and welfare under the 1992 CAP (CAP-1992) from those under the Agenda 2000 (AGENDA). A third scenario simulates continuing domestic policies in place

in 1997 without accession (NON-ACCESSION). The policy instruments are assumed to be the same as those of the CAP, however, within the current definition and protection of CEC market and trade policies. Finally, the fourth scenario simulates a complete liberalization of agricultural policies (LIBERAL). The last two scenarios serve as benchmark scenarios for the analysis by addressing the effects related to EU accession relative to the present situation and by providing the basis for analyzing welfare effects. The analysis is pursued for Bulgaria, the Czech and Slovak Republics, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovenia. This analysis is within the realm of classic partial equilibrium analyses; the treatment of macroeconomic indicators is based on assumptions using the stand-alone version of ESIM.

Despite recent political discussions advocating a country-by-country approach rather than a first and second wave process, the analysis sticks to the latter approach. The main reason for this choice is technical as it facilitates the interpretation of results. Therefore, first wave accession is assumed to take place in 2002/03 for Estonia, the Czech Republic, Hungary, Poland, Slovenia, and, deviating from current EU policies, the Slovak Republic. In the second wave Bulgaria, Latvia, Lithuania, and Romania become full members in 2008/09 after the completion of all Agenda 2000 reforms. In both cases accession takes place without a harmonization period and immediate and full integration into the Single Market.

With full integration into the EU in 2002 and 2008, the Single Market extends price formation from the EU-15 to the EU-21 and then to the EU-25; the supply and total demand of the new member countries are taken into account. When the EU net trade position and hence, the price level within the band between intervention and entry price is determined, i.e. the domestic equilibrium is sought. With introduction of the Single Market, it is assumed that marketing margins in the new member countries adjust to reflect the increasing competition as barriers to trade and institutional obstacles are removed with full integration.

In March 1999, the EU Council in Berlin finally decided a new agricultural policy for the period of 2000–08. Relevant for the simulations is the stepwise reduction of intervention prices for cereals, beef, and, beginning in 2005, butter and skimmed milk powder. Additionally, direct payments for area and beef cattle are increased and new direct payments coupled to milk quotas are introduced in 2005. The area payment for oilseeds is gradually

aligned with that for cereals. With these steps, direct payments remove some of production incentives for oilseeds.

The treatment of area payments in the AGENDA scenario changes in comparison to the CAP-1992 scenario. The AGENDA scenario considers area payments as decoupled between cereals and oilseeds. However, since the requirement of production and a maximum base area eligible for direct payments are still valid under the Agenda 2000 regulations, area is constrained in the simulations. Compared to the design of the 1992 CAP reform, the instruments of agricultural support are further shifted from market price support towards direct payments. Tariffs remain unchanged, only cereal entry prices are adjusted to the decline of intervention prices according to the 155 percent rule (see EU Council, 1999).

Another important ingredient in market models is the amount of technical progress assumed in the future production of commodities. Technical progress, here assumed to be neutral regarding different inputs, shifts the supply curve at given rates per year. These rates are conventional with slight country-specific differences. Wheat, corn, and sugar yields are assumed to grow by around 2 to 2.4 percent annually while barley, other grains, rapeseed, sunflower, and soybean yields increase by rates of 1.5 to 1.8 percent. Technical progress in livestock production differs between cattle and other livestock. While technical progress in the dairy and beef sector increases by 0.8 to 1 percent per year, pork, poultry, and egg production rise by rates of 1.2 to 1.5 percent. Feeding efficiency is assumed to increase by 0.5 percent yearly for all countries. These rates are the same for all scenarios.

Other exogenous variables are income and population growth, which are based on projections from several sources such as the World Bank, the EU-Commission, and the FAO. The other macroeconomic indicators, capital and labor costs and the real equilibrium exchange rate, are assumed to be unchanging. Exchange rates are set at the level of 1997. The analysis pursued in this chapter, therefore, resembles a classic partial equilibrium analysis, in which the agricultural sector is assumed to be a small sector that is not affected, nor is affected by, the rest of the economy.

Table 3.1: Scenario Assumptions.

	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Macroeconomic and cost indicators	Real exchange rates, capital costs: constant Income: country-specific rates Labor costs, other consumer prices: increase by 1 percent per year			
Technical progress	Neutral, conventional rates	Neutral, conventional rates	Neutral, conventional rates	Neutral, conventional rates
Policies				
Single Market and full implementation of the CAP	No	2002 (EST,CZ, HU,PO,SLO,SK) 2008 (BG,LAT,LIT,RO)	2002 (EST,CZ, HU,PO,SLO,SK) 2008 (BG,LAT,LIT,RO)	
Marketing and processing margin	Constant	Alignment to EU margins with Single Market	Alignment to EU margins with Single Market	Alignment to EU margins with Single Market
Set-aside	No	10% with full accession	10% with full accession	No
Production quotas	No	In compliance with WTO restrictions on max. subsidized exports	In compliance with WTO restrictions on max. subsidized exports	No
Compensatory payments				
Area	No	Compensatory payments for area and beef	Compensatory payments for area (decoupled)	No
Cattle	No		Headage payments for dairy cows and beef cattle	No
Trade and price policies	As currently implemented in national policies	CAP prices as of 1999	CAP prices and tariffs 1999 Berlin Council Decision	Total liberalization

3.2 The Development of CEC Markets under Different Scenarios

One of the main driving factors in the simulations of CEC-EU accession is the price difference between the acceding CECs and the EU. These prices represent exactly that price where the lever of CAP price and trade policy instruments is applied. At the beginning of transformation, the price gap was large. This is explained by significant liberalization of trade regimes, missing market institutions, low world market prices, poor average qualities of agricultural and food products, and not least, high protection within the CAP (see Tangermann and Josling, 1994). In recent years prices in the CECs have been closing in on EU levels due to increases in protection, better market institutions, restructuring the agricultural and food sector, higher world market prices, and decreasing EU market prices. However, large country- and commodity-specific differences remain. Figure 3.1 compares the 1997 price gap between the EU-15 and the CECs at the wholesale/first stage processing level.

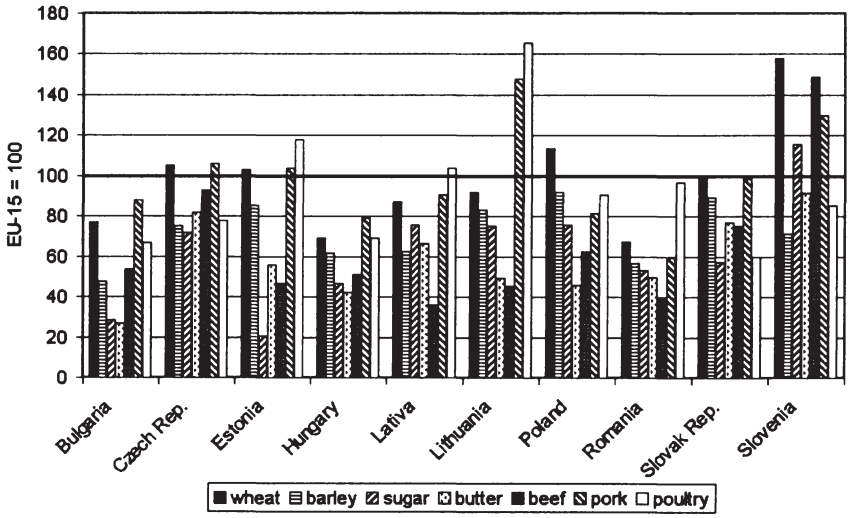

Figure 3.1: Relative Wholesale Price in the CECs, 1997.

While a large wholesale price gap still existed in 1997 in net-exporter Hungary (prices at 42 to 80 percent of respective EU-15 prices), net importing countries such as Poland increased protection and raised prices, and approached the EU situation in recent years. In second wave countries, especially Bulgaria (25 to 85 percent of EU prices) and Romania (40 to 98 percent), large price differences towards the EU remain, sometimes at levels below world market prices, mainly for transitional reasons. These two countries only recently underwent substantial transition reforms including price liberalization for agricultural and food commodities, almost a decade later than Hungary and Poland. In general the CECs have prices close to, but typically below EU levels and only Slovenia's wholesale prices remain significantly higher; Slovene wheat and beef prices are 160 and 150 percent of the EU level. For poultry and dairy products, which are surplus products in Slovenia, prices are 10 and 15 percent below those of the EU.

Looking at commodities, the wholesale price gap is lower for those which are less protected by the CAP, i.e. wheat, oilseeds, pork, poultry, and eggs. Still a larger gap remains between the highly protected commodities of the CAP: coarse grains, sugar, dairy, and beef. Therefore, producer incentives during accession remain high, especially in the second wave countries.

Figure 3.2 compares EU-15 and CEC prices in 2008 after all Agenda reforms, including those on the milk market, have been completed.[1] The CAP reform diminishes the price gaps for wheat and barley, somewhat for beef, and less so for butter and other dairy products. Cereal wholesale prices in the first wave countries are on a higher level than those of the EU (except Hungary, and additionally for other grains in Poland). With Agenda 2000 reforms, the price gap for beef decreases only slightly. The main cause is the change from an intervention-based system to a market regime which resembles that applied to pork, poultry, and eggs. In these scenarios, the price of beef in the EU-15 falls roughly to 75 to 85 percent of the intervention price of 1997 as net exports sufficiently lift the market price above the safety net price of 60 percent of the guidance price. Still large gaps remain for the regimes that are minimally reformed (dairy) or unreformed (sugar).

For the second wave countries Bulgaria and Romania, the price differences remain substantial despite the Agenda 2000 reforms, and cereal prices are assumed to reach world market price levels as a consequence of transitional

[1]The NON-ACCESSION scenario keeps policies constant, i.e. administrative prices and tariffs. However, production costs are assumed to increase over time, the same as other consumer goods.

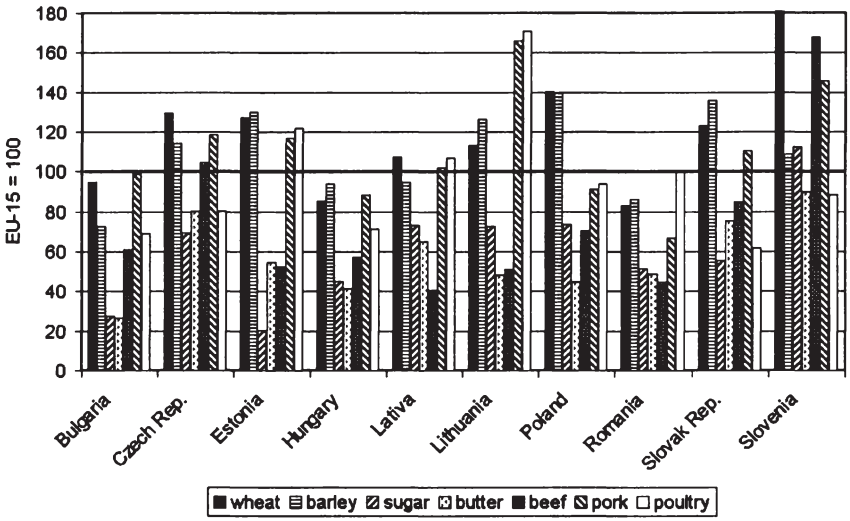

Figure 3.2: Relative Wholesale Price in the CECs under the NON-ACCESSION Scenario, 2008.

reforms. For different reasons a similar large price gap also remains for Hungary. For the other countries a mixed picture appears.

While the prices shown thus far are wholesale prices, i.e. the price level at which CAP instruments apply, in the simulation model supply depends on producer prices. In the model, producer prices are derived from wholesale prices using a percentage margin.[2] As the margins adjust to EU-15 levels, producer prices change correspondingly with a given wholesale price; a decline of margins increases producer prices while an increase of margins puts

[2]The margins for the EU-15 are based on differences in producer and wholesale prices from various statistical sources (e.g. ZMP, Eurostat, OECD). Margins for the CECs are based on those used by the OECD in their PSE calculations and expert estimates. The margins for sugar and dairy are calculated in the fashion of the CAP, i.e. calculated with respect to the content of sugar in sugar beets and fat in milk, as well as by using the processing margins assumed in the CAP regulations for the EU-15 (see CAP Monitor). These calculated reference prices are then compared with the actual producer prices for sugar beets and milk (see Tangermann and Münch, 1997).

pressure on producer prices. Cereal and oilseed margins in the CECs are very different from those in the EU-15. While Hungary, Slovenia, Bulgaria, and Romania have significantly higher margins (around 18 to 24 percent of the wholesale price), those in Poland, the Czech and Slovak Republics, and the Baltics are close to those of the EU-15 of 8.5 percent in 1997. Sugar beet and milk processing on the other hand are roughly 18 to 32 percent and 15 to 26 percent less efficient than in the EU-15. Livestock slaughtering gives a different picture. Here margins are around half of those in the EU-15, which might be interpreted as differences in standards and technology.[3]

In each CEC, the overall change in agricultural price level due to accession will depend on the product composition of its agricultural output. The exposure of the countries towards the effects of accession in agriculture becomes visible in Figure 3.3, where commodities are grouped according to their degree of protection under the CAP after Agenda 2000. Highly protected commodities under Agenda regulations are sugar, rye, dairy, and barley, while less protected commodities are wheat, corn, oilseeds, beef, pork, poultry, and eggs. Poland and the Baltic countries have the highest exposure to CAP incentives, with over 50 percent of agricultural production value in highly protected commodities. Romania, Hungary, and Bulgaria have the lowest exposure; less protected commodities make up only 10 to 25 percent of agricultural production.

In the CAP 1992 scenario, coarse grains, beef, and dairy enjoy higher prices than in the AGENDA scenario. This leads to a higher percentage of highly protected commodities and thus to a higher exposure of CECs towards the effects of the CAP.

Future market balances in the CECs will change over time in response to price changes as resulting from accession and from market developments, but also from external factors such as macroeconomic developments and technical progress. Tables 3.2 to 3.7 summarize the results for the base period (the average of 1995–97), for 2002 when the first group of CECs joins the Union, for 2008 when the second wave countries become EU members, and finally, 2012 when the extended Union is several years old. Results are presented for the aggregates of the six first wave countries (Tables 3.2–3.4) and for the four second wave countries (Tables 3.5–3.7).

[3]Livestock prices in the CECs represent quality levels for intervention prices (R3 young bulls for cattle and E quality carcasses for pork). Chicken carcass prices for standard qualities in the EU represent poultry prices for the CECs.

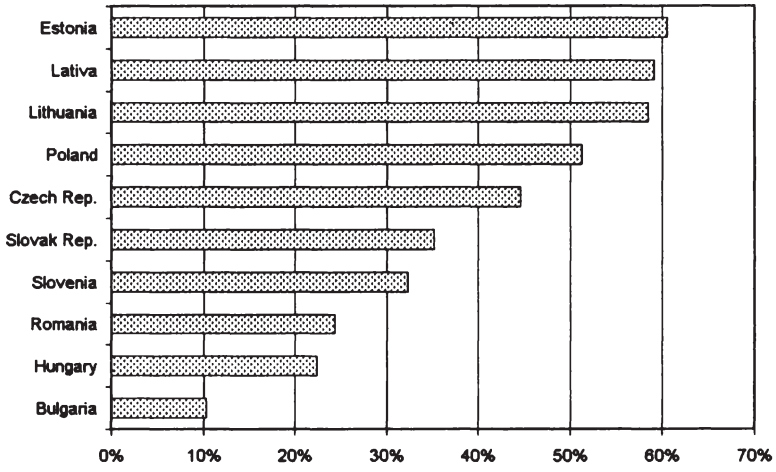

Figure 3.3: Share of Highly Protected Commodities in the CEC-10 under the AGENDA Scenario, 2012 (share in production value).

Continuing domestic policies in the first wave CEC-6 in the NON-ACCESSION scenario causes crop production to grow more rapidly than domestic use. The first wave countries shift from importing cereals, especially coarse grains, to exporting 3 Mill. tons in 2012. Most of these exports are wheat. Net exports on the other crop markets increase. For livestock a mixed picture appears: Net exports of pork increase from 0.17 Mill. tons in 1995–97 to 0.51 Mill. tons until 2008, and decline afterwards to 0.44 Mill. tons in 2012. For poultry, the CEC-6 turn from net exporters in 1995–97 to net importers in 2012. Consumption of poultry increases more than that of other livestock, especially beef. Net exports of beef and eggs remain fairly constant.

Results for intensive livestock products are caused by modeling CEC policies slightly differently than those of the EU (see Equation 2.40). The CECs are allowed to export pork, poultry, and eggs in accordance with their WTO commitments for the maximum amount of subsidized exports, if domestic prices are higher than world market prices. This allows some countries to go from net-importing to net-exporting status. Should domestic prices reach world market levels, the countries may export without constraints.

Table 3.2: Development of Production in the First Wave Countries under Different Scenarios (Mill. tons).

First Wave	1995–97		2002			
	NON-ACCESSION	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	48.06	45.65	52.26	55.85	53.03	49.70
of which						
Wheat	18.76	18.89	20.62	17.71	17.41	20.75
Coarse grains	29.30	26.76	31.64	38.14	35.62	28.95
Oilseeds	2.40	2.58	2.78	2.03	2.26	2.88
Sugar*	3.41	3.12	3.30	3.77	3.82	2.98
Milk	19.43	19.46	19.88	23.80	23.80	20.08
Butter	0.28	0.30	0.28	0.35	0.35	0.30
Beef	0.85	0.86	0.83	1.11	1.13	0.86
Pork	3.14	3.31	3.51	3.24	3.42	3.64
Poultry	1.12	1.21	1.15	1.79	1.82	1.28
Eggs	1.10	0.94	1.18	0.73	0.84	0.93

Table 3.2: *Continued.*

First Wave	2008				2012			
	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	58.24	62.18	58.59	55.42	62.64	66.90	60.52	59.91
of which								
Wheat	23.21	20.03	19.88	23.37	25.14	21.83	20.72	25.44
Coarse grains	35.03	42.16	38.71	32.05	37.50	45.06	39.79	34.47
Oilseeds	3.06	2.29	2.58	3.17	3.26	2.47	2.69	3.39
Sugar*	3.70	3.89	3.89	3.39	4.00	3.90	3.89	3.70
Milk	21.85	23.80	24.27	22.41	23.39	23.80	24.27	24.10
Butter	0.27	0.34	0.33	0.30	0.27	0.34	0.33	0.30
Beef	0.91	1.14	1.16	0.96	0.97	1.12	1.14	1.04
Pork	3.90	3.42	3.56	3.97	4.19	3.67	3.70	4.19
Poultry	1.21	2.04	2.08	1.38	1.40	0.89	1.01	1.13
Eggs	1.31	0.80	0.96	1.03	1.40	0.89	1.01	1.13

* Includes C-quota sugar.

Table 3.3: Development of Total Domestic Use in the First Wave Countries under Different Scenarios (Mill. tons).

First Wave	1995–97		2002			
	NON-ACCESSION	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	48.09	53.33	50.92	44.13	48.36	56.53
of which						
Wheat	18.24	18.55	19.34	17.98	18.99	19.61
Coarse grains	29.86	34.78	31.58	26.15	29.38	36.92
Oilseeds	2.28	2.39	2.23	2.21	2.23	2.33
Sugar	2.91	2.92	2.93	2.66	2.60	2.95
Milk	19.43	19.46	19.88	23.80	23.80	20.08
Butter	0.25	0.25	0.25	0.21	0.21	0.25
Beef	0.80	0.91	0.81	0.75	0.77	0.92
Pork	2.97	3.21	3.01	3.05	3.22	3.30
Poultry	1.03	1.02	1.11	0.92	0.93	1.08
Eggs	0.96	1.11	0.99	1.11	1.13	1.17

Table 3.3: *Continued.*

First Wave	2008				2012			
	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	55.79	47.07	51.98	61.89	59.35	49.89	53.37	66.00
of which								
Wheat	21.33	19.37	20.29	21.51	22.85	20.70	20.93	23.14
Coarse grains	34.46	27.70	31.69	40.38	36.51	29.01	32.44	42.86
Oilseeds	2.48	2.47	2.54	2.60	2.61	2.60	2.61	2.76
Sugar	3.17	2.81	2.74	3.19	3.37	2.94	2.80	3.40
Milk	21.85	23.80	24.27	22.41	23.39	23.80	24.27	24.10
Butter	0.26	0.23	0.23	0.28	0.28	0.25	0.24	0.30
Beef	0.88	0.81	0.85	0.99	0.94	0.87	0.88	1.06
Pork	3.39	3.53	3.80	3.75	3.75	4.02	4.05	4.19
Poultry	1.34	1.08	1.09	1.30	1.57	1.26	1.17	1.54
Eggs	1.08	1.22	1.24	1.29	1.17	1.32	1.29	1.40

Table 3.4: Development of Net Exports in the First Wave Countries under Different Scenarios (Mill. tons).

First Wave	1995–97		2002			
	NON-ACCESSION	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	−0.03	−7.68	1.34	10.70	4.11	−6.83
of which						
Wheat	0.52	0.34	1.28	0.73	−0.52	1.14
Coarse grains	−0.55	−8.02	0.06	14.83	9.17	−7.97
Oilseeds	0.11	0.19	0.55	−0.18	0.03	0.55
Sugar	0.50	0.20	0.36	1.11	1.22	0.03
Milk	0.00	0.00	0.00	0.00	0.00	0.00
Butter	0.03	0.05	0.03	0.14	0.14	0.05
Beef	0.05	−0.05	0.02	0.36	0.35	−0.06
Pork	0.17	0.10	0.50	0.19	0.20	0.35
Poultry	0.10	0.19	0.05	0.87	0.89	0.20
Eggs	0.14	−0.17	0.19	−0.37	−0.29	−0.25

Table 3.4: *Continued.*

First Wave	2008				2012			
	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	2.45	13.89	5.97	−6.47	3.29	15.86	6.49	−6.09
of which								
Wheat	1.88	1.73	0.71	1.86	2.29	2.29	0.96	2.30
Coarse grains	0.57	17.53	10.19	−8.33	0.99	19.31	10.60	−3.56
Oilseeds	0.58	−0.18	0.04	0.56	0.65	−0.13	0.08	0.63
Sugar	0.54	1.09	1.15	0.20	0.63	0.96	1.09	0.30
Milk	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Butter	0.01	0.12	0.10	0.03	−0.01	0.10	0.09	0.00
Beef	0.03	0.33	0.31	−0.03	0.03	0.25	0.27	−0.02
Pork	0.51	−0.10	−0.24	0.22	0.44	−0.35	−0.35	0.00
Poultry	−0.14	0.96	0.99	0.07	−0.34	0.97	1.00	−0.09
Eggs	0.23	−0.41	−0.28	−0.25	0.23	−0.44	−0.28	−0.27

Table 3.5: Development of Production in the Second Wave Countries under Different Scenarios (Mill. tons).

Second Wave	1995–97		2002			
	NON-ACCESSION	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	25.51	26.60	27.58	27.57	27.56	29.40
of which						
Wheat	9.11	9.67	9.82	9.80	9.79	10.81
Coarse grains	16.41	16.93	17.76	17.78	17.77	18.59
Oilseeds	1.67	1.41	2.03	2.04	2.05	1.36
Sugar*	0.41	0.39	0.39	0.39	0.39	0.38
Milk	7.68	10.22	7.10	7.08	7.08	9.80
Butter	0.06	0.07	0.06	0.06	0.06	0.07
Beef	0.36	0.48	0.32	0.32	0.32	0.44
Pork	1.04	1.12	1.37	1.38	1.39	1.23
Poultry	0.46	0.31	0.57	0.56	0.56	0.40
Eggs	0.14	0.11	0.16	0.17	0.16	0.12

Table 3.5: *Continued.*

Second Wave	2008				2012			
	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	31.10	35.76	33.92	32.89	33.57	38.60	35.01	35.86
of which								
Wheat	11.10	12.63	12.19	12.27	12.06	13.79	12.65	13.49
Coarse grains	20.00	23.12	21.73	20.62	21.51	24.81	22.36	22.37
Oilseeds	1.95	0.89	1.04	1.33	1.91	0.92	1.06	1.30
Sugar*	0.44	0.39	0.39	0.44	0.48	0.40	0.40	0.49
Milk	7.82	9.30	9.30	11.07	8.42	9.30	9.30	12.12
Butter	0.06	0.08	0.07	0.07	0.06	0.07	0.07	0.07
Beef	0.34	0.54	0.54	0.47	0.35	0.54	0.54	0.50
Pork	1.65	1.32	1.32	1.36	1.80	1.45	1.38	1.46
Poultry	0.62	0.68	0.70	0.46	0.66	0.79	0.74	0.50
Eggs	0.18	0.12	0.15	0.13	0.19	0.14	0.15	0.14

* Includes C-quota sugar.

Table 3.6: Development of Domestic Use in the Second Wave Countries under Different Scenarios (Mill. tons).

Second Wave	1995–97		2002			
	NON-ACCESSION	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	25.55	25.97	27.81	27.91	27.85	28.43
of which						
Wheat	8.95	9.27	9.55	9.56	9.55	10.06
Coarse grains	16.60	16.70	18.26	18.35	18.30	18.37
Oilseeds	1.59	1.42	1.84	2.19	2.14	1.40
Sugar	0.73	0.69	0.71	0.71	0.71	0.68
Milk	7.68	10.22	7.10	7.08	7.08	9.80
Butter	0.04	0.04	0.04	0.04	0.04	0.04
Beef	0.40	0.41	0.38	0.37	0.37	0.40
Pork	1.04	1.32	1.29	1.30	1.30	1.39
Poultry	0.45	0.34	0.54	0.54	0.54	0.42
Eggs	0.13	0.13	0.13	0.13	0.13	0.13

Table 3.6: *Continued.*

Second Wave	2008				2012			
	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	30.90	32.28	32.02	31.35	33.05	34.68	32.96	33.89
of which								
Wheat	10.50	11.43	11.35	11.12	11.24	12.29	11.68	12.03
Coarse grains	20.41	20.85	20.67	20.24	21.81	22.39	21.28	21.85
Oilseeds	1.74	0.72	0.87	1.36	1.70	0.75	0.88	1.33
Sugar	0.77	0.65	0.65	0.73	0.81	0.67	0.66	0.78
Milk	7.82	9.30	9.30	11.07	8.42	9.28	9.30	12.12
Butter	0.04	0.04	0.03	0.04	0.04	0.04	0.03	0.04
Beef	0.39	0.41	0.42	0.42	0.40	0.41	0.42	0.44
Pork	1.52	1.50	1.51	1.50	1.62	1.61	1.56	1.60
Poultry	0.60	0.65	0.66	0.47	0.64	0.75	0.70	0.52
Eggs	0.13	0.13	0.13	0.13	0.14	0.13	0.14	0.14

Table 3.7: Development of Net Exports in the Second Wave Countries under Different Scenarios (Mill. tons).

Second Wave	1995–97		2002			
	NON-ACCESSION	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	−0.03	−7.68	1.34	11.72	4.66	−6.83
of which						
Wheat	0.52	0.34	1.28	−0.27	−1.58	1.14
Coarse grains	−0.55	−8.02	0.06	11.99	6.24	−7.97
Oilseeds	0.11	0.19	0.55	−0.18	0.03	0.55
Sugar	0.50	0.20	0.36	1.11	1.22	0.03
Milk	0.00	0.00	0.00	0.00	0.00	0.00
Butter	0.03	0.05	0.03	0.14	0.14	0.05
Beef	0.05	−0.05	0.02	0.36	0.35	−0.06
Pork	0.17	0.10	0.50	0.19	0.20	0.35
Poultry	0.10	0.19	0.05	0.87	0.89	0.20
Eggs	0.14	−0.17	0.19	−0.37	−0.29	−0.25

Table 3.7: *Continued.*

Second Wave	2008				2012			
	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL	NON-ACCESSION	CAP-1992	AGENDA	LIBERAL
Cereals	2.45	15.11	6.61	−6.47	3.29	17.19	7.15	−6.09
of which								
Wheat	1.88	0.65	−0.41	1.86	2.29	1.14	−0.21	2.30
Coarse grains	0.57	14.46	7.02	−8.33	0.99	16.06	7.35	−8.39
Oilseeds	0.58	−0.18	0.04	0.56	0.65	−0.13	0.08	0.63
Sugar	0.54	1.09	1.15	0.20	0.63	0.96	1.09	0.30
Milk	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Butter	0.01	0.12	0.10	0.03	−0.01	0.10	0.09	0.00
Beef	0.03	0.33	0.31	−0.03	0.03	0.25	0.27	−0.02
Pork	0.51	−0.10	−0.24	0.22	0.44	−0.35	−0.35	0.00
Poultry	−0.14	0.96	0.99	0.07	−0.34	0.97	1.00	−0.09
Eggs	0.23	−0.41	−0.28	−0.25	0.23	−0.44	−0.28	−0.27

Freeing the markets as assumed under the LIBERAL scenario has only limited effects on production compared to the scenario with unchanged agricultural policies. While wheat production remains almost at the levels of NON-ACCESSION in 2002, coarse grain production for the first wave countries is about 2.7 Mill. tons lower. Oilseeds become more attractive, because domestic prices slightly increase. Livestock production benefits from lower cereal prices for feeds and production expands slightly. All producer prices, except those for livestock, benefit from the assumed decrease of processing margins in cereals, oilseeds, sugar, and milk as well as in the case of commodities little protected from increasing world market prices. Some world market prices in small world markets (e.g. cheese, sugar) sharply increase as a result of total liberalization, especially dropping the CAP in the EU-15. In these small markets, even a slight change in net exports of big countries result in relatively high changes in world market prices. Consumption of agricultural products is higher than in the NON-ACCESSION scenario. Consumption of livestock products in particular increases, to the highest levels of all scenarios. As a result the first wave countries have lower levels of net exports of almost all agricultural products (except poultry and initially oilseeds) in the LIBERAL scenario than under current policies. Under free market conditions, the first wave countries turn into significant importers of coarse grains and then decrease in the simulation period, mainly due to technical progress and increasing world market prices. This development continues up to 2012.

In the second wave countries (Bulgaria, Latvia, Lithuania, and Romania), developments are different. This is mainly due to the fact that agricultural production in Romania and Bulgaria was partly taxed during the base period of 1995–97 due to transition-based deficiencies in the agri-food chain. In contrast, protection was positive in the first wave countries (except partly in Hungary). In the second wave countries, liberalization leads to higher domestic market prices and higher production of cereals, milk, beef, and pork. Production of other positively protected commodities, i.e. oilseeds, sugar, poultry, and eggs, drops under world market conditions (see Tables 3.5–3.7). Consumption, on the other hand, rises in Latvia and Lithuania because of lower prices in the LIBERAL scenario, but partly suffers in Bulgaria and Romania. This development leads to increasing net imports in the free market situation.

Upon accession in 2002, production of cereals in first wave countries reacts most strongly under CAP-1992 policies: coarse grain production is 6.6 Mill. tons higher than under NON-ACCESSION conditions. Rye production in

Poland, corn production in Hungary, and barley production in the Czech Republic are the main beneficiaries from the incentives of the CAP. Wheat production, on the other hand, decreases by 3 Mill. tons, because relative prices change in favor of coarse grain production. Total cereal production is 3.6 Mill. tons above NON-ACCESSION levels. Set-asides prescribe land use, though to different effective rates. The calculation of effective set-aside takes into account the amount of arable area under small-scale holdings and administrative slippage. The area of small holders falls under the simplified scheme and is exempted from set-aside. Administrative slippage is the disparity between the area which should be under set-aside and that actually set-aside. This kind of slippage is also applied in the CECs. The area of small-scale holders is assumed to be increasing and, after EU accession, slightly decreasing by country-specific rates.

In sectors with predominantly small-scale farms, like in Poland, Romania, Slovenia, and Estonia, effective set-aside is only a fraction of the nominal 10 percent. In sectors with small-scale farming like in Hungary and the Czech and Slovak Republics, effective set-aside is close to 10 percent (see Table 3.8). Since most of the arable area in the CECs is in countries with predominantly small-scale holdings, the instrument of set-aside is far less effective as a production control than in the EU-15. Compared to the EU-15 with 6.5 percent set-aside, only 2.6 percent of the area in the CECs is taken out of production.

The AGENDA scenario is providing less producer incentives as EU intervention prices for cereals decrease by 15 percent. Coarse grain production is only 4 Mill. tons higher than in the NON-ACCESSION scenario. In the AGENDA and CAP-1992 scenarios, wheat production remains at 17 Mill. tons in 2002, because wheat prices only moderately change and because world market prices become higher than the intervention price. CAP-1992 clearly sets signals for coarse grain production. As a result, oilseed production is 0.2 Mill. tons higher in the AGENDA scenario than under CAP-1992 conditions, despite the fact that the area payments of oilseeds are significantly higher than under AGENDA scenario conditions. However, some potential effects are not included in the model. Such effects could include roughage area transformed into cereal and oilseed production once farmers anticipate impending introduction of direct payments. Moreover, the effect of increased production of silage maize, which is also eligible for direct payments, is not incorporated. Hence, the model probably underestimates the potential effects of direct payments on overall area allocation.

Table 3.8: Effective Set-Aside under 10 Percent Set-Aside Rate, 2012.

	Effective Set-Aside (%)	Small-scale Holders (% of area)	Effective Set-Aside (Mill. ha)	Base Area (Mill. ha)
Lithuania	1.0	88.0	0.010	1.065
Poland	1.2	85.0	0.110	9.133
Romania	1.5	81.0	0.107	7.053
Estonia	1.8	77.0	0.006	0.314
Latvia	1.9	76.0	0.009	0.448
Bulgaria	2.0	74.7	0.051	2.501
Slovenia	2.1	73.4	0.002	0.100
Hungary	7.1	10.9	0.238	3.339
Slovak Rep.	7.6	5.0	0.073	0.968
Czech Rep.	7.7	3.7	0.144	1.874
CEC-10	2.6	67.5	0.693	26.795
EU-15	6.5	18.6	2.884	44.376

Source: National statistics; own calculations.

In the livestock sector, milk production responds considerably to accession. In 2002, around 4 Mill. tons more milk is produced under AGENDA and CAP-1992 conditions than under NON-ACCESSION conditions. Equally responsive are poultry and beef production. Only pork and egg production is lower under accession as EU-21 prices are lower than domestic prices in the NON-ACCESSION scenario. Compared to CAP-1992, livestock production benefits from lower feed costs in the AGENDA scenario. Milk production increases to the assumed quota of 23.8 Mill. tons. Under the AGENDA scenario, quotas increase by 2 percent under reforms scheduled for 2005–07. The 15 percent decrease of butter and skimmed milk powder prices has only limited effects on production of these dairy products.

Some distortions of the CAP are not visible in the market results, namely the supply side effects of quotas for highly protected sugar and dairy products. If higher quotas are assumed, average protection rapidly increases because the share of highly protected commodities enlarges.

Quotas distort production by containing supply to a predefined level. At the same time, market prices stay on a high level via intervention systems and export subsidies. In the simulations, shadow prices for the quota products are calculated. The shadow price is the price at which farmers produce

exactly the amount of the quota. Figure 3.4 compares market and shadow prices for sugar in four CECs under the AGENDA scenario in 2006. In Slovenia, sugar quotas are not binding, consequently shadow prices remain at the market price level. In Poland, Hungary, and the Czech Republic, quotas restrict production by varying degrees, i.e. most severely in Hungary and less so in Poland and the Czech Republic. This means the Czech Republic would produce the same amount of white sugar (0.38 Mill. tons), if the sugar price were 543 EUR/ton instead of the market price of 679 EUR/ton. This shows the extraordinary protection given by the CAP's sugar regime which is not visible in market balances. Sugar producers in Poland would need roughly 220 EUR/ton less than the guaranteed CAP price to produce the assumed quota of 1.78 Mill. tons; in Hungary a price of 289 EUR/ton would be sufficient to induce production of 0.35 Mill. tons of white sugar. The difference between market and shadow price is the so-called quota rents per ton, which producers receive without providing extra economic activity. These rents increase with technical progress over time. Generally lower quota rents are calculated for milk producers.

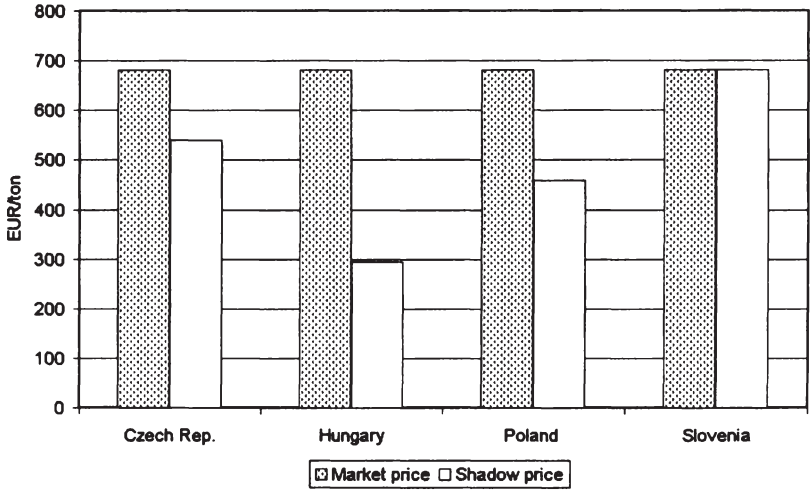

Figure 3.4: Market and Shadow Prices for Sugar in Four CECs under AGENDA Scenario Conditions, 2006.

Domestic use responds in an analogous way; increasing coarse grain prices lead to higher wheat use and lower coarse grain use in animal feed. As a result, in the CAP-1992 scenario, net exports of coarse grains expand by 14.77 Mill. tons in 2002, while at the same time in the first wave countries, exports of wheat decrease and oilseeds are net imported. In the livestock sector, dairy products in particular are increasingly exported, as are beef and poultry. In the AGENDA scenario, some of the distortions produced on agricultural markets during accession diminish; the first wave countries have 6 Mill. tons less in cereals exports.

Accession raises prices higher in the second wave countries than in the first wave countries. However, the lines of development are similar. The CAP design of 1992 increases net exports of cereals considerably on accession in 2008. At the same time oilseed production is lower than under NON-ACCESSION conditions. Therefore, the second wave countries turn into net importers of oilseeds. In the livestock sector, milk and beef production again increase while pork and egg production enjoy less favorable conditions under accession. Some of the effects in Bulgaria and Romania depend on the ability of the downstream sector to restructure and compete on the Single Market. In these simulations it is assumed that downstream efficiency adjusts to EU-15 levels.

From 2008 the CEC-10 members of the EU are considerable net exporters of cereals: 29 Mill. tons under the CAP-1992 scenario and 13 Mill. tons in the AGENDA scenario. Dairy, beef, and poultry are equally exported under these two scenarios, while pork and egg exports are smaller compared to the NON-ACCESSION scenario. The Agenda reforms remove much of the incentive to produce that existed in the unreformed CAP, though they ingrain significant protection to leave the CEC-10 considerable net exporters of agricultural commodities in 2012 compared to a free market situation and to current policies.

3.3 Budgetary Effects

As far as budget implications are concerned, ESIM generates projections only for net expenditure on trade measures, i.e. export subsidies minus tariff revenues and compensatory and headage payments. To make the model results comparable to FEOGA guarantee spending, conversion factors have been applied to include expenditures for administration and storage. These

conversion factors are based on model results for the EU-15 for the base period, that is the average of 1995–97, and the actual budgetary outlays for the model products in the same period (see Table 3.9).

These comparisons, calculated with the help of the model results and actual FEOGA spending, show that the pure model results for budgetary outlays underestimate actual spending, but overestimate direct payments for beef and export subsidies for eggs. There are several reasons for this. First, the EU-15 is exporting to different markets which requires different levels of export subsidies not displayed in the model. Moreover, intervention storage for beef and dairy products is actually more expensive than the pure export refunds. On the other hand, some commodities like poultry, eggs, and pork are partly exported without refunds, e.g. about 50 percent of pork and the majority of egg exports. This explains the overestimation of budgetary results for eggs.

On the other hand, area payments are quite accurately mirrored by the model results, except for beef premiums, which can be explained by the various ceilings for maximum payments. For example, farms only receive premiums for up to 90 heads; moreover, national and partly regional ceilings for maximum payments exist. The model therefore overestimates these payments.

It is difficult to apply these coefficients to the CECs as budget results assume they use intervention storage and exports from the so-called "free market" in equal proportions as the EU-15. This might not be the case as argued in Section 4.8. However, this simple method allows for some interpretations of aggregated results, which otherwise would not be possible.

Table 3.9: Model Results: EU Budget Expenditure as Percentage of Actual Spending for the EU-15 (actual outlays = 1).

	Market Guarantee	Direct Payments
Cereals	0.80	0.95
Dairy	0.23	
Beef	0.67	1.36
Pork	0.76	
Poultry	0.96	
Eggs	1.13	

Source: EU-Commission, 1997b; own calculations.

Figure 3.5 shows the development of market guarantee spending, i.e. outlays for export subsidies, storage, and other related spending items. The less distorting effects of the AGENDA scenario are clearly visible as market guarantee spending increases less under AGENDA than CAP-1992 scenario conditions. While the unreformed CAP increases spending to 6 Bill. EUR in 2008, the AGENDA scenario results in roughly 2.5 Bill. EUR less for market guarantee outlays. The main reason is lower intervention prices. Corresponding to smaller incentives to produce together with lower net exports, world market prices for key commodities are generally higher in the AGENDA simulations than in the CAP-1992 simulations. This, in turn, contributes to less need for export subsidies. However, compared to domestic policies, either of the two CAP designs proves to be costly in market guarantee spending. The sources of the costs are the highly protected coarse grains (barley and other grains), dairy, and in the CAP-1992 scenario, also beef.

Figure 3.6 depicts spending for direct payments in the CEC-10. Direct payments are lower in the unreformed CAP. In 2008 direct payments under the AGENDA scenario amount to 10.3 Bill. EUR, of which around 6.2 Bill. in direct payments benefit the first wave countries. In the CAP-1992 scenario, direct payments are around 1 Bill. EUR less for the CEC-10 in 2008. The difference between the two scenarios is a result of stepwise dairy payments introduced beginning in 2005, increased beef cattle payments, and differences in arable area payment.

Figure 3.7 shows the development of total budgetary outlays for the CEC-10 in different scenarios. Total liberalized markets cause no budgetary outlays because domestic prices are the same as world market prices. In the NON-ACCESSION scenario, spending for the products included in ESIM total 0.7 Bill. EUR for all CECs. On accession of the first wave countries in 2002, budgetary spending in the CAP-1992 scenario increases to 10 Bill. EUR. The AGENDA scenario causes 8 to 9 Bill. EUR of direct payments and market guarantee expenditure. When the second wave countries accede in 2008, total expenditure for the CEC-10 increases to 15 Bill. EUR in the CAP-1992 scenario, while the AGENDA scenario shows 13 Bill. EUR in budgetary outlays. Two factors explain the difference between the CAP-1992 and the AGENDA scenarios. First, the lower spending on direct payments is a result of oilseed area receiving the same payments as cereals under the AGENDA scenario. Second, the AGENDA scenario prices give less incentive to produce, especially in the first wave countries.

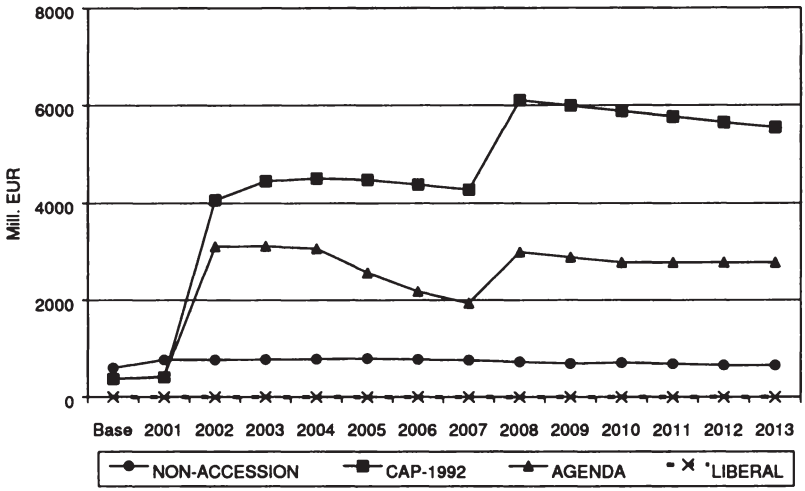

Figure 3.5: Development of Market Guarantee Outlays in the CEC-10 in Different Scenarios.

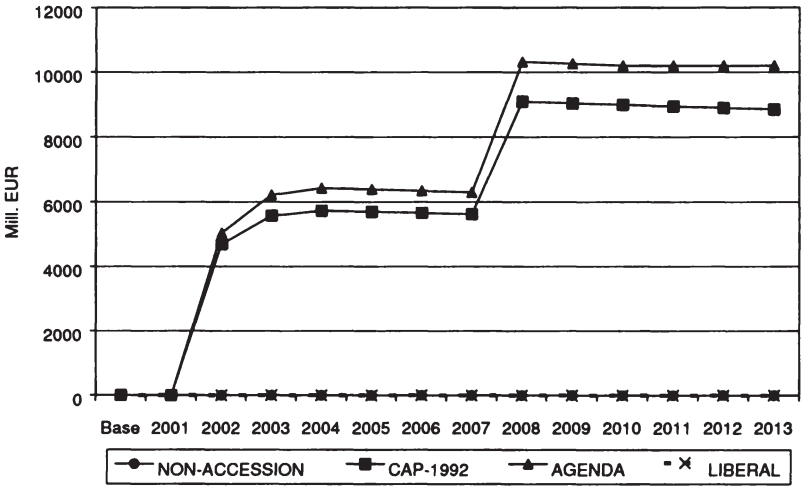

Figure 3.6: Direct Payments for the CEC-10 in Different Scenarios.

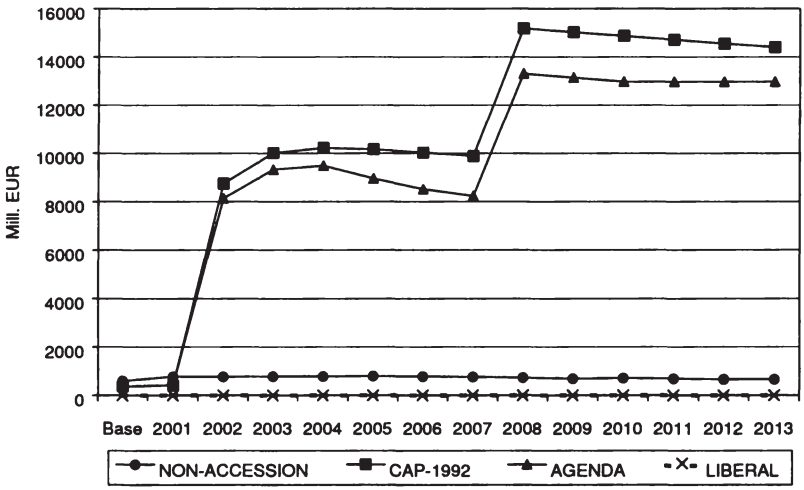

Figure 3.7: Direct Payments and Market Guarantee Outlays for the CEC-10 in Different Scenarios.

Most budgetary spending, therefore, is caused by direct payments for area and cattle. Direct payments form the largest portion of total spending, which clearly shows their political importance in the accession negotiations. Each country's share of market guarantee spending is shown in Figure 3.8. The largest outlays go to Poland and Romania with 28 and 23 percent, respectively. The Czech Republic and Hungary have a share of 12 and 11 percent, respectively. The remaining outlays go to the smaller agricultural producers.

3.4 Policy Assumptions and Budgetary Expenditure

The simulations show that direct payments of all kinds represent the majority of agricultural expenditure in the EU-15 as well as in the CEC-10. Actual market expenditure accounts for only a fraction of the expenditure. Agenda 2000 policies further increase the importance of direct payments. This element of expenditure for the CEC-10 depends primarily on the outcome of the accession negotiations, which define base area, base yields, cattle

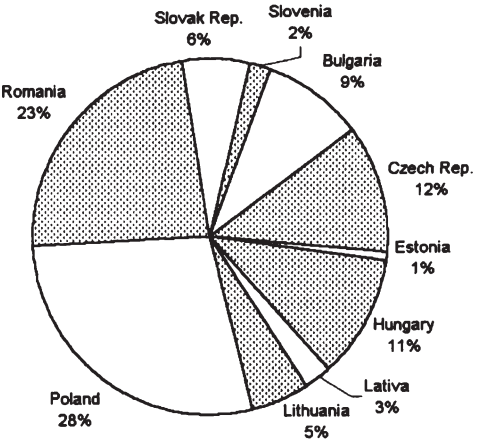

Figure 3.8: Share of Budgetary Outlays in the CEC-10, 2008.

premiums, and, by fixing the appropriate level of milk quotas, the level of direct payments for milk. The majority of the expenditure is therefore completely policy determined and varies with the political success of the EU-15, which seeks to restrict additional spending, and the ability of the CEC-10 to invest political capital in these areas. This section examines the variability of agricultural expenditure relative to the political assumptions.

Market guarantee costs are highly sensitive to assumptions made about the milk quota in the CEC-10.[4] As the amount of quota finally granted to the new members is a political question rather than a technical or statistical one, the sensitivity of market guarantee costs towards higher quota assumptions is calculated (see Table 3.10).

The calculations outside the model framework assume constant prices on world and domestic markets. It is also assumed that liquid milk and fresh milk products are the favorable produce of dairies, giving milk higher value

[4]Market expenditure assumes that all the surpluses of the EU-15 and the CEC-10 are to be exposed by government intervention and exports to world markets. Some cost-dampening effects could appear for those commodities, that are in deficit in one group of countries and in surplus in the other. These effects are not taken into account.

Table 3.10: Supply, Use, and Market Guarantee Spending under Different Assumptions for Milk Quotas in the CEC-10, 2008.

	-1 Mill. tons	2008	+1 Mill. tons	+2 Mill. tons	+3 Mill. tons
CEC-10 Quota	32.57	33.57	34.57	35.57	36.57
Supply					
SMP	0.38	0.40	0.41	0.43	0.45
Butter	0.39	0.40	0.42	0.44	0.46
Cheese	0.71	0.74	0.77	0.80	0.83
Domestic Use					
Liquid milk	8.89	8.89	8.89	8.89	8.89
Manufactured use	23.68	24.68	25.68	26.68	27.68
SMP	0.10	0.10	0.10	0.10	0.10
Butter	0.35	0.35	0.35	0.35	0.35
Cheese	0.72	0.72	0.72	0.72	0.72
Net Exports					
SMP	0.28	0.30	0.31	0.33	0.35
Butter	0.04	0.06	0.07	0.09	0.11
Cheese	−0.01	0.02	0.05	0.08	0.11
Market Guarantee Expenditure (Mill. EUR)					
SMP	386.35	410.72	435.09	460.45	485.81
Butter	720.83	1017.79	1314.76	1623.76	1932.75
Cheese	0.00	8.80	25.89	43.67	61.45
Sum of dairy	1107.17	1437.31	1775.74	2127.87	2480.01
Total market guarantee spending (Mill. EUR)	2705.46	3035.60	3374.03	3726.17	4078.30
Total market guarantee (2008 = 100)	89	100	111	123	134
Total milk production (2008 = 100)	97	100	103	106	109

added than the production of butter, SMP, and cheese. As a result of these two assumptions, domestic use of dairy products, liquid milk, and fresh milk products stays constant. However, for the supply side the model mechanism applies to the distribution of manufactured milk in the individual dairy products (see Section 2.2.5). The calculations change the milk quota in 1 Mill. ton steps starting from the assumed quota of 2008 for the CEC-10 under the AGENDA scenario. As domestic consumption stays constant, net exports balance the market. With all these restrictions, including the rather limited dairy sector modeling of ESIM, some simple conclusions can be drawn.

Market expenditure for market guarantee in dairy changes significantly for different levels of quotas. Regarding the high share of dairy in total market guarantee expenditure (45 percent for the CEC-10 in 2008), the total is highly sensitive to changes in the milk quota. An increase of the milk quota by 1 Mill. tons increases overall spending by 11 percent, 2 Mill. tons by 22 percent. This also works for a quota decrease. The setting of quotas, therefore, has much leverage on total market guarantee expenditure. Additional costs or savings arise under Agenda 2000 policies as these link direct payments for dairy cattle to the quota.

Equally sensitive are the calculations for direct payments of area. Statistical data for the CECs shows that arable area remains relatively stable, while yields vary considerably depending on weather and market conditions. Political maneuvering room for the CECs on the area side seems to be lower than the possibility of arguing for higher base yields, especially in the context of transition, bad weather, and tight markets. It is likely that arguments will be similar to those used by Spain and Portugal in the aftermath of the 1992 reform to negotiate higher base yields than justified by any reference period.

The scenarios as presented above are relatively generous regarding the choice of base yields. It is assumed that the CECs would be able to negotiate base yields to 2008 levels, even when entry takes place in 2002 for the first wave countries. If one assumes lower base yields, expenditure could be significantly less. The same holds for beef and for milk premiums as these crucially depend on reference levels.

Table 3.11 shows a calculation of different levels of area payments per country depending on the levels of base area and base yields. If the CEC-10 succeed in negotiating the implementing of base yields at possible 2008 yields, total payments would sum up to 6.7 Bill. EUR. With lower yields,

set at the average of 1995–97, total spending would be 5.2 Bill. EUR. This simple example shows that 23 percent of the direct payments for area, or 1.5 Bill. EUR, depends on the level of base yields chosen.

In the AGENDA scenario, cattle and milk premiums add up to approximately 3.7 Bill. EUR. This amount depends again on the political choices of the amount of milk quota and number of cattle premiums. In simulations, quotas and premiums represent a generous choice giving all CECs room to expand production. A restrictive base for this category of direct payments, i.e. based on the assumption that the CECs should not increase production, both direct payments for cattle and milk as well as related market expenditure would drop. With this political model, direct payments for livestock could be restricted to about half of the 3.7 Bill. EUR.

Depending on the political choices for milk quotas, direct payments for area, and the number of cattle premiums, the possible range of budgetary costs for direct payments could range from 6.5 to 10.3 Bill. EUR under Agenda 2000 policies. Total spending, including market guarantee, would then add up to 9.2 to 13.3 Bill. EUR. This difference shows the considerable incentives for both the EU-15 and the CEC-10 to invest political capital into the negotiations.

Despite the considerable variation of budgetary costs, further calculations use the standard assumption on the outcome for budget, i.e. 10.3 Bill. EUR for direct payments and 3 Bill. EUR for market guarantee.

3.5 Welfare Effects

The reference situation for welfare calculations is the LIBERAL scenario, the scenario with no market intervention policies in either the EU-15 or the CECs. The year 2008, which marks the start of the EU-25 in the simulations, serves as a focal point for the detailed discussion of welfare effects. The calculation of welfare effects is displayed for the sectoral level, taking into account the producer surplus, the compensated variation, market guarantee spending, and direct payments.

The modeling of the area allocation under direct payments prevents the use of more sophisticated welfare measures than the simple producer surplus (see Section 2.5). For the consumer side, however, simple consumer surplus and the more elaborate compensating variation have been calculated. The

Table 3.11: The Sensitivity of Expenditures for Direct Payments for Area and the Choice of the Base Yield (AGENDA Scenario).

	Standard Assumption			Alternative Assumption		
	Base Area (av. 1995–97) (Mill. ha)	Base Yield (2008) (tons/ha)	Direct Payments (2008) (Mill. EUR)	Base Yields (av. 1995–97) (tons/ha)	Direct Payments (av. 1995-97) (Mill. EUR)	Direct Payments (2008 = 100)
Bulgaria	2.5	2.9	457.4	2.4	384.3	84
Czech Rep.	1.87	5.1	604.4	4.1	479.5	79
Estonia	0.31	2.3	44.3	1.9	37.5	85
Hungary	3.34	5.1	1073.1	4.0	841.7	78
Latvia	0.45	2.6	74.8	1.9	54.4	73
Lithuania	1.07	3.2	213.7	2.3	154.4	72
Poland	9.13	3.6	2093.7	3.0	1696.8	81
Romania	7.05	3.9	1736.6	2.8	1252.5	72
Slovak Rep.	0.97	5.7	350.8	3.9	238.3	68
Slovenia	0.1	5.9	37.2	4.6	28.9	78
CEC-10	26.79	4.0	6686.0	3.1	5168.3	77

difference between the compensating variation and the consumer surplus is small. A greater difference can be expected for those products which have a high share in expenditure and a high income elasticity. This is not the case for the products used in this modeling exercise. For all CECs, the consumer surplus overestimates the consumer rent by 2 percent (see Table 3.12). In the following calculations, the compensating variation is the exclusive measurement of consumer welfare.

Table 3.13 shows the welfare effects of the NON-ACCESSION scenario. Among the CECs, large differences appear. Bulgaria, Hungary, and especially Romania show positive protection of consumers. Producers are negatively protected as some producer prices remain below comparable reference prices at the farm gate. The main cause for this taxing of producers is the downstream sector with its relatively high wholesale and processing margins. While this seems to be a characteristic in Slovenia and Hungary (see Sections 4.6 and 4.7), the situation in Bulgaria and Romania might also be driven by strong transitional effects, which the other CECs already faced in the early 1990s (see Gorton, Buckwell and Davidova, 2000). These kind of policies produce distortions, which are difficult to measure in a mar-

Table 3.12: Results of Different Measurements of Consumer Welfare Effects in the NON-ACCESSION Scenario, 2008.

	Consumer Surplus (CS)	Compensating Variation (CV)	Error of Consumer Surplus (% of CV)
Bulgaria	88.57	87.63	−1.1
Czech Rep.	−839.89	−846.27	0.8
Estonia	−52.62	−52.71	0.2
Hungary	54.46	54.54	0.1
Latvia	−46.77	−46.86	0.2
Lithuania	−208.10	−208.92	0.4
Poland	−1832.86	−1837.63	0.3
Romania	1464.83	1444.95	−1.4
Slovak Rep.	−211.74	−213.22	0.7
Slovenia	−476.65	−481.28	1.0
CEC-10	−2060.76	−2099.78	1.9

Table 3.13: Welfare Effects in the CECs and the EU-15 in the NON-ACCESSION Scenario, 2008 (Mill. EUR).

	Producer Rent	Consumer Rent	Budget	Total
Bulgaria	−32.84	87.63	59.39	−4.60
Czech Rep.	528.70	−846.27	213.27	−530.84
Estonia	48.19	−52.71	0.11	−4.63
Hungary	−123.37	54.54	17.15	−85.99
Latvia	61.16	−46.86	16.26	−1.96
Lithuania	91.36	−208.92	105.54	−223.09
Poland	1431.87	−1837.63	−2.52	−403.24
Romania	−773.50	1011.46	272.78	−34.81
Slovak Rep.	236.85	−213.22	47.95	−24.33
Slovenia	231.65	−481.28	16.41	−266.04
CEC-10	1700.07	−2533.27	746.33	−1579.53
EU-15*	55777.01†	−35287.78	23377.44†	−2888.21

* Agenda 2000 policies.

† Including 21402 Mill. EUR in direct payments.

ket model. In the other countries, domestic policies lead to protection of producers and taxing of consumers. This is especially the case in Poland, the Czech Republic, and Slovenia.[5]

In total, agricultural policies in the CEC-10 prior to EU membership lead to a loss of welfare of 1.6 Bill. EUR. The EU-15, on the other hand, completed its Agenda 2000 reforms in the simulations. Despite reforms for cereals, oilseeds, dairy, and beef, the welfare loss amounts to 2.9 Bill. EUR in 2008. This is still lower than under the unreformed CAP (for a rough comparison, see Table 3.12). Of particular note, the consumer surplus, including direct payments, is considerably lower than under CAP-1992 policies.

The accession scenarios require a more differentiated welfare analysis. Welfare effects for the individual CECs depend to a large extent on their net payment position as new members in the EU, i.e. the question of how much of the costs of agricultural trade, price, and market policies the new members will have to bear. Their exact net payer position in the enlarged EU

[5]Slovenia has slightly positive budgetary outlays for market guarantee, despite being a net importer of agricultural products. Exports of dairy products, though small in comparison to other countries, compensate for the tariff revenues from other products, e.g. cereals.

depends on the outcome of the accession negotiations. Therefore, four different net payer positions are calculated.

Another important factor is to what extent CEC farmers become eligible for direct payments. In the scenarios, CEC farmers instantly get direct payments for area and for cattle. In welfare terms, direct payments are treated like neutral transfers from taxpayers (government) to farmers.

The calculations show that the CAP is highly distortive for the CECs. Compared to the NON-ACCESSION scenario, consumer losses triple in the CAP-1992 scenario from roughly 2.5 Bill. EUR to 8.8 Bill. EUR. Producer prices increase compared to the NON-ACCESSION scenario, driven by increased wholesale prices as well as through changes of wholesale and processing efficiency (except most livestock). Agricultural production expands and producer rents exceed consumer rents as most of the countries become net exporters of agricultural commodities. Under the CAP-1992 scenario, producer rents in the CEC-10 total nearly 9 Bill. EUR, contrasting with 1.7 Bill. EUR under the NON-ACCESSION scenario. The biggest jump in producer rents takes place in the second wave countries Bulgaria and Romania, but also increases significantly in Poland and Hungary (see Table 3.14).

Generally, the same trends prevail for the AGENDA scenario (see Table 3.15). Though the reformed CAP is also highly distortive, CEC consumers face imposed costs of 2 Bill. EUR less compared to the CAP-1992 scenario. Still, the consumer bill more than doubles to 6.8 Bill. EUR compared to the NON-ACCESSION scenario. The gain of producer surplus is actually smaller than the loss of consumer rent, i.e. production expands less than under CAP-1992. Nevertheless, rents almost quadruple to 6.3 Bill. EUR compared to the NON-ACCESSION scenario. Of these, 52 percent stem from the quota products milk and sugar. If taxpayer costs are neglected for the CECs (the budget is paid by the EU-15) and only producer surplus and consumer rent are taken into account, pure market results lead to a loss of 0.5 Bill. EUR under the AGENDA scenario and a slight gain of 0.1 Bill. EUR under the CAP-1992 scenario.

Direct payments as welfare-neutral transfers from governments to producers add to producer surpluses such that producer rents for the CEC-10 total 16.6 Bill. EUR under the AGENDA scenario and 18.5 Bill. EUR under the CAP-1992 scenario. As a result, producer rents are three times the producer surplus in the AGENDA scenario and almost double that in the CAP-1992 scenario. This shows the importance of direct payments for producer in-

come in the AGENDA scenario. The biggest effect of direct payments on producer rents in the AGENDA scenario takes place in Bulgaria (eight times the producer surplus), Romania, Hungary, Slovenia, and the Slovak Republic (two to three times the producer surplus). The producer surplus in these countries is relatively small as the agricultural sectors largely produce commodities that are little protected under the CAP (see Figure 3.3). In other countries, those with a greater share of highly protected commodities (Poland or Estonia), producer surplus doubles. In conclusion, direct payments are shown to have a significant impact on producer welfare within the limited scope this market model can offer regarding distribution effects, land prices, etc.

For the EU-25, welfare losses add up to 6.2 Bill. EUR under the AGENDA scenario, 5.3 Bill. EUR less than under the unreformed CAP. With the accession of ten new members, the welfare loss from agricultural policies in the EU increases significantly in both scenarios. In view of the huge distortions of the CAP on markets in the CECs, this is not a surprising result.

The central political question, however, is who will bear these losses. Thus, in Tables 3.14 and 3.15, welfare losses are distributed among the EU-15 and the CEC-10 according to the assumed net payer status or co-financing status of the CECs versus the central EU budget. The net payer status defines the distribution of taxpayers' burden in the EU-15 and the CEC-10. Should the CECs finance 100 percent of the budgetary costs of agricultural policies, the ten countries would face a losses of 3.6 Bill. under the AGENDA scenario and 5.6 Bill. EUR under the CAP-1992 scenario. The EU-15, on the other hand, would hold their losses steady at 2.6 and 8 Bill. EUR, respectively.

This picture alters dramatically if the CECs become net receivers, i.e. contribute less to the central EU budget than they get back. If the CEC-10 contribute 66 percent of the budgetary expenditure, the balance changes from a loss to a welfare gain of 1 Bill. EUR under the AGENDA scenario and a slight loss under the CAP-1992 scenario. The losses in the EU-15, however, mount to 7 and 13 Bill. EUR, respectively. This effect of distributing the losses to the EU-15 and the gains to the CEC-10 naturally increases with the lowering of financial net contributions of the new members. In the extreme case of zero CEC contribution, the ten new members win a healthy welfare gain of 9.8 Bill. EUR and 9.6 Bill. EUR in the AGENDA and CAP-1992 scenarios, while the EU-15 would face welfare losses of 16 Bill. EUR and 23 Bill. EUR, respectively.

Table 3.14: Welfare Effects of the CAP-1992 Scenario in the CECs, the EU-15, and the EU-25, 2008 (Mill. EUR).

	Producers			Consumers	Budget		
	Producer Surplus	Direct Payment	Total Producer Rent	Compensating Variation	Market Guarantee	Direct Payment	Total Budget
	A	B	C (A+B)	D	E	F	G (E+F)
Bulgaria	300.11	596.06	896.17	−368.62	288.87	596.06	884.93
Czech Rep.	1062.96	1052.01	2114.96	−969.54	694.75	1052.01	1746.76
Estonia	89.02	65.26	154.28	−101.65	95.04	65.26	160.30
Hungary	644.08	1239.67	1883.75	−609.57	541.66	1239.67	1781.33
Latvia	206.64	161.50	368.14	−167.48	188.61	161.50	350.11
Lithuania	356.61	333.43	690.03	−323.64	546.13	333.43	879.56
Poland	4321.14	2885.28	7206.42	−3460.76	2202.60	2885.28	5087.89
Romania	1446.25	2423.58	3869.83	−2220.81	943.49	2423.58	3367.08
Slovak Rep.	427.96	607.89	1035.85	−392.98	194.72	607.89	802.61
Slovenia	123.94	182.84	306.78	−255.15	−17.63	182.84	165.21
CEC-10	8978.71	9547.52	18526.23	−8870.18	5678.25	9547.52	15225.77
EU-15	36944.92	17613.57	54558.49	−37830.75	7118.60	17613.57	24732.17
EU-25	45923.63	27161.10	73084.73	−46700.93	12796.84	27161.10	39957.94

Table 3.14: *Continued.*

	Welfare Effects				
	100% CEC Contribution	66% CEC Contribution	33% CEC Contribution	0% CEC Contribution	0% CEC Contribution No Direct Payment
	(C+D-G)	(C+D-G)*.66	(C+D-G)*.33	(C+D)	(A+D)
Bulgaria	−357.38	−56.50	235.53	527.55	−68.51
Czech Rep.	−601.33	−7.43	569.00	1145.43	93.42
Estonia	−107.66	−53.16	−0.26	52.64	−12.62
Hungary	−507.14	98.51	686.35	1274.19	34.52
Latvia	−149.44	−30.41	85.13	200.67	39.16
Lithuania	−513.17	−214.12	76.14	366.39	32.96
Poland	−1342.23	387.65	2066.65	3745.66	860.38
Romania	−1718.05	−573.25	537.89	1649.02	−774.56
Slovak Rep.	−159.73	113.16	378.02	642.88	34.99
Slovenia	−113.59	−57.41	−2.89	51.63	−131.21
CEC-10	−5569.72	−392.96	4631.55	9656.05	108.53
EU-15	−8004.43	−13181.19	−18205.69	−23230.20	−13682.67
EU-25	−13574.15	−13574.15	−13574.15	−13574.15	−13574.15

Table 3.15: Welfare Effects of the AGENDA Scenario in the CECs, the EU-15, and the EU-25, 2008 (Mill. EUR).

	Producers			Consumers	Budget		
	Producer Surplus	Direct Payment	Total Producer Rent	Compensating Variation	Market Guarantee	Direct Payment	Total Budget
	A	B	C (A+B)	D	E	F	G (E+F)
Bulgaria	152.09	1105.75	1257.84	−267.38	175.41	1105.75	1281.16
Czech Rep.	727.30	1091.39	1818.69	−712.81	414.20	1091.39	1505.59
Estonia	68.85	65.01	133.86	−73.20	74.22	65.01	139.23
Hungary	506.90	1287.10	1794.00	−463.92	233.43	1287.10	1520.52
Latvia	179.84	161.44	341.28	−133.90	155.57	161.44	317.01
Lithuania	242.82	334.51	577.34	−208.92	399.73	334.51	734.25
Poland	3038.07	2992.13	6030.20	−2554.19	956.18	2992.13	3948.31
Romania	982.24	2466.81	3449.05	−1954.29	477.13	2466.81	2943.94
Slovak Rep.	330.43	627.66	958.08	−289.61	162.11	627.66	789.77
Slovenia	108.17	186.96	295.13	−202.80	−12.38	186.96	174.59
CEC-10	6336.70	10318.77	16655.47	−6861.02	3035.60	10318.77	13354.36
EU-15	34892.45	8542.71	43435.16	−34141.66	3362.96	8542.71	11905.67
EU-25	41229.16	18861.47	60090.63	−41002.69	6398.56	18861.47	25260.03

Table 3.15: *Continued.*

	Welfare Effects				
	100% CEC Contribution (C+D-G)	66% CEC Contribution (C+D-G)*.66	33% CEC Contribution (C+D-G)*.33	0% CEC Contribution (C+D)	0% CEC Contribution No Direct Payment (A+D)
Bulgaria	−290.70	144.90	567.68	990.46	−115.29
Czech Rep.	−399.71	112.19	609.04	1105.88	14.49
Estonia	−78.57	−31.23	14.71	60.66	−4.35
Hungary	−190.45	326.53	828.30	1330.07	42.98
Latvia	−109.63	−1.84	102.77	207.38	45.94
Lithuania	−365.83	−116.18	126.12	368.42	33.90
Poland	−472.30	870.13	2173.07	3476.01	483.88
Romania	−1449.18	−448.24	523.26	1494.76	−972.05
Slovak Rep.	−121.30	147.22	407.85	668.47	40.81
Slovenia	−82.26	−22.90	34.72	92.33	−94.63
CEC-10	−3559.91	980.57	5387.51	9794.45	−524.32
EU-15	−2612.17	−7152.66	−11559.60	−15966.54	−5647.77
EU-25	−6172.09	−6172.09	−6172.09	−6172.09	−6172.09

Of the two accession scenarios, the AGENDA scenario brings higher welfare gains for the CECs when considering different net payer positions and lower additional losses for the EU-15. The simple reason is that Agenda 2000 policies are less distortive on markets than is the unreformed version of the CAP. However, the welfare calculations show that any of these two accession policies are highly distortive and produce a high welfare loss in the EU-25, however, the losses might be distributed among the member countries. More importantly, the general picture shows that consumers largely bear the costs of the CAP. In both accession scenarios, the welfare loss of consumers far exceeds market guarantee costs.

Accession also produces some direct effects on the markets of the EU-15, which are not discussed in detail here, mainly due to adjustments of market prices.[6] Compared to the NON-ACCESSION scenario, the AGENDA scenario shows that producer surplus and consumer losses decline by around 1.5 to 3.3 percent under the same policy assumptions. As a result, welfare losses of the EU-15 declined by almost 0.3 Bill. EUR. Accession puts pressure on prices for beef, pork, poultry, and eggs as export constraints for the EU-25 become tighter for these products. Moreover, the EU changes from net importer to net exporter of maize, which lowers average EU-25 maize market prices to intervention price levels.

3.6 Conclusions

The results show that the unreformed CAP is more distortive than the Agenda 2000 policies for the CECs. In the past, the CECs themselves embarked on a path of gradually adjusting protection levels to those of the CAP, while the EU-15 itself lowered prices in the Agenda 2000 reforms. As a result of these developments, price gaps diminish for cereals in the CEC-10. In the first wave countries, prices are even higher for most cereals (except for rye and most cereals in Hungary) after the implementation of the new policies. The assumed effect of the Single Market on competitiveness of the downstream sector, has positive effects on agricultural producer prices.

As a result, market reactions to the introduction of the CAP are limited. Market guarantee spending for export subsidies and storage has only a low share in total spending. Under Agenda 2000 policies, market guarantee

[6] See country results in Appendix D.

spending amounts to roughly 3 Bill. EUR for the CEC-10. This is 2.6 Bill. less than under an unreformed CAP. However, even under the less protective CAP version, this is roughly four times the spending resulting from current CEC agricultural market and trade policies.

Most of this spending is linked to the highly protected commodities under the CAP: Dairy, beef, sugar, barley, and other grains (rye). The Agenda 2000 reforms remove most of the incentives for beef. The rest of the regimes for sensitive commodities remain at highly distortive protection levels. Most of these effects are not visible in the market balances because of the supply control instruments introduced upon accession. The spending on market guarantee depends on the setting of these quotas, especially for dairy; in Poland about half the market guarantee spending under the AGENDA scenario is caused by market interventions in the dairy sector. The budgetary results are highly sensitive for changes of the dairy quotas for the CECs.

This may lead to the conclusion that the majority of sensitive market and budgetary reactions can be controlled by sufficiently tight quotas and other supply-restricting measures (much tighter than in the scenarios discussed here). In view of the low effect of set-aside on land retirement in the CECs, very high rates need to be applied to even approach a solution to the barley and other grain (rye) problem. The milk quota, however, is very efficient in capping budgetary costs. At first glance, this may solve the more daunting problems and make accession more acceptable for the old EU members in political and budgetary terms. However, this would be at the cost of depriving the new members of exploiting their production potential under the CAP, perhaps too high a political price to be paid by the new members.

The welfare calculations show that the CAP, whatever its design, is highly distortive. In these calculations, even such "budget-neutral" and potentially surplus-neutral regimes as for sugar or dairy, show their distorting nature. Of course producers benefit hugely, but consumers must foot a large part of the bill. This result is especially important in the CECs where average income per capita is much lower than in the EU-15, and consequently relative food expenditure is significantly higher (see Table 1.1). Consumers in the CECs, therefore, will be more harmed by the CAP than those in the EU-15, which may cause social problems for less affluent CEC consumers. Setting supply control measures even tighter leaves this fundamental problem of the CAP far from solved.

Most of the budgetary costs are caused by direct payments. Market guarantee spending is even less important under Agenda 2000 policies. The

majority of budgetary spending depends on political choices for direct payments for area and livestock. With the amount of payments and quotas as generous as that used in the simulations, direct payments under the CAP-1992 scenario amount to 9.5 BillÈUR. Agenda 2000 policies increase this sum to 10.3 Bill. EUR. In total, government expenditure is at roughly 13 Bill. EUR under the less protective Agenda 2000 and about 1 Bill. EUR more under the CAP-1992 scenario. The sensitivity analysis shows that a more restrictive outcome of the negotiations could effectively hold payments under Agenda 2000 policies to 6.5 Mill. EUR for direct payments and about 2.7 Bill. EUR on market-related spending.

Depending on the political choices made for milk quotas, direct payments for area, and number of cattle premiums, budgetary costs for direct payments could be considered somewhere in the range of 6.5 to 10.3 Bill. EUR under Agenda 2000 policies. Total spending including market guarantee would then add up to 9.2 to 13.3 Bill. EUR. This difference shows the considerable incentive for the EU-15 as well as for the CEC-10 to invest political capital in the negotiations.

The question of whether the CAP will cause welfare gains or losses for the CECs depends largely on their status as net payers or co-financers. A CAP policy financed in total by the CECs causes huge welfare losses of around 3.6 Bill. EUR and 5.6 Bill. EUR under Agenda 2000 and the unreformed CAP, respectively. The less the CECs contribute to the budgetary costs of accession, the more they gain. If only a third of the budgetary costs for the CEC-10 are contributed by the new members, a healthy welfare gain of 5.3 Bill. EUR under Agenda 2000 is realized. The other side of the coin, however, is that such a distribution raises the losses for the old members; welfare losses for the EU-15 increase significantly to 12 Bill. EUR as a result of additional taxpayers' costs.

In general terms, the CEC welfare gain might be interpreted, with some justification, as a transfer from the old to the new members to enable the CECs to embark on a path of further transitional reform and towards convergence with the old members. In the end, this would enable the CECs to foot a larger part of the bill as their economic prosperity increases, thus benefiting the old members.

As net budget receivers, the direct payments make up a large part of the welfare gains of the CECs from agricultural policies. This line of reasoning, however, requires taking into account additional factors, which go far beyond the scope of the market model used in this analysis. Textbook eco-

nomics tells us that landowners benefit from CAP-like policies in general, and direct payments in particular via higher land prices, the more so as the regulations additionally link payments to area.[7] This alone will harm agriculture in the CECs; as the cost of land increases, structural change is hampered (as currently in the EU). Another important aspect of judging efficiency at raising agricultural income is how active landowners are in agriculture. In countries with large-scale farming (e.g. Hungary, the Czech Republic), it is doubtful that the majority of landowners are active in agriculture, or even live in rural areas. In small-scale agricultural sectors such as Poland and Slovenia, it is unclear how much of the payments would actually be received by active farmers or used to increase pensions of retired farmers who sell or lease their land.

Significant welfare effects for the CECs can be expected from the transfers. The question of who should be the beneficiaries of such transfers and what alternative instruments cause the least distortion for further economic integration and restructuring must yet be answered for the CECs as well as for the EU-15.

[7]Direct payments for cattle are formally linked to cattle heads and to milk quotas. Since cattle production as such is linked to area, and CAP regulations for livestock payments foresee a maximum number of cattle per hectare, there is a rather strong link to area here, too.

4 Effects of Accession to the EU on Agricultural Markets and Government Expenditure in the Czech Republic, Hungary, Poland, and Slovenia: A Combined Partial and General Equilibrium Analysis

The rapidly changing equilibrium in CECs during transition is caused not only by substantial short-term policy changes, but also by considerable structural changes and changes in economic fundamentals. This poses special problems for policy analysis. This chapter addresses the effects of alternative macroeconomic developments on EU-CEC accession.

So far most partial equilibrium studies have been built on a constant real exchange rate assumption, which reach a limit when applied to inherited and new distortions in CEC transition economies. The analysis in the previous chapter neglects the special situation in transition economies, i.e. countries with a rapidly moving general equilibrium.

Exchange rates affect the agricultural sector via the price relation of tradables and non-tradables. If currencies appreciate in real terms, prices of tradables decline while prices for non-tradables remain constant. This generally leads to a decline of competitiveness in those industries which rely more on non-tradables (labor-intensive sectors), while declining prices for tradable inputs compensate some of the losses in input-intensive industries. As shown by Bojnec, Münch and Swinnen (1998), strong real appreciation of CEC currencies have led to taxation of agriculture. In the context of EU-CEC accession, real exchange rates become important; the CAP defines important instruments in EUR which must be converted to national currencies in those countries that are not members of the European Monetary Union. A real appreciation could lead to diminishing accession effects, including budgetary costs. Prices of labor, capital, and intermediates play

an important role for the competitiveness of agricultural production. The expected macroeconomic repercussions in the CECs following accession are large, because beside economy-wide changes, the agricultural sector plays a prominent role in CEC economies (see Banse, 2000). Therefore, the traditional assumption of a small agricultural sector and the rest of the economy in a steady equilibrium is even less valid in the CECs than in stable market economies.

Extending the previous analysis, the macroeconomic figures needed as exogenous parameters for simulations, i.e. exchange rates, labor costs, capital and non-agricultural intermediates, and prices of non-food consumer goods, are simulated in an analysis combining partial and CGE models (Banse, Münch, and Tangermann, 2000; Banse, 2000; Münch, 2000).

This chapter focuses on agricultural accession effects of the Agenda 2000 in a joint general and partial equilibrium analysis for four CECs: The Czech Republic, Hungary, Poland, and Slovenia, while Chapter 3 shows accession effects for ten CECs based on the stand-alone version of ESIM.

4.1 Accession Scenarios and Main Assumptions

The analysis of the effects of the future CAP on four acceding countries of Central Europe considers four different scenarios. The NON-ACCESSION and AGENDA scenarios of the previous chapter are compared with MEMBER and AGENDAPPP scenarios. Both of these latter scenarios differ in the treatment of the following macroeconomic indicators: equilibrium exchange rate, opportunity costs of labor and capital, costs for non-agricultural intermediates, and price developments of non-food consumer goods. The first part of this section explains the scenario structure, the latter part lays out the joint CGE-ESIM analysis.

The MEMBER scenario assumes that the CECs become eligible for pre-accession aid at the level granted to Spain and Portugal during their accession to the EU, but the CECs continue with their individual agricultural policies. Therefore, the NON-ACCESSION and MEMBER scenarios evaluate the same agricultural policies, although with different macroeconomic settings. When comparing NON-ACCESSION and MEMBER scenarios, the effects of increasing economic CEC-EU integration on agricultural markets without the influences of the CAP are shown (see Table 4.1).

Table 4.1: Scenario Assumptions.

	NON-ACCESSION	AGENDA	MEMBER	AGENDAPPP
Macroeconomic and cost indicators	Real exchange rates, capital costs: constant Income: country-specific rates Labor costs, other consumer prices: increase by 1 percent per year		CGE results for real exchange rates, capital, labor, input costs, income: country-specific rates	
Countries with specific scenarios	EU-15, CZ, HU, PO, SLO			
Technical progress	Neutral, conventional rates	Neutral, conventional rates	Neutral, conventional rates	Neutral, conventional rates
Total area	Constant	Constant	Constant	Constant
Policies				
Single Market and full implementation of the CAP	No	2002 (CZ, HU PO, SLO)	No	2002 (CZ, HU, PO, SLO)
Marketing and processing margin	Constant	Alignment to EU margins with Single Market	Constant	Alignment to EU margins with Single Market
Set-aside	No	10% with full accession	No	10% with full accession
Production quotas	No	In compliance with WTO restrictions on max. subsidized exports	No	In compliance with WTO restrictions on max. subsidized exports
Compensatory payments				
Area	No	Compensatory payments for area (decoupled)	No	Compensatory payments for area (decoupled)
Cattle	No	Headage payments for dairy cows and beef cattle	No	Headage payments for dairy cows and beef cattle
Trade and price policies	As currently implemented in national policies	CAP prices and tariffs Council decision March 1999	As currently implemented in national policies	CAP prices and tariffs Council decision March 1999

These macroeconomic effects of integration result from the assumed effects of implementing the Common Legislation of the EU. The new institutions reduce the risks for foreign investors and, hence, foreign direct investment increasingly flows into the countries (see Baldwin, Francois and Portes, 1997). Banse (2000) additionally assumed levels of FDI inflows similar to those in Portugal and Spain. Apart from the simple increase in capital available for the economy, FDI in the CGEs is linked to X-efficiency which translate into increasing technical progress (see Banse, 2000). Therefore, the MEMBER scenario takes into account the current pre-accession developments in the Czech Republic, Hungary, Poland, and Slovenia.

The scenarios for accession are AGENDA and AGENDAPPP. Both scenarios assume the same terms of agricultural policies and the same dates of agricultural accession. Like the previous pair of scenarios, the treatment of macroeconomic indicators differs: AGENDA assumes the development of the macroeconomic indicators, while AGENDAPPP takes the variables from joint CGE-ESIM analyses. By linking general and partial analysis in a recursive joint model structure, key macroeconomic variables, as well as the development of protection, which are usually exogenous variables in partial equilibrium models and in CGEs, respectively, are made endogenous in the overall analysis.

The indicators are based on a joint scenario structure between ESIM and the country CGEs, developed by Banse (2000). Within this joint structure, the CGEs receive the weighted average NPR for the agricultural sector,[1] while ESIM uses the development of real equilibrium exchange rates, costs of labor, capital and non-agricultural intermediates, and non-food consumer goods.

The CGEs and the partial equilibrium model are not totally integrated, i.e. a data exchange between the models takes place when scenario calculations are completed. The exchanged variables, therefore, differ from those that would have been received from a totally integrated model structure as both models instantly reacted on changes of the respective variables. In order to approach the "real" scenario value as closely as possible, a recursive scenario structure has been chosen. This procedure means to reduce the error resulting from not simultaneously solving the model. Figure 4.1 shows the recursive scenario structure: The scenarios in bold boxes are those

[1]The NPRs describe the domestic prices relative to world market prices. The sectoral NPRs show the value of production to domestic prices relative to world market prices.

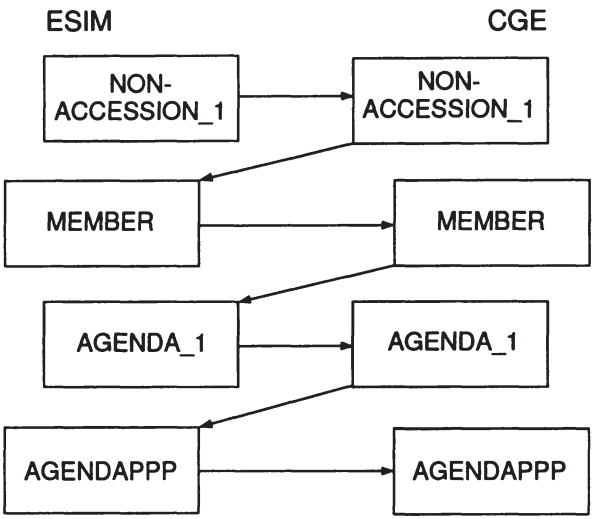

Figure 4.1: Scenario Structure of the Combined Partial and General Equilibrium Analysis.

displayed in the text, scenarios in dotted boxes are calculations to adjust the model results. For example, the NONACCESSION_1 scenario in ESIM is calculated with the assumption of continuing domestic policies without changing macroeconomic parameters. The resulting production-weighted average NPRs serve as starting values for the CGE simulations. The resulting development of macroeconomic variables is then fed into ESIM for the final calculation of MEMBER. The resulting NPRs of MEMBER then serve again as starting values for the final CGE simulations for MEMBER. The final values for the macroeconomic variables are used in the AGENDA_1 scenario in ESIM. This first agricultural accession scenario serves as a starting point for four AGENDA scenario calculations. The resulting NPRs again serve as starting point of the AGENDA_1 scenarios in the CGEs. The resulting macroeconomic developments were used for the final calculation of the accession scenarios in ESIM (AGENDAPPP). The resulting NPRs then were used in the final CGE simulations.

The CGE results are discussed in detail in Banse (2000). The financial net transfers from Brussels and the increase of labor and capital productivity assumed to occur as a result of accession have major impacts on costs (cap-

ital, wages, and intermediates) and consumer incomes as well as on real exchange rates. While capital becomes more abundant (opportunity costs of capital drop by 5 percent in the Czech Republic and 25 percent in Poland over the simulation period), wages increase by 50 percent in the Czech Republic and Hungary and almost triple in Poland by 2013. At the same time, appreciating real exchange rates (4 percent to 40 percent over the period) against EUR and USD reduce much of the producer incentives resulting from CAP prices, because their value in national currency declines. Also taking the price developments of tradable intermediates for agriculture into account, which fall by up to 6 percent, macroeconomic development clearly favors the supply of products in agriculture that are intensive in capital and intermediates (e.g. cereals). For other products that rely mainly on domestic factors (e.g. beef), the situation becomes less favorable.

4.2 Accession Effects on Agricultural Protection

Tables 4.2 and 4.3 show the developments of NPRs under different scenarios. The variation of macroeconomic indicators is especially visible in the NON-ACCESSION scenario. As the production structure changes in favor of capital-intensive and less-protected commodities such as cereals, average NPRs are lower in the MEMBER scenario in the Czech Republic, Hungary, and Poland. Slovenia, on the other hand, highly protects capital-intensive products such as cereals and oilseeds. As opportunity costs of capital decline, these highly protected commodities gain weight in Slovenia's agricultural sector. Therefore, protection increases for Slovenia in the MEMBER scenario.

The introduction of the CAP in the CECs leads to changes in agricultural protection as measured by average NPRs. After the implementation of the CAP in 2002, the average NPRs increase in the four CECs. Only in Slovenia protection decreases. After 2002, the further development of protection in the CECs is determined by the CAP, where support prices are assumed to follow the path designed under Agenda 2000 and then remain constant in nominal EUR terms.

In the AGENDAPPP scenario, the changes in macroeconomic variables are less significant when compared to the MEMBER scenario (see Appendix D). The inflow of capital far outscores the real appreciation as an effect of increasing protection in AGENDAPPP, except in Slovenia. Here a decrease

Table 4.2: Development of Average NPR under Different Non-Accession Scenarios.

	Base	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
							NON-ACCESSION							
Czech Rep.	0.43	0.41	0.40	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Hungary	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05
Poland	0.33	0.30	0.30	0.30	0.31	0.31	0.32	0.33	0.33	0.33	0.32	0.32	0.32	0.32
Slovenia	1.43	1.41	1.38	1.36	1.35	1.34	1.32	1.31	1.30	1.29	1.28	1.26	1.24	1.23
							MEMBER							
Czech Rep.	0.43	0.39	0.38	0.36	0.35	0.35	0.35	0.34	0.34	0.34	0.34	0.33	0.33	0.33
Hungary	0.06	0.05	0.04	0.01	0.00	−0.01	−0.01	−0.02	−0.03	−0.04	−0.04	−0.04	−0.05	−0.05
Poland	0.33	0.23	0.22	0.19	0.18	0.17	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.10
Slovenia	1.43	1.39	1.39	1.40	1.41	1.43	1.45	1.46	1.48	1.50	1.52	1.54	1.56	1.58
							Difference between MEMBER and NON-ACCESSION							
Czech Rep.	0.00	−0.02	−0.02	−0.03	−0.03	−0.04	−0.04	−0.04	−0.04	−0.05	−0.05	−0.05	−0.05	−0.06
Hungary	0.00	0.00	−0.01	−0.03	−0.04	−0.05	−0.06	−0.07	−0.07	−0.08	−0.09	−0.09	−0.10	−0.10
Poland	0.00	−0.07	−0.08	−0.11	−0.12	−0.14	−0.15	−0.17	−0.18	−0.19	−0.20	−0.21	−0.21	−0.22
Slovenia	0.00	−0.02	0.01	0.04	0.06	0.09	0.12	0.15	0.18	0.21	0.24	0.28	0.32	0.35

Table 4.3: Development of Average NPR under Different Agenda Scenarios.

	Base	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
							AGENDA							
Czech Rep.	0.43	0.41	0.44	0.44	0.44	0.42	0.41	0.40	0.40	0.39	0.39	0.39	0.39	0.39
Hungary	0.06	0.05	0.31	0.31	0.31	0.30	0.30	0.30	0.30	0.29	0.29	0.29	0.29	0.29
Poland	0.33	0.30	0.48	0.47	0.45	0.44	0.43	0.41	0.40	0.39	0.38	0.38	0.38	0.38
Slovenia	1.43	1.30	0.60	0.58	0.57	0.55	0.53	0.52	0.52	0.51	0.51	0.51	0.51	0.51
							AGENDAPPP							
Czech Rep.	0.43	0.39	0.44	0.43	0.43	0.41	0.40	0.39	0.39	0.38	0.38	0.37	0.36	0.36
Hungary	0.06	0.05	0.31	0.30	0.30	0.30	0.29	0.29	0.29	0.29	0.28	0.28	0.27	0.27
Poland	0.33	0.23	0.47	0.45	0.44	0.42	0.41	0.40	0.39	0.38	0.37	0.35	0.34	0.34
Slovenia	1.43	1.29	0.62	0.59	0.58	0.56	0.55	0.54	0.53	0.53	0.52	0.52	0.51	0.51
							Difference between AGENDAPPP and AGENDA							
Czech Rep.	0.00	−0.02	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.02	−0.02	−0.03
Hungary	0.00	0.00	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.02	−0.02
Poland	0.00	−0.07	−0.01	−0.02	−0.02	−0.02	−0.02	−0.02	−0.02	−0.02	−0.02	−0.03	−0.04	−0.04
Slovenia	0.00	−0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.00	0.00

of agri-food protection by 70 percentage points leads to a real depreciation. Though agriculture is an important sector in the CEC economies, the macroeconomic effects of accession move the economy far more than agricultural policies.

While the CAP imposes the same measures in all four CECs, the average level of protection across all agricultural products differs across countries. The reason is that the CAP affords different rates of protection for different products, and production structures differ among countries. Slovenia's protection is the highest under AGENDA conditions, with an initial level of 62 percent. Hungary and the Czech Republic are the countries with the lowest average NPR. Protection in the EU-15 is close to the Czech level of 45 percent. When dividing commodities into those with a high NPR (barley, other grains, sugar, milk) and a low NPR (wheat, corn, oilseeds, beef, pork, poultry, eggs) under AGENDAPPP conditions, Poland has a share of 45 percent of highly protected products in the total value of production. This share increases to 58 percent in 2003. Consequently, average NPR remains higher in these countries than in Hungary, where the share of high NPR products in total production is only 21 percent in the base period and 22 percent in 2003 under AGENDAPPP conditions.[2]

From 2002, agricultural protection decreases over time in the CECs under AGENDAPPP conditions, mainly because of increases in world market prices and a shift of agricultural production to capital-intensive, less-protected commodities. The reform of the milk market regime, i.e. a price reduction for skimmed milk powder and butter, leads to a slight drop of average protection in all countries in 2006.

In the Czech Republic and Hungary, AGENDAPPP protection is only six and nine percentage points higher than MEMBER protection in the first year of accession. In the following years, protection develops rather steadily despite real appreciating exchange rates. Under accession, administrative prices of the CAP defined in EUR determine protection in the CECs. Under constant CAP prices, the development of the EUR exchange rate against the USD determines the size of price gap, i.e. the NPR. CEC exchange rates only partly influence the internal incentives to producers and consumers. With accession, the CECs are trapped in the CAP, i.e. CEC exchange rates have no effect on the relationship between world market and domestic prices.

[2]These shares and those mentioned in Chapter 3 differ because the structure of agricultural production changes with different assumptions regarding opportunity costs for capital and labor as well as prices for intermediates.

4.3 Market Effects

When taking the macroeconomic effects into account, the results of the policy simulations alter market reactions. By 2008 in the NON-ACCESSION scenario, arable crop and intensive livestock production in the four CECs exceeds early transition levels. Only production of milk and beef remains lower than the average of 1990–91 (see Table 4.4). The macroeconomic effects of pre-accession dampen this development. In the MEMBER scenario, production of some products is lower compared to the NON-ACCESSION scenario, especially as a response to real appreciation of CEC exchange rates. However, in the long run, the decreasing opportunity costs of capital and lower prices for non-agricultural intermediates outweigh appreciating exchange rates and the increase of opportunity costs of labor. Thus the production of capital-intensive agricultural products, i.e. crops and intensive livestock, are consistently above the levels of the NON-ACCESSION scenario by 2012. Labor-intensive beef production, on the other hand, suffers from increasing labor costs as well as appreciating exchange rates. Compared to the NON-ACCESSION scenario, in 2012 cereal production is about 1 Mill. tons higher under the MEMBER scenario. Milk production is roughly 3.3 Mill. tons lower, mainly as a response to increasing labor costs. Intensive livestock production benefits from lower real feed costs and decreasing capital costs under the MEMBER scenario conditions; production is between 19 percent (eggs) and 26 percent (poultry) higher than under the NON-ACCESSION scenario.

The above general development also takes place in the AGENDAPPP scenario compared to the AGENDA scenario. On accession in 2002, appreciating exchange rates and higher labor costs lower production significantly compared to a situation without changes in exchange rates, capital, and labor costs. In the long run, however, production shifts to capital-intensive crop and livestock production. A comparison of the AGENDA and AGENDAPPP scenarios leaves the production of crops roughly four percent higher than under unchanged macroeconomic indicators. Consumption, on the other hand, is only one percent higher in the AGENDAPPP scenarios than the AGENDA scenario. Pork production is five percent higher; lower capital costs far outweigh appreciating real exchange rates.

Compared to the AGENDA scenario, livestock prices in AGENDAPPP on the Single Market are less competitive for production because of the real appreciation of CEC currencies against the EUR, despite the fact that real

Table 4.4: CEC-4 Development of Production under Different Policy Scenarios (Mill. tons).

	1990–91	1995–97	2002			
			NON-ACCESSION	MEMBER	AGENDA	AGENDAPPP
Cereals	51.42	44.19	48.15	48.56	49.09	50.21
Oilseeds	2.38	2.16	2.44	2.62	1.99	2.05
Sugar*	3.31	3.21	3.11	2.93	3.57	3.51
Milk	24.58	17.58	17.95	16.74	21.14	21.14
Butter	0.44	0.25	0.25	0.25	0.32	0.32
Beef	1.32	0.77	0.75	0.69	0.99	1.03
Pork	3.66	2.91	3.26	3.37	3.25	3.15
Poultry	0.98	1.04	1.07	1.03	1.56	1.48
Eggs	0.96	0.98	1.05	1.06	0.73	0.72
			2012			
Cereals			57.63	58.41	55.98	62.41
Oilseeds			2.88	3.83	2.37	2.72
Sugar*			3.77	3.45	3.64	3.65
Milk			21.13	17.76	21.66	21.67
Butter			0.24	0.24	0.30	0.30
Beef			0.87	0.66	0.99	0.98
Pork			3.89	4.70	3.52	3.70
Poultry			1.16	1.46	1.85	2.32
Eggs			1.24	1.48	0.88	0.98

* Includes C-quota sugar.

Table 4.5: CEC-4 Development of Total Domestic Use under Different Policy Scenarios (Mill. tons).

	1990–91	1995–97	2002			
			NON-ACCESSION	MEMBER	AGENDA	AGENDAPPP
Cereals	50.04	43.07	46.32	46.61	42.60	43.30
Oilseeds	1.94	1.89	1.91	1.70	1.72	1.72
Sugar	2.79	2.65	2.66	2.60	2.42	2.31
Milk	24.58	17.58	17.95	16.74	21.14	21.14
Butter	0.42	0.23	0.23	0.23	0.27	0.27
Beef	1.17	0.77	0.75	0.69	0.93	0.97
Pork	3.47	2.87	3.09	3.17	3.53	3.42
Poultry	0.72	0.91	0.95	0.92	0.93	0.88
Eggs	0.93	0.85	0.89	0.90	0.67	0.66
			2012			
Cereals			54.27	53.15	46.03	51.82
Oilseeds			2.43	3.14	2.20	2.50
Sugar			3.05	2.82	2.60	2.24
Milk			21.13	17.76	21.66	21.67
Butter			0.23	0.23	0.27	0.27
Beef			0.85	0.66	0.90	0.88
Pork			3.58	4.13	3.94	4.02
Poultry			1.10	1.32	1.06	1.36
Eggs			1.03	1.14	0.75	0.74

Table 4.6: CEC-4 Development of Net Exports under Different Policy Scenarios (Mill. tons).

	1990–91	1995–97	2002			
			NON-ACCESSION	MEMBER	AGENDA	AGENDAPPP
Cereals	1.38	1.12	1.83	1.95	6.49	6.91
Oilseeds	0.44	0.27	0.53	0.92	0.27	0.32
Sugar	0.52	0.57	0.45	0.34	1.15	1.21
Milk	0.00	0.00	0.00	0.00	0.00	0.00
Butter	0.02	0.02	0.02	0.02	0.04	0.05
Beef	0.15	0.00	0.00	0.00	0.06	0.06
Pork	0.19	0.04	0.17	0.20	−0.29	−0.27
Poultry	0.26	0.13	0.12	0.11	0.63	0.61
Eggs	0.03	0.14	0.16	0.16	0.05	0.06
			2012			
Cereals			3.36	5.26	9.94	10.59
Oilseeds			0.46	0.69	0.17	0.22
Sugar			0.72	0.63	1.04	1.40
Milk			0.00	0.00	0.00	0.00
Butter			0.01	0.01	0.04	0.04
Beef			0.02	0.00	0.10	0.10
Pork			0.31	0.57	−0.42	−0.32
Poultry			0.05	0.13	0.79	0.96
Eggs			0.21	0.35	0.13	0.24

appreciating exchange rates lower feed costs. Production, therefore, is lower than under MEMBER scenario conditions, although real appreciating exchange rates do not change the relative prices of commodities. As in the AGENDA scenario, relative prices in the AGENDAPPP scenario favor poultry production.

4.4 Budgetary Implications

Figure 4.2 shows the effects on budgetary expenditure of different agricultural policies and macroeconomic assumptions. Under current policies (NON-ACCESSION), agricultural expenditure for market guarantee totals 350 Mill. EUR which would gradually decline to 130 Mill. EUR.[3] Should policies maintain their current nominal level and real appreciating currencies are assumed (MEMBER), expenditure would increase rapidly to 910 Mill. EUR. This shows the protective potential of the current agricultural policies in the CECs, if combined with appreciating real exchange rates.

With implementation of the Agenda 2000 in the four CECs, expenditure for market guarantee including direct payments, increases significantly to 8 Bill. EUR (Figure 4.2). Surprisingly, the expenditure under the AGENDAPPP scenario is 500 Mill. EUR higher than the AGENDA scenario spending. This is because macroeconomic developments influence the development of production, which reshuffles the structure of trade and, therefore, expenditure for market guarantee. As capital becomes increasingly less expensive for agriculture, capital and purchased inputs for intensive production are favored; more cereals and intensive livestock products are produced. The main reason for the additional 500 Mill. EUR in spending is the increased net export of some highly protected and capital-intensive commodities (e.g. rye, barley).

As can be seen by comparing overall expenditure (including direct payments), the largest part of the extra expenditure is for direct payments for arable crops and for cattle. The spending on these items is less dependent on exchange rate developments as market guarantee because they are fixed in EUR and, as far as arable payments are concerned, only slightly coupled to production.

[3] As support prices are assumed to be set in national currencies, exchange rate revaluation raises the level of protection.

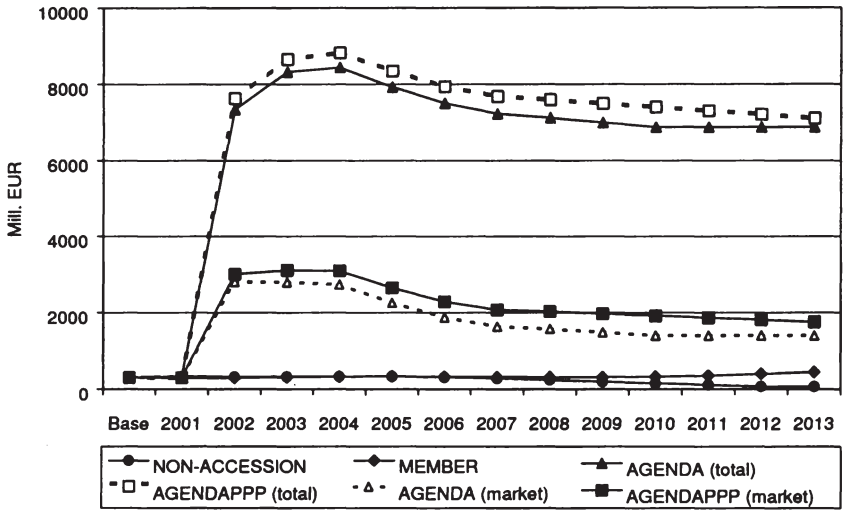

Figure 4.2: Development of Budgetary Expenditure for Market Guarantee in the CEC in Different Scenarios, 2001–13. Source: Model results, data from EU-Commission (1997b).

4.5 Conclusions

The results show that macroeconomic developments matter when analyzing the effects of accession on agricultural markets in the CECs. The development of capital and labor costs favor capital-intensive production. Labor-intensive products become less advantageous. At the beginning of accession, agricultural production develops less favorably when appreciating real exchange rates are taken into account.

The sensitivity of the results to changes in macroeconomic equilibrium conditions show the importance of extending the traditional scope of partial equilibrium analysis when examining transition economies. Bojnec, Münch and Swinnen (1998) used a stand-alone version of ESIM and varied the exchange rate assumption from the traditional constant exchange rate towards adjustment to PPP levels over the simulation period. The results showed a serious decline of competitiveness in CEC agriculture as the currencies strongly revalued in real terms.

In comparison, this analysis extends the variation of macroeconomic conditions towards other production-relevant indicators. Decreasing capital costs and a decline in purchased input prices compensate the effect of real exchange rate appreciation on producer prices.

The analysis in this chapter shows that the increasing availability and falling opportunity costs of capital in transition economies positively affects agriculture and its long-run competitiveness. Increasing opportunity costs of labor mainly affect labor-intensive products, though even for these products decreasing capital costs compensate for some labor cost-induced effects. Under this condition, Agenda 2000 policies prove to be more costly in the long run than those under unchanged macroeconomic conditions. The additional costs mainly arise from extra net exports of the highly protected cereals, feed barley, and rye.

5 Specific Case Studies: The Importance of Marketing Margins and Technical Progress in CEC-EU Accession

Two specific case studies highlight some of the effects not discussed in Chapters 3 and 4. One of the important questions of EU accession is the effect of integration on the efficiency of the downstream sector. As CAP price and trade policy instruments apply on the wholesale level and on first stage processing, protection at the farm level depends on the efficiency of the downstream sector. The more efficient the downstream sector, the higher the producer price. The scenarios in the previous chapters assume a conversion of marketing and processing margins to EU averages once the countries join the Single Market. In this chapter, this assumption is altered by comparing the effects of a conversion of the margins on accession, holding margins constant. Slovenia has been selected because its downstream sector is highly inefficient compared to the EU.

This chapter also addresses the alterations in market risks in the CECs brought by introducing the CAP. One of the results might be an increase in investments and technical progress. This assumption is tested for Hungary, which is the biggest exporter of agricultural commodities among the CECs. Other reasons for selecting Hungary are the generally competitive farm structure, especially in crop production, and a long history of high-performing agriculture. Compared to other CECs with less favorable structures, an intensification in Hungarian crop production on accession seems most probable.

5.1 Marketing Margins and Accession: The Case of Slovenia

Agricultural markets and policies in Slovenia have never been liberalized to the extent in other CECs, resulting in farmgate prices higher than in the other CECs, even approaching EU price levels. Wholesale and processing sectors have a special structure as Slovenia is a small country with high import barriers. Slovenia is a net-importing country, thus domestic prices are driven by imports. This excursus, therefore, looks a bit closer into Slovenia's agricultural policies and briefly compares them to those of the EU, before discussing the possible implications of EU integration.

5.1.1 A Comparison of Slovenian and EU Market and Trade Policies

The prime objective of Slovenian agricultural policies and the CAP is to provide income support for agriculture.[1] However, the most visible differences in price, trade and market policy instruments, and support systems results from the difference in the net trade position between the EU and Slovenia (Bojnec and Münch, 2000). The EU is a substantial net exporter of agricultural commodities, while Slovenia is a net importer. Therefore, market price support in Slovenia is delivered through import protection measures and state marketing systems rather than export subsidies. While the CAP covers a large range of products from wheat to silkworms, Slovenia focuses its support on a smaller number of products, i.e. wheat and wheat flour, sugar, and dairy. For these products, price policies are applied, while for the majority of agricultural and food products, import measures shield domestic markets.

For efficiency reasons, CAP trade and price policy instruments aim at the first stage of processing or wholesaling, e.g. intervention prices for cereals are wholesale prices not farmgate prices. Slovenia's price policies aim additionally at farmgate and, to some extent, consumer prices. The price support mechanism in Slovenia is based on direct intervention by the government in different levels of the markets (farm, wholesale/processing, retail). In comparison with the EU, Slovenia's price support system relies more heavily

[1] This section is based on Bojnec and Münch (2000).

on administrative approaches and ad hoc measures. The downstream sector in Slovenia is dominated by monopsonistic structures because markets are small in size such that often only one first-stage processing enterprise exists (e.g. sugar and oilseed) in a highly protected environment. However, government involvement in business objectives of the monopsonies is often unclear. These kinds of policies need institutions and regulations other than those found in the CAP. Therefore, substantial differences of instrumental settings and levels of market control exist between the EU and Slovenia.

The main focus of Slovenian agricultural support is the dairy sector. The government sets a basic price for milk, fixed for a certain quality, while the producer price of milk for farmers is derived from the basic price considering the quality of milk delivered to the dairy. Similarly, the CAP sets a reference price for milk. This price, however, serves only as a general guideline from which actual milk prices may deviate substantially. Dairy products are among the few products for which a surplus exists on Slovene markets. No special government intervention purchases of dairy produce for State Storage Reserves have been required in recent years. However, the government has from time to time provided official support for dairy promotion activities abroad. The main instruments of protection for the domestic milk and dairy markets are custom duties consisting of ad valorem and specific tariffs (Bojnec, 1994; 1996). The EU delivers support to the dairy sector in four ways: Direct constraints on milk production (quotas), intervention purchases of storable dairy products, export subsidies for a wide range of products, and prohibitive import barriers.

Direct payments play an increasingly important role in Slovenian agricultural policy. These have been introduced for cattle and sheep in mountainous areas, for suckler calves as well as for wheat area, and are being considered for sugar beet and corn area. Similar to EU regulations, direct payments are coupled to actual area and livestock heads. This type of policy design also indicates an alignment of agricultural support towards the CAP. However, the Slovenian scheme of direct payments rather resemble per hectare aid paid for disadvantaged areas in the EU. Therefore, these have not been included in the analysis.

In summary, agricultural markets in Slovenia are influenced by direct interventions of the government at the micro level through state and private monopolies and state trading. Their role may be diminishing as Slovenia adjusts agricultural policies to those of the CAP, and as competition increases with integration into the Single Market. The most striking differ-

ence is that CAP price policy instruments generally are not directly aimed at the farm level. Institutional prices in the CAP are applied to agricultural commodities at the first stage of wholesaling or processing. Crucial for the support to arrive at the farmgate under CAP conditions, is the vertical price transmission through the marketing and processing chain.

5.1.2 Effects of Accession to the EU

Erjavec, Rednak and Majcen (1996), Rednak and Volk (1997) and Erjavec et al. (2000) indicate that the impact of EU accession on Slovenian farm income levels largely depends on the conditions under which Slovenia joins the CAP. If Slovenian farmers join with the same status as present members, farm incomes may slightly increase. However, it is possible that the agricultural and food sector in Slovenia will be among those sectors where negative effects of EU accession are felt (Potocnik and Majcen, 1996). Hence, Erjavec, Rednak and Volk (1997) and Erjavec et al. (2000) concluded that Slovene farm incomes would increase if the EU grants Slovenian farmers the CAP including market price support, direct payments, and structural policies. In the event that compensation payments are not a part of the accession package, overall Slovenian farm incomes will still increase due to price increases and budgetary supports, but will decline for those products where producer prices are currently higher than in the EU.

As for other CECs, the downstream sector plays a prime role in the accession effects in the farm sector. Bojnec and Münch (1999) show that restructuring of the downstream sector is crucial to transmit support prices of the CAP to the farm gate. An unadjusted downstream sector would lead to a significant decrease of major producer prices. The marketing margins of Slovenia and the EU-15 differ greatly. Cereal and oilseed margins are 21 percent in Slovenia versus 9 percent in the EU-15, while those for livestock processing are closer, 12 versus 22 percent in Slovenia and the EU-15, respectively. Also Slovene sugar and milk processing margins are significantly higher than in the EU-15. While the cereal margins are based on price differences between farmgate and wholesale prices, the others are calculated by determining the reference prices for milk and sugar beets as laid down in the respective CAP regulations.

For these calculations, the CAP fixes certain processing margins related to the content of sugar in beets and protein and fat in milk. The CAP formulae convert prices of white sugar and skimmed milk powder and butter,

which are subject to price policies, back into the respective raw material prices, i.e. sugar beets and milk. In a variation of this procedure, Slovene prices for white sugar, skimmed milk powder, and butter are converted using the CAP formulae to reference prices. These artificial reference prices for milk and sugar beets are then compared to actual producer prices. The difference between these prices is lower than the calculated reference prices, by about 30 percent for sugar beet processing and around 24 percent for milk processing.

There are three main reasons for the differences in margins. First, the farm structures are small, which explains higher transport costs. Second, large portions of the downstream sector are monopsonistic in structure, resulting in taxes on agriculture; and, third, there are technical inefficiencies in comparison to EU competitors (see Gorton, Buckwell and Davidova, 2000).

Since the CAP applies its instruments at the wholesale level, the downstream sector is the avenue for transferring support to the farm gate. To specifically address the issue of marketing and processing efficiency, three scenarios are simulated. The MEMBER scenario continues Slovene agricultural policies as found in 1997 for the period of 2000–13. Accession takes place in two scenarios, i.e. AGENDAPPP and AGENDAPPP(no downstream adjustment).

AGENDAPPP holds the standard assumptions with respect to policies, macroeconomic developments, technical progress, and adjustment of wholesale and processing margin to EU-15 levels as in the previous chapter. The other accession scenario, AGENDAPPP (no downstream adjustment), just varies the latter assumption and presumes that the integration into the single market would not change the downstream efficiency in Slovenia (see Table 5.1).

The wholesaling and processing margin describes the difference between market prices and farmgate prices. Keeping the margin constant neglects any consideration concerning monopsonistic or oligopolistic behavior; demand follows an ordinary demand curve. The basic reason for treating food processing in Slovenia, as well as in the other CECs, in this simplistic way is the lack of information on competitive behavior in the CECs. Moreover, governments often dominate important marketing channels through market agencies and by ownership of firms. In particular, market agencies dominate markets as they pursue price and trade policies with a great degree of freedom. Slovenia is surely an extreme example because the State Storage Reserve acts as state trader. This implies that behavior might not be

Table 5.1: Scenario Assumptions.

	MEMBER	AGENDAPPP	AGENDAPPP (No downstream adjustment)
Macroeconomic and cost indicators	CGE results for real exchange rates, capital, labor, input costs, income: country-specific rates		
Countries with specific scenarios	EU-15, SLO		
Technical progress	Neutral, conventional rates	Neutral, conventional rates	Neutral, conventional rates
Total area	Constant	Constant	Constant
Policies			
Single Market and full implementation of the CAP	No	2002 (CZ, HU, PO, SLO)	2002 (CZ, HU, PO, SLO)
Marketing and processing margin	Constant	Alignment to EU margins with Single Market	Constant
Set-aside	No	10% with accession	10% with accession
Production quotas	No	In compliance with WTO restrictions on max. subsidized exports	In compliance with WTO restrictions on max. subsidized exports
Compensatory payments			
Area	No	Compensatory payments for area (decoupled)	Compensatory payments for area (decoupled)
Cattle	No	Headage payments for dairy cows and beef cattle	Headage payments for dairy dairy cows and beef cattle
Trade and price policies	As currently implemented in national policies	CAP prices and tariffs Council decision March 1999	CAP prices and tariffs Council decision March 1999

pure profit maximization as textbook theory on monopsonies and oligopolies suggests, but rather aims to finance a relative large bureaucracy or seeks other policy-related objectives. In light of these conditions, a conversion of Slovene marketing and processing margins might be expected between the two extremes simulated, i.e. total conversion in AGENDAPPP and no conversion in AGENDAPPP(no downstream adjustment).

5.1.3 Simulation Results of Slovene Accession to the EU

The simulation results are displayed in Table 5.2. Slovenia actually faces a decline in agri-food protection when accession to the Agenda 2000 takes place. With a continuing of domestic policies in the MEMBER scenario, the weighted average NPR decreases from 143 percent in the base to 123 percent in 2013 due to increasing world market prices. In 2002, when accession to the CAP takes place, alignment to CAP prices decreases Slovenian agricultural and food protection at the wholesale/processor level by 70 percentage points. In AGENDAPPP, this decrease of wholesale/processor protection is only partly transmitted to the farm level because handling and processing margins decline with accession, due to improved efficiency of the downstream sector. The increased efficiency of the downstream sector offset some of the reduction in wholesale and processing prices. Therefore, agricultural producer prices decline less when Slovenian agricultural and food prices adjust to average EU levels (except for sugar and dairy). Maize producer prices slightly increase as margins of around 20 percent fall to EU averages, offsetting the decline of wholesale protection. Prices for wheat, however, drop slightly. This, and set-asides, are the biggest factors reducing cereal production from 510,000 tons to 487,000 tons. Poultry and butter are the only markets where a surplus remains at 45,000 tons and 1,700 tons, respectively. Under constant marketing and processing margins, however, producer prices generally decrease further, resulting in lower production and higher net imports compared to AGENDAPPP.

The effects of margins on the livestock sector are quite different. The increase of margins, which may be interpreted as higher operation costs under common standards in the Single Market, further depress producer prices and lead to production declines. Unchanged margins, on the other hand, lead to higher production levels than in the MEMBER scenario. The effect of increasing marketing and processing efficiency on production is between 7 and 20 percent.

Table 5.2: Development of Production and Net Exports in Slovenia under Different Policy Scenarios (1,000 tons).

		2002			2012		
	1995–97	MEMBER	AGENDA PPP	AGENDA PPP (No downstream adjustment)	MEMBER	AGENDA PPP	AGENDA PPP (No downstream adjustment)
Production							
Cereals	456.59	510.65	487.11	453.49	652.96	596.83	555.64
Oilseeds	0.77	0.79	0.81	0.73	0.79	0.98	0.88
Sugar	60.74	63.29	54.97	48.63	79.12	68.86	60.92
Milk	588.00	650.95	603.43	497.91	780.99	735.82	607.15
Butter	2.10	2.12	2.55	2.10	2.14	2.45	2.02
Beef	51.93	55.60	57.80	68.49	60.31	79.38	94.05
Pork	59.83	56.56	48.30	57.06	54.13	47.53	56.14
Poultry	62.18	56.38	87.22	105.08	47.06	111.43	134.26
Net exports							
Cereals	−475.61	−394.67	−373.73	−407.34	−254.52	−428.97	−470.15
Oilseeds	−1.79	−1.77	−1.76	−1.84	−1.77	−1.61	−1.71
Sugar	−47.81	−48.46	−57.79	−64.13	−49.92	−57.57	−65.51
Butter	1.07	1.07	1.70	1.25	0.98	1.52	1.09
Beef	−4.73	0.56	−26.58	−18.89	1.09	−17.20	−2.52
Pork	−21.83	−26.38	−67.54	−58.78	−40.23	−91.89	−83.28
Poultry	13.85	3.64	45.16	63.03	−22.30	58.71	81.54

In terms of budgetary spending, Slovenia's accession increases overall government outlays only slightly. Net spending on market guarantee is negative, i.e. tariff revenues are higher than export subsidies. The net revenue is around 50 Mill. EUR. As in the other acceding CECs, the main spending item is direct payments. For area as well as dairy and beef cattle, these sum up to 200 Mill. EUR. Net total spending for Slovenia is, therefore, in the area of 150 Mill. EUR.

5.1.4 Conclusions

Slovenian farmgate prices are close to EU levels, while wholesale and processing prices exceed EU prices due to larger processing and handling margins in Slovenia. Some food processing branches are highly concentrated (e.g. sugar and oilseeds) due to the small size of the country. Regarding the relatively low market efficiency, the downstream sector could well be among the losers during and after accession. The positive or negative effects of implementing EU price policies on farms will, among others, significantly depend on the ability of the downstream sector to adjust to the competitiveness of the Single Market. The scenarios indicate that without adjustment and restructuring of Slovenia's wholesaling and processing sector, farmgate prices will decline during accession. In this case, direct payments would have an even greater political importance.

The Slovenian example shows how important the analysis of the downstream sector is, when effects of accession on the agricultural sector are considered. Slovenia certainly is an extreme example with little competition on their agri-food markets, however, other countries like Hungary also face sizeable inefficiencies in the downstream sector. Agriculture has shown its ability to adapt to new situations during transition. The Single Market, therefore, seems to be a greater challenge for the food processing industry in the CECs. Much of the possible positive benefits of accession for agriculture, especially its ability to sell, depend on the capability of the downstream sector to become competitive on the Single Market.

5.2 Rapid Technical Progress and Accession: The Case of Hungary

Compared to the other accession candidates, Hungary is the only country consistently net exporting agricultural and food products throughout the transition period. Moreover, the agricultural sector faces the lowest prices for most commodities (except sugar) in the four CECs. This can be partly explained by its landlocked geography. Consequently, Hungary must rely on relatively more expensive means of transporting its exports to the nearest seaport. Thus, Hungarian f.o.b. prices are generally lower than the standard North Sea f.o.b. prices of the EU-15. Another explanation lies in highly variable quality of cereals from year to year caused by frequent drought. A third reason is the concentrated downstream sector, though it sees less government involvement than in Slovenia. Gorton, Buckwell and Davidova (2000) show that these conditions lead to a taxation of agriculture, i.e. the policy transfers to agriculture actually remain in the downstream sector.

Out of this complexity, the focus of this analysis is on effects resulting from bridging the price gap between Hungary and the EU-15. The second aspect to be explored is the response of market in Hungary on a higher rate of technical progress (AGENDAPPP+TP).

Banse, Guba and Münch (1998) identify the evolution of comparative advantages in Hungary during accession in a disaggregated CGE of the type developed in Banse (1997b). The results were used to calculate Domestic Resource Costs, which measure international competitiveness, and Private Resource Costs, which measure competitiveness within the economy under given policy conditions. The results show that Hungarian agriculture has comparative advantages in the area of crop production and disadvantages in livestock production.

To capture some of the effects of increasing competitiveness for arable crops, the scenario AGENDAPPP has been extended by increasing technical progress by 50 percent above the annual rates for crops (AGENDAPPP+TP). Table 5.3 summarizes the scenarios.

5.2.1 Selected Results

The price gap between the EU-15 and Hungary is the largest among the first wave countries. The highest price gap is for butter at 42 percent, closely

Table 5.3: Scenario Assumptions.

	MEMBER	AGENDAPPP	AGENDAPPP+TP
Macroeconomic and cost indicators	CGE results for real exchange rates, capital, labor, input costs, income: country-specific rates		
Countries with specific scenarios	EU-15, HU		
Technical progress	Neutral, conventional rates	Neutral, conventional rates	Neutral, 1.5x conventional rates
Total area	Constant	Constant	Constant
Policies			
Single Market and full implementation of the CAP	No	2002 (CZ, HU, PO, SLO)	2002 (CZ, HU, PO, SLO)
Marketing and processing margin	Constant	Alignment to EU margins with Single Market	Constant
Set-aside	No	10% with accession	10% with accession
Production quotas	No	In compliance with WTO restrictions on max. subsidized exports	In compliance with WTO restrictions on max. subsidized exports
Compensatory payments			
Area	No	Compensatory payments for area (decoupled)	Compensatory payments for area (decoupled)
Cattle	No	Headage payments for dairy cows and beef cattle	Headage payments for dairy dairy cows and beef cattle
Trade and price policies	As currently implemented in national policies	CAP prices and tariffs Council decision March 1999	CAP prices and tariffs Council decision March 1999

followed by sugar at 46 percent, while the closest is sunseed at 98 percent of the comparable EU price. Cereal and intensive livestock prices by and large fall between these figures at around 70 to 80 percent of EU-15 prices (see Figure 3.1).

Despite the same regulations for each commodity under the CAP, average Hungarian protection after accession is the lowest of the first wave CECs. This is the effect of the Hungarian production structure, which has 78 percent of its production value in less-protected commodities, i.e. wheat, corn, oilseeds, and intensive livestock.

During accession, Hungary extends its net exports for crops despite an initial drop in 2002. Most of the increases take place in cereal, much less in oilseeds. Hungary's net exports of cereals consist of wheat and corn, both commodities where no export refunds are needed. Net exports grow to 4.39 Mill. tons; most of these exports are wheat, which is exported without subsidies. Hungarian corn makes up for most of the coarse grain exports, also exported without subsidies (see Table 5.4).

The increased technical progress for crops in AGENDAPPP+TP translates into higher production of those crops not controlled by quotas. In 2012, cereal production is 3 Mill. tons higher than in AGENDAPPP. Sunseed production is almost 25 percent higher. This leads to a 2.6 Mill. ton rise to 7 Mill. tons in net exports of Hungarian cereals than in AGENDAPPP. The additional net exports are mainly wheat, exported without subsidies to world market prices which exceed intervention prices.

However, the increase of technical progress by 50 percent in AGENDAPPP+TP expands budgetary expenditure by just 33 Mill. EUR in 2012. With almost constant direct payments, between AGENDAPPP and AGENDAPPP+TP, total expenditure for agricultural policies increases by 34 Mill. EUR.

The reason for the low responsiveness of government expenditure for market guarantee is that exports are mainly less-protected commodities such as wheat and corn. Highly protected crops, such as barley, rye, and sugar, are not important in Hungarian agricultural production or are capped by a supply quota. In other countries, however, the situation is different as highly protected cereals have a higher share in cereal production, e.g. barley in the Czech Republic and rye in Poland.

Table 5.4: Development of Production and Net Exports in Hungary under Different Policy Scenarios (Mill. tons).

		2002			2012		
	1995–97	MEMBER	AGENDA PPP	AGENDA PPP+TP	MEMBER	AGENDA PPP	AGENDA PPP+TP
Production							
Cereals	11.24	12.46	12.96	13.65	15.41	17.14	20.25
Oilseeds	0.88	1.06	0.73	0.78	1.69	1.02	1.25
Sugar	0.49	0.42	0.49	0.49	0.49	0.49	0.49
Milk	2.00	1.93	2.26	2.26	2.10	2.32	2.32
Butter	0.01	0.01	0.02	0.02	0.01	0.02	0.02
Beef	0.07	0.07	0.09	0.09	0.08	0.11	0.11
Pork	0.36	0.42	0.39	0.40	0.68	0.49	0.49
Poultry	0.37	0.38	0.63	0.64	0.51	0.99	0.99
Eggs	0.39	0.41	0.34	0.34	0.59	0.51	0.51
Net exports							
Cereals	1.65	2.44	2.58	3.19	1.97	4.39	7.03
Oilseeds	0.28	0.94	0.34	0.51	0.71	0.23	0.34
Sugar	0.09	0.02	0.22	0.22	0.09	0.25	0.25
Milk	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Butter	−0.01	−0.01	0.00	0.00	−0.01	0.00	0.00
Beef	0.00	0.00	0.04	0.04	0.00	0.05	0.05
Pork	0.07	0.13	0.09	0.09	0.39	0.16	0.16
Poultry	0.12	0.12	0.41	0.41	0.21	0.72	0.73
Eggs	0.12	0.14	0.06	0.06	0.31	0.23	0.23
Budget (adjusted) in Mill. EUR							
Export subsidies	24.63	13.98	259.78	270.15	6.44	317.08	350.13
Direct payments	0.00	0.00	2227.02	2227.02	0.00	2208.44	2209.19
Total	24.63	13.98	2486.81	2497.44	6.44	2525.52	2559.32

5.3 Conclusions

The analyses presented in this chapter address two questions that are closely related to the accession of CECs to the EU. The economic integration into the Single Market leads to reducing monopoly power, reducing levels of x-efficiency (overmanning, excessive holding of stocks, and other types of slack management practices), and finally, reaping economies of scale and learning effects (see McDonald, 1999). Inevitably, downstream sector industries, which themselves compete for markets in the enlarged EU, need to adjust where inefficiencies prevail in order to be competitive. The second question relates to the development of farm efficiency in the CECs once economic conditions change with integration into the EU. Both effects have potential impact on agricultural markets during accession.

Early in this chapter, the effects of downstream sector efficiency were addressed using the example of Slovenia, which as a small country with a highly protected downstream sector, is currently characterized by high processing margins compared to the EU. The Slovenian example shows the importance of the role of the downstream sector for the effects of accession. Slovenia is certainly an extreme example with little competition on agri-food markets. However, other countries like Hungary, Poland, and the Czech Republic, also face high inefficiencies in the downstream sector. Since agriculture has already shown its adaptability to new situations, much of the possible positive benefits of accession for agriculture, especially its ability to sell, depends on the ability of the downstream sector to become competitive on the Single Market.

The example of Hungary shows the potential effects of the crop sectors catching up to their EU equivalents. The effects on markets are relatively large and net exports for cereals are roughly 75 percent higher than with a lower rate of technical progress. The budgetary effect in Hungary is, however, relatively small as the net exports mostly consists of less-protected wheat and corn. If higher protected commodities are affected, budgetary costs of removing the surpluses would inevitably rise.

The comparison of the two case studies shows that in reality both the adjustment of the downstream sector and the potential catching up are likely to be closely linked. Agriculture will only react if price signals are transmitted from the markets through the downstream sector. Under conditions such that agriculture is fully exposed to the supply incentives of the CAP, suppliers might react by increasing production and efficiency. This shows

the potential long-term effects of accession, which might be higher than those discussed in previous chapters. Under these circumstances, the CAP will become economically less favorable for the EU-25.

6 Summary and Conclusions

6.1 Summary

The simulations in this study were defined and carried out during the summer of 1999, before the Candidate Countries and the EU-15 defined their initial positions on the agricultural chapter. The policy assumptions on direct payments, cattle premiums, and quota quantities are broadly defined as in the Common Positions of the EU-15. Certainly, the position of the EU-15 would yield lower budgetary costs than those estimated in the present work. However, despite all the recent developments in negotiations, the identified general trends on agricultural markets and budget expenditure have remained valid.

The methodological aspect of the work focuses on developing and applying a partial equilibrium model on the specific questions of CEC-EU accession. The model used is ESIM, which had been developed in a joint project between the USDA/ERS, Institute of Agricultural Economics/University of Göttingen, and Food Research Institute/Stanford University between 1992 and 1994. For this study, ESIM was further developed and adapted in various co-operations and frameworks with researchers, governments in Central and Western Europe, and the European Commission.

ESIM is a multi-country, multi-commodity, comparative static, partial equilibrium model, capable of producing a time series of results. CAP policies are modeled in great detail. Moreover, the integration of the EU-15 into the modeling framework allows for simulating various aspects of CEC-EU integration. For example, transition periods similar to those applied for Portugal and Spain as well as immediate accessions like that of Austria, Finland, and Sweden may be modeled.

This study analyzes effects of integrating the agricultural sectors of ten CECs into the EU on agricultural markets, government budgets, and the CECs' welfare. For this purpose, several scenarios have been applied to

the partial equilibrium model, and, in a combined analysis, also on country CGEs. The study proceeds in two steps. First, it follows the concepts of a classic partial equilibrium analysis for all ten CECs and the EU-15. Second, the macroeconomic developments are endogenized in a combined partial and general equilibrium analysis. This analysis is pursued for a smaller range of countries, i.e. the Czech Republic, Hungary, Poland, and Slovenia. Rather than developing new policy approaches, the study concentrates on identifying sensitive areas of existing policies.

The simulations in the classic partial equilibrium analysis, in which the macroeconomic variables are based on assumptions, pursue analyses of different policies: (1) a continuation of current (1997) CEC policies, (2) a scenario which assumes abandonment of all agricultural market, price, and trade policies in the countries represented in ESIM, (3) an accession scenario under the unreformed, 1992 CAP, and (4) an accession scenario under Agenda 2000. Accession is assumed to take place for Estonia, the Czech and Slovak Republics, Poland, Hungary, and Slovenia in 2002. A second step of accession is assumed in 2008 for Bulgaria, Latvia, Lithuania, and Romania after all envisaged Agenda 2000 reforms have been enacted in the EU (see Chapter 3).

Accession is assumed to take place without a harmonization period, i.e. without the need of transition periods for price, trade, and market policies and an immediate and complete integration into the Single Market. Neglecting the transition period for the Spanish and Portuguese accession reflects the higher state of integration of the current EU-15 compared to the EU-10. Moreover, farmers in the CECs are assumed to become instantly eligible for direct payments upon accession, which echoes the discussion in the EU, rather than speculating on when these direct payments should be implemented in the CECs.

Compared to a continuation of national policies in the CECs, i.e. no accession, surpluses increase on accession for the highly protected commodities under CAP. These are coarse grains (barley, other grains), and beef. Supply quotas effectively cap production of sugar and milk such that price increases of 35 to 80 percent for sugar and 25 to 55 percent for dairy products do not develop their full supply incentives.

Coarse grain exports in 2008 mount to 10.2 Mill. tons under Agenda 2000 policies and 17.5 Mill. tons for the first group of countries joining the EU. Slightly lower net exports of 14.4 and 7 Mill. tons appear in the second group of countries joining the EU. Of these exports, maize is less problem-

atic in terms of export subsidies; more budget sensitive are those of barley and other grains (rye). On the other hand wheat production becomes less attractive as prices actually fall in first wave countries (except Hungary). For crops in the CEC-10, set-aside appears to be less an effective instrument of supply control than in the EU-15. However, with country-specific differences: Hungary and the Czech Republic are more affected by set-asides than Poland and Slovenia.

For beef, the other budget-sensitive commodity, exports of the CEC-10 increase from 40,000 tons to 700,000 tons in both accession scenarios. Under the unreformed CAP, beef and milk prices increase substantially. Under Agenda 2000, the beef price increases less, but direct payments and lower feed costs lifts production to slightly higher levels than under the unreformed CAP.

As a result of supply growing more rapidly than demand, the need for export subsidies and other market intervention measures increases in the CEC-10 to 5.7 Bill. EUR under unreformed CAP conditions and 3 Bill. EUR under Agenda 2000 in the year 2008. While the Agenda 2000 reforms seem to relax the budgetary expenditure in this area, it is still substantial: 7.6 and 4 times higher than under a continuation of domestic policies in the first and second group, respectively.

Under the assumptions of a quota of 33.65 Mill. tons for the CEC-10, dairy intervention and export subsidies would cause about 45 percent of market guarantee spending. The actual level of the quotas in the CECs will be a result of the accession negotiations–a political rather than a technical question. The results show that an increase of 3 percent of milk production lifts total market guarantee expenditure by about 11 percent under Agenda 2000 policies. The market guarantee costs are therefore highly sensitive to the size of milk quotas. Additional costs of different quota levels arise from the fact that Agenda 2000 links direct payments for dairy cattle to the quotas.

The largest parts of the budgetary expenditure of accession in the agricultural sector are the direct payments for area and cattle. The amount of these payments depends entirely on the political outcome of the negotiations.

With a generous interpretation of the base for direct payments, these add up to 9.5 Bill. EUR under the unreformed CAP and 10.3 Bill. EUR under Agenda 2000 policies. Total expenditure for both types of accession policies are around 14.5 and 13.3 Bill. EUR for the CEC-10. This is 6 Bill. EUR more

than the Agenda 2000 financial projections for enlargement up to 2006. A more restrictive outcome, i.e. giving the CECs no room to expand beef and milk production and using comparably low reference yields, direct payments would add up to 6.5 Bill. EUR and total to 9.2 Bill. EUR in expenditures. This would be 3 Bill. EUR more than in the financial perspectives. This comparison indicates the incentives of both sides to invest political capital into the negotiations on issues related to direct payments.

The market and budget effects identify some of the distortive elements of the CAP. Further distortions, however, are covered up by supply quotas. The full distortive effects of the CAP on agricultural markets in the CECs are more clearly identified in the welfare calculations. Compared to continuing domestic polices, producer surplus without direct payments grows five fold under unreformed CAP conditions and almost four fold under Agenda 2000 conditions.

At the same time, however, consumer losses increase from 2.5 Bill. EUR under continuous domestic policies, to 8.9 Bill. EUR under the unreformed CAP and 6.9 Bill. EUR under Agenda 2000 policies. These losses of welfare are by far higher than the related market guarantee spending.

CEC agriculture would benefit even more when farmers become eligible for direct payments. In the welfare analysis, the direct payments are assumed to be welfare-neutral transfers from taxpayers to farmers (though the model recognizes the supply responses, if they are coupled to production as under the unreformed CAP). In this case, producer rents would increase from 1.7 Bill. EUR to roughly 19.2 and 19.5 Bill. EUR under unreformed and reformed CAP conditions, respectively.

The overall welfare effect of introducing the CAP, however, depends on the net payer status of the CECs vis-à-vis the central EU budget. Since the net payer status of the CECs depends on the political decisions during the accession negotiation as well as the applied policy instruments, several scenarios are constructed. If the CECs' taxpayers would finance agricultural expenditure totally then the economy would have to bear a loss of between 3.6 and 5.6 Bill. EUR (respectively Agenda 2000 and unreformed CAP). If CEC taxpayers only contribute a third of the government expenditure for direct payments and market guarantee, the economies would gain 5.3 Bill. EUR of welfare under Agenda 2000 and 4.6 Bill. EUR less under unreformed CAP conditions. In this case, welfare losses for the EU-15 would sum up to 11.6 and 15.9 Bill. EUR, respectively. Regardless of the distribution of the

taxpayer's costs among old and new members, the EU-25 loses 6.2 Bill. and 13.5 Bill. EUR welfare under both accession scenarios, respectively.

The simulations show that compared to the unreformed CAP, the Agenda 2000 reforms lighten the economic burdens of agricultural policies for the CEC-10, the EU-15, as well as for the EU-25. However, the economic losses for the consumers in the CECs are still impressive, especially considering their relatively low income level.

The above part of the analysis summarizes the classic partial equilibrium analysis, i.e. agriculture is assumed to exist in a framework of stable intersectoral relationships. This assumption, of course, is difficult to maintain in stable market economies with a small agricultural sector, but has to be regarded as even less valid in transition economies, which have undergone massive restructuring and where agriculture is an important part of the economy.

This problem and its likely effects are addressed in the second set of scenarios (Chapter 4). It is designed for four CECs, i.e. Czech Republic, Hungary, Poland, and Slovenia. It shows the effects of Agenda 2000 under assumed and endogenized macroeconomic variables, i.e. labor and capital costs, prices for non-agricultural intermediates, consumer prices, and the development of real equilibrium exchange rates.

The results of the four countries' simulations show that macroeconomic developments have an impact on the simulation results. Altering macroeconomic variables like costs and exchange rates affect the relative competitiveness of individual commodities.

In the combined analysis, the partial equilibrium model is linked to four country CGEs. Thus, average agricultural protection becomes endogenous for the CGEs, labor, capital costs, prices of non-agricultural inputs, real equilibrium exchange rates, real income, and prices of non-agricultural consumption goods become endogenous for ESIM. The models link via a recursive simulation structure.

Accession considerably changes the macroeconomic framework. Increasing inflows of foreign direct investment and financial net transfers from Brussels (based on the experience of Portugal and Spain) significantly change the macroeconomic conditions in the CECs. The increase of labor and capital productivity assumed to occur as a result of accession has major impacts on costs (capital costs, wages, and intermediates) and consumer incomes as well as real exchange rates. While capital becomes more abundant (opportunity

costs of capital drop between 5 percent in the Czech Republic and 25 percent in Poland over the simulation period), wages increase by 50 percent in the Czech Republic and Hungary and almost triple in Poland by 2013. At the same time appreciating real exchange rates (4 percent to 40 percent over the period) reduce much of the producer incentives resulting from CAP prices, because their value in national currency declines. When also taking into account the price developments of tradable intermediates for agriculture, which falls by up to 6 percent, macroeconomic development clearly favors the supply of products that are relatively capital- and intermediate-input intensive (e.g. cereals). For other products that rely mainly on domestic factors (e.g. beef), the situation becomes less favorable.

Typically, capital-intensive products are less protected under the CAP as well as under current CEC policies (except for sugar and for Slovenia in general). The macroeconomic developments change in favor of these lower protected and capital-intensive commodities. When taking macroeconomic developments into account, averaged protection for all products caused by national policies falls in the Czech Republic (-6 percent), Hungary (-10 percent), and Poland (-22 percent) until 2012. Slovenia, on the other hand, highly protects capital-intensive products such as cereals and oilseeds. As opportunity costs of capital decline, these highly protected commodities gain weight in Slovenia's agricultural sector and protection under domestic policies increases by 35 percent.

In the accession scenario for the Czech Republic, Hungary, and Poland the inflow of capital by far outscores the real appreciation of exchange rates resulting from Agenda 2000 policies such that the exchange rate response is relatively modest in the accession scenario. Slovenia, however, experiences a huge decrease of agri-food protection by 70 percentage points, which leads to a real depreciation of its currency. Though agriculture is an important sector in the CECs, the macroeconomic effects of accession generally move the economies far more than do agricultural policies. In the Czech Republic and Hungary, agricultural protection of Agenda 2000 policies in 2002 is only 6 and 9 percentage points higher than under non-accession conditions.

The macroeconomic changes realize their effects in the relatively long run. In the CEC-4, the long-run effects lead to a 12 percent higher supply of cereals, especially of coarse grains, and slightly contain beef production despite increasing producer incentives through prices and direct payments. As a result, market surpluses for cereals are higher than under non-changing key macroeconomic variables.

Market guarantee spending is about 300 Mill. EUR higher with endogenized macroeconomic variables, mainly resulting from market intervention for barley and other grains (rye). At the same time, the spending for cattle payments is slightly lower. Total expenditure is slightly less than 300 Mill. EUR higher for the four CECs than those under constant key macroeconomic indicators. In general, however, the market trends presented for the CEC-10 under non-changing key macroeconomic variables remain valid, though some alteration occurs.

6.2 Conclusions

About a decade has passed since the project of EU membership for CECs entered the political discussions. It has gained political weight since, but EU membership still seems unlikely in the very near future. Judging from the state of negotiations at the time of writing, the hugely complex agricultural chapter has yet to be negotiated.

The complexity of the CAP with its mixture of price support, supply control instruments, and direct payments has a strong impact on agricultural markets in the CECs. In terms of market effects, Agenda 2000 policies produce less expressive effects than the unreformed CAP. Sensitive market reactions and actual budgetary costs greatly depend on the supply control mechanisms.

This may lead to the conclusion that simply setting quotas and set-asides at a restrictive enough level can control the majority of sensitive market and budgetary reactions. Regarding the low effect of set-aside on land retirement in the CECs, very high rates (far above 20 percent) have to be applied to get to levels of retired land that would even begin to solve the barley and other grain (rye) problem. The milk quota, on the other hand, is more efficient in capping budgetary costs. At first sight, this may be an attractive political solution for solving the CAP problems for the CECs and the EU-15.

Such a solution, however, would deprive the CECs of expanding their production potential under the CAP, which may be argued as the price the new members would have to pay. Set-aside is a bit different in this respect as the rates have to be applied for the whole EU-25 and thus also affect the old members. Moreover, set-aside would also affect production of more competitive crops like wheat and corn as well as that of oilseeds. Though an even tighter CAP might technically solve the problems of market

and budget imbalances, market distortions would inevitably increase. The major technical question in this respect is whether such a restrictive CAP would be workable for the CECs as well as for the EU-15. The experience of current EU member countries with initial supply restrictions (such as for milk) that were too tight show that under such conditions a circumvention of the rules is so profitable for farmers, processors, and wholesalers that regulations were impossible to enforce, regardless of their complexity.

Any simple solution would not solve the underlying problems of the CAP in general. The welfare calculations presented for the CECs reveal the large distortions generated by the CAP. Producers benefit hugely, but consumers have to foot a large part of the bill. This result is especially important in the CECs, as their average income per capita is much smaller than in the EU-15. Relative household expenditure for food in the CECs is significantly higher than in the EU-15. The relatively poorer consumers in the CECs, therefore, will have to bear the costs of such a policy and will be much more affected by the CAP than their relatively richer counterparts in the old member countries. The consumers in the CECs would clearly be the losers of accession.

The question of whether the CAP will cause welfare gains or losses for the CECs depends largely on their status as net payers vis-à-vis the central EU budget, and whether farmers become eligible for direct payments. Should no direct payments be granted, the CECs face global welfare losses, even if the EU-15 were to cover all market guarantee expenditure. Should the CECs receive direct payments, they would gain welfare as net receivers.

In total, the EU-25 loses welfare. The distribution of welfare among the new and the old members depends on the net payer position of the CECs. The calculations show that the CECs are able to gain welfare if they are in a net receiver position. For the old members, the increased budget adds to the welfare losses of the CAP in their countries. This distribution of gains and losses between old and new members is the core of the complications in the accession negotiations on the agricultural chapter.

A potential welfare gain for the CECs as a result of transfers from EU-15 taxpayers to CEC farmers might be justified as a contribution from the old to the new members to enable the CECs to embark on a path of economic conversion. This, at the end of the day, would enable the CEC taxpayers to foot a larger part of the bill as their economic prosperity increases.

As direct payments play such a dominant role in determining welfare gains and losses between the CECs and the EU-15, the question arises whether such welfare gains could be efficiently distributed to help the CECs pursue a path of economic conversion via direct payments to agriculture. Regarding the effects of direct payments in increasing land prices, negative effects on structural change can be expected, the more so if the CAP were much more restrictive in supply control measures in order to control mounting surpluses and budgets.

The underlying problems of the CAP in imposing high costs on consumers, the doubtable effects of direct payments on the structure of the agricultural sector, and the potential to enormously distort agricultural markets by supply control measures might have found a fragile balance in the EU-15 under current market conditions. Whether in the future such a design of agricultural policies is bearable for the EU-15 as well as for the new members remains questionable.

Enlargement creates new problems as it reveals that the CAP (as defined in Agenda 2000) was constructed for the needs of the current member countries. The CAP is designed to preserve structures by providing high support and direct payments, which, while supporting agricultural income and conserving structures, also inhibit the movement of production factors. The acceding transition economies, which still have to undergo massive restructuring in the agri-food sector, need a different set of policies than currently provided by the CAP. Restructuring will only take place if production factors get the right signals, which can be more efficiently provided by markets than by policies. In this respect the EU can learn from the experience of liberalization in the transition economies. This implies a further reduction of market price support-related instruments of the CAP and a turn to supporting instruments to cushion and actively support the restructuring of agriculture, the food industries, and rural economies in the CECs as well as in the EU-15.

References

Adelman, I. and S. Robinson. 1978. *Income Distribution Policy in Developing Countries - A Case Study of Korea.* Cambridge: MIT Press.

Anderson K. and R. Tyers. 1995. Implication of EU expansion for European agricultural policies, trade and welfare. In *Expanding Membership of the European Union*, ed. R. Baldwin, P. Haaparanta, and J. Kiander. Cambridge: Cambridge University Press.

Anderson, K. and R. Tyers. 1993. Implication of EU expansion for European agricultural policies, trade and welfare. CEPR Discussion Paper No. 829, June. London: Centre for Economic Policy Research.

Baldwin, R., J. Francois and R. Portes. 1997. EU-Enlargement. Small Costs for the West, Big Gains for the East. Economic Policy 24 April: 125–176.

Banse, M. 1994. A demand system with special emphasis on food consumption in Hungary. Working paper. Institute for Agricultural Economics, University of Göttingen.

Banse, M. 1997a. *Die Analyse der Transformation der ungarischen Volkswirtschaft. Eine Empirische Allgemeine Gleichgewichtsanalyse unter besonderer Berücksichtigung des Agrarsektors und der Ernährungsindustrie. Schriften zu internationalen Wirtschaftsfragen. Band 23.* Berlin: Duncker und Humblot.

Banse, M. 1997b. Macro-economic Implications of EU-Accession. In *Agricultural Implications of CEEC Accession to the EU*, ed. S. Tangermann. Midterm Report to the European Commission. FAIR1-CT95-0029. Göttingen: University of Göttingen.

Banse, M. 2000. Macro-economic Implications of EU-Accession. In *Central and Eastern European Agriculture in an Expanding European Union*, ed. S. Tangermann and M. Banse. Oxon: CAB International.

Banse, M. and S. Tangermann. 1998. Agricultural Implications of Hungary's Accession to the EU. Partial versus General Equilibrium Effects. In *Economic Transition and the Greening of Agricultural Policies: Modelling New Challenges for Agriculture and Agribusiness in Europe*, ed. M. Brockmeier et al. Kiel: Vauk-Verlag.

Banse, M. and W. Münch. 1998. Die Einführung einer GAP auf den Märkten in den Beitrittsländern Mitteleuropas: Effekte der gegenwärtigen GAP und der Agenda 2000. *Agrarwirtschaft. Zeitschrift für Betriebswirtschaft, Marktforschung und Agrarpolitik* 3/4 1998: 180–195.

Banse, M., W. Guba and W. Münch. 1998. Eastern Enlargement of the EU: How competitive is the Agri-Food Sector in Central Europe under EU conditions? The Example of Hungary and Poland. Paper presented at the EAAE/ISHS Conference: Understanding Competitiveness, 22–24 April, Apeldoorn.

Banse, M., W. Münch and S. Tangermann. 2000. Accession of the Central European Countries to the EU: Implications for Agricultural Markets, Trade, Government Budgets and the Macroeconomy in Central Europe. In *Agriculture and East-West European Integration*, ed. J.G. Hartell and J.F.M. Swinnen. Aldershot: Ashgate.

Bojnec S., W. Münch and J.F.M. Swinnen. 1998. Exchange Rates and the Measurement of Agricultural Price Distortions in the CEECs and of CEEC-EU Accession Costs. Working Paper 1/3. Institute of Agricultural Economics. University of Göttingen.

Bojnec, S. 1994. Agricultural Reform in Slovenia. In *Policy and Institutional Reform in Central European Agriculture*, ed. J.F.M. Swinnen. Aldershot: Avebury.

Bojnec, S. 1996. The Cereal and Oilseed Sectors of Slovenia: Recent Policy Development and Main Issues. Paper presented to the OECD Group on Cereals, Animal Feeds and Sugar, 14–17 October, Paris.

Bojnec, S. and J.F.M. Swinnen. 1997. The Pattern of Agricultural Price Distortions in Central and Eastern Europe. *Food Policy* 22(4): 289–306.

Bojnec, S. and W. Münch. 2000. Slovenia's Accession to the EU: Implications for the Agricultural Sector. In *Agriculture and East-West European Integration*, ed. J.G. Hartell and J.F.M. Swinnen. Aldershot: Ashgate.

Bojnec, S. and W. Münch. 1999. Implications of Agricultural Accession to the European Union: the Case of Slovenia. *Agricultural Transition and European Integration* (Special Issue: Moct/Most—Economic Policy in Transitional Economies) 9(3): 345–71.

Brosig, S. 1999. Determinanten des Nahrungsmittelkonsums in Mitteleuropa. PhD. diss., Department of Agricultural Economics, University of Göttingen. Buckwell, A. and S. Tangermann. 1997. The CAP and

Central and Eastern Europe. In *The Common Agricultural Policy*, 2nd ed., ed. C. Ritson and D.R. Harvey. Oxon: CAB International.

CAP Monitor. Various issues. London: AgraEurope.

Chambers, R.G. 1988. *Applied Production Analysis. A Dual Approach.* Cambridge: Cambridge University Press.

Chavas, J. P. and T. L. Cox. 1996. On Market Equilibrium Analysis. Agricultural Economics Staff Paper Series. University of Wisconsin-Madison.

Chiang, A. C. 1984. *Fundamental Methods of Mathematical Economics.* Auckland: McGraw-Hill.

Erjavec, E., S. Kavcic, G. Mergos and C. Stoforos. 2000. Slovenian Agricultural Policy Options in View of Future Accession to the EU. Contributed Paper for the XXIVth Conference of the International Association of Agricultural Economists, August 15–18, Berlin.

Erjavec, E., J. Turk, L. Mizzi, G.J. Mergos and T. Cunder. 1997. A System of Demand Analysis for Food in Slovenia. Working paper. University of Ljubljana.

Erjavec, E., M. Rednak and B. Majcen. 1996. *Slovensko kmetijstvo in evropske integracije: Ucinki vkljucevanja Slovenije v mednarodno integracijo na slovensko kmetijstvo.* Working paper. University of Ljubljana.

Erjavec, E., M. Rednak and T. Volk. 1997. *Slovensko kmetijstvo in Evropska Unija.* Ljubljana: CZD Kmecki Glas.

EU-Commission. 1995. *Agricultural Situation and Prospects in the Central and Eastern European Countries: Summary Report.* Brussels: EU Directorate General for Agriculture (DG VI).

EU-Commission. 1997a. *Agenda 2000*, Vol. I and II. Brussels: EU Commission.

EU-Commission. 1997b. *Twenty-Fifth Financial Report concerning The European Agricultural Guidance and Guarantee Fund E.A.G.G.F. Guarantee Section.* Brussels: EU-Commission.

EU-Commission. 1998. *Agenda 2000. The legislative proposal.* Brussels: EU-Commission.

EU-Commission. 1999. Agriculture Council: Political Agreement on CAP Reform. In *Newsletter: Special Edition.* `http://www.europa.eu.int/comm/dg06/publi/newsletter/spec1_en.htm`. 7 April.

EU-Commission. Fact Sheets. Various issues. Brussels: EU-Commission.

EU-Council. 1999. *Legislative Journal* 160/1 - 160/113. Brussels: EU-Council. European Commission. 1997. *Twenty-Fifth Financial Re-*

port concerning The European Agricultural Guidance and Guarantee Fund E.A.G.G.F. Guarantee Section. Brussels: European Commission.

Eurostat. 2000a. *Yearbook Candidate Countries.* Luxembourg.

Eurostat. 2000b. *Labour Force Survey in the Candidate Countries. Annual Report 1999.* Luxembourg: European Commission.

Feger, F. and D. Müller. 1999. Strong separability in the binary and extended partition and the functional structure of the dual profit function. Working paper in series Diskussionsbeitrag No. 9904. Institute of Agricultural Economics, University of Göttingen.

Frohberg, K., M. Hartmann, P. Weingarten, O. Wahl and A. Fock. 1998. Development of CEEC Agriculture under Three Scenarios - Current CEEC Policies, CAP 1995/96, Agenda 2000. In *Economic Transition and the Greening of Agricultural Policies: Modelling New Challenges for Agriculture and Agribusiness in Europe*, ed. M. Brockmeier et al. Kiel: Vauk-Verlag.

Gerken, A. 1997. *Die Außenhandelspolitik der Europäischen Union bei landwirtschaftlichen Verarbeitungsprodukten. Ausgestaltung, Auswirkung und Anpassung an die GATT Bestimmungen.* Kiel:Wissenschaftsverlag Vaux.

Gorton, M., A. Buckwell and S. Davidova. 2000. Transfers and Distortions Along CEEC Food Supply Chains. In *Central and Eastern European Agriculture in an Expanding European Union*, ed. S. Tangermann and M. Banse. Oxon: CAB International.

Halpern, L. and D. Wyplosz. 1996. Equilibrium Real Exchange Rates in Transition Economies. IMF Working Paper WP/96/125. Washington: International Monetary Fund.

Hartell, J. G. and J. F. M. Swinnen. 1997. Trends in Agricultural Price and Trade Policy Instruments since 1990 in Central European Countries. Policy Research Group Working Paper No. 4. Department of Agricultural Economics, Catholic University of Leuven.

Hathaway, D.E. and M.D. Ingco. 1995. Agricultural Liberalization and the Uruguay Round. Paper presented at the World Bank Conference: The Uruguay Round and the Developing Economies, 26–27 January, Washington.

Hertel, T.W. and M.E. Tsigas. 1997. Structure of GTAB. In *Global Trade Analysis. Modeling and Application*, ed. T. W. Hertel. Cambridge: Cambridge University Press.

Jackson, M. and J.F.M. Swinnen. 1994. *A Survey and Evaluation of the Current Situation and Prospects of Agriculture in the Central*

and Eastern European Countries with Emphasis on Six States with European Agreements. Final Report to the European Commission. Catholic University of Leuven.

Josling, T.E. and S. Tangermann. 1994. The Significance of Tariffication in the Uruguay Round Agreement on Agriculture. Paper presented to the North American Policy Research Consortium Workshop on Canadian Agricultural Policy, 14 May, Vancouver.

Layard, P.R.G. and A.A. Walters. 1987. *Microeconomic Theory.* Auckland: McGraw-Hill.

Macours, K. and J.F.M. Swinnen. 1997. Causes of Output Decline in Economic Transition: The Case of Central and Eastern European Agriculture. Policy Research Group Working Paper No. 11. Department of Agricultural Economics, Catholic University of Leuven.

McDonald, F. 1999. Market Integration into the European Union. In *European Economic Integration*, 3rd ed., ed. F. McDonald and S. Dearden. Harlow: Longman.

Münch, W. 1995. Possible Implications of an Accession of the Visegrad Countries to the EU. Can the CAP do without Reform? Paper presented at the Agricultural Economic Society One-Day Conference, 13 December, London.

Münch, W. 1997a. Competitiveness of Poland's Agriculture and Processing Industries under EU-Conditions. In *Analysis of Polish Agriculture and Food Economy's Competitiveness and Complementarity in Regard to EEC/EU over the Time Span 1990–1995 and Forecast until 2002. Final Report for the Polish Ministry of Agriculture and Food Economy*, ed. GFA. GFA: Hamburg.

Münch, W. 1997b. Effects of CEC-EU Accession on Agricultural Markets and Government Budgets in the CEC. In *Agricultural Implications of CEEC Accession to the EU*, Midterm Report, ed. S. Tangermann. Midterm Report to the European Commission. FAIR1-CT95-0029. Göttingen: University of Göttingen.

Münch, W. 2000. Effects of CEEC-EU Accession on Agricultural Markets in the CEEC and on Government Expenditure. In *Central and Eastern European Agriculture in an Expanding European Union*, ed. S. Tangermann and M. Banse. Oxon: CAB International.

Nölle, F. 2000. Die Auswirkungen der McSharry-Reform: Quantitative Analyse im Rahmen eines Marktmodells. Masters' thesis, Department of Agricultural Economics, University of Göttingen.

OECD. 1987. *National Policies and Agricultural Trade.* Paris: OECD.

OECD. 1989. *Impacts of Agricultural Reform on Production Inputs. Working Party on Agricultural Policies and Markets of the Committee for Agriculture.* Joint Working Party of the Committee for Agriculture and the Trade Committee. Paris: OECD.

OECD. 1992. *AGLINK: Introduction and Overview of the Main Characteristics. Working Party on Agricultural Policies and Markets of the Committee of Agriculture.* Joint Working Party of the Committee for Agriculture and the Trade Committee. Paris: OECD.

OECD. 1994a. *Review of Agricultural Policies: Hungary.* Paris: OECD.

OECD. 1994b. *Review of Agricultural Policies. Poland.* Paris: OECD.

OECD. 1995. *Review of Agricultural Policies. Czech Republic.* Paris: OECD.

OECD. 1996a. *Review of Agricultural Policies. Estonia.* Paris: OECD.

OECD. 1996b. *Review of Agricultural Policies. Latvia.* Paris: OECD.

OECD. 1996c. *Review of Agricultural Policies. Lithuania.* Paris: OECD.

OECD. 1997. *Review of Agricultural Policies. Slovakia.* Paris: OECD.

OECD. 2000a. *Countries in Transition Database.* Paris: OECD.

OECD. 2000b. *Monitoring and Evaluation: Transition Economies.* Paris: OECD.

OECD. 2000c. *PSE and CSE Database.* Paris: OECD.

OECD. 2000d. *Review of Agricultural Policies: Romania.* Paris: OECD.

Overberg, B. 1996. *Die Auswirkungen der Europaabkommen mit den mitteleuropäischen Ländern auf den Agrarhandel. Schriftenreihe des Bundesministeriums fuer Ernaehrung, Landwirtschaft und Forsten: Reihe A: Angewandte Wissenschaft: 451.* Bonn: Bundeministerium fuer Ernaehrung, Landwirtschaft und Forsten.

Pohl-Nielsen, C. 1999. *Enlargement of the European Union. A Survey of Quantitative Analyses. Rapport No 106.* Copenhagen: Danish Institute of Agriculture and Fisheries Economics (SJFI).

Potocnik, J. and B. Majcen. 1996. *Slovenia and the European Union: Analysis of Possible Consequences of Approaching Europe: CGE Approach.* Ljubljana: Institute for Economic Research.

Rednak, M. and T. Volk. 1997. Slovene Agriculture and the European Union. In *Agricultural Accession of the Central and Eastern European Countries to the European Union*, ed. M. Soma. Budapest: Institute for World Economics of the Hungarian Academy of Sciences.

Roningen, V.O. and P.M. Dixit. 1989. *Economic Implications of Agricultural Policy Reform in Industrial Market Economies.* Washington: USDA/Economic Research Service, Agriculture and Trade Division.

Roningen, V.O., J. Sullivan and P.M. Dixit. 1991. *Documentation of the Static World Policy Simulation (SWOPSIM) Modeling Framework.* Staff Report AGES 9151. Washington: USDA/Economic Research Service.

Samuelson, P. 1952. Spatial price equilibrium and linear programming. *American Economic Review* 42: 283–303.

Schmidt, E. 1991. Analyse der Beschaffungspolitik von Zuckerfabriken in der BR Deutschland. *Agrarwirtschaft* 40, No. 11: 340–49.

Tangermann, S. 1994. Aspects of Integration Between Western and Eastern Europe: West looks East, Proceedings of the Seventh Congress of the European Association of Agricultural Economists. *European Review of Agricultural Economics* 21(3/4): 375–392.

Tangermann, S. and T.E. Josling. 1994. *Pre-Accession Agricultural Policies for Central Europe and the European Union.* Study commissioned by the European Commission (DG I). Göttingen: University of Göttingen.

Tangermann, S. and W. Münch. 1995. *Agriculture in Poland, the Czech and Slovak Republics and Hungary and Possible Evolutions in the Medium Term - using the ESIM Sector Model.* Final Report to the European Commission (DGVI). Göttingen. University of Göttingen.

Tangermann, S. and W. Münch. 1997. Sugar Markets in Central Europe and Eastward Enlargement of the European Union. Working paper in the series Diskussionsbeitrag No. 9705. Institute for Agricultural Economics, University of Göttingen.

Waquil, P. D. and T. L. Cox. 1995. Spatial Equilibrium with Intermediate Products: Implementation and Validation in the MERCOSUR. Agricultural Economics Staff Paper Series. University of Wisconsin-Madison.

Weyerbrock, S. 1996. East-West Integration in Europe: A General Equilibrium Analysis of the Budgetary and Trade Implications. Paper presented at the 1997 AAEA Annual Meeting, November (1996), Toronto.

Williamson, J.W. ed. 1994. *Estimating Equilibrium Exchange Rates.* Washington: Institute for International Economics.

ZMP. 1997. *Agrarmarktordnungen in der Europischen Union und Agrarmrkte in Deutschland.* Bonn.

ZMP. Various issues. *Osteuropa Agrarmärkte - aktuell.*

Appendices

A Appendix: Price Gaps and Macroeconomic Assumptions

Table A.1: Gap between EU Producer Prices to CEC Producer Prices and World Reference Prices (EU-15 = 0).

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000(e)
					WHEAT					
Bulgaria	-66	-71	-48	-63	-61	-27	-8	-41	-47	-21
Czech Rep.	-65	-62	-47	-45	-48	-28	-16	-21	-11	-29
Estonia		-49	-53	-46	-28	-3	4	-17	-28	-21
Hungary	-66	-61	-43	-45	-51	-10	-24	-48	-27	-15
Latvia		-27	-61	-48	-27	-3	-8	-20	-25	-1
Lithuania		-74	-65	-59	-28	-5	-13	-28	-16	
Poland	-65	-47	-26	-34	-20	20	6	2	-8	25
Romania	-39	-58	-23	-24	-39	-15	-22	-29	-34	-14
Slovak Rep.	-63	-59	-41	-36	-43	-34	-24	-24	-41	-19
Slovenia	-11	-3	12	16	23	35	40	43	-3	
EU	0	0	0	0	0	0	0	0	0	0
World	-54	-41	-36	-27	-10	9	4	-17	-27	-5
					BARLEY					
Bulgaria	-64	-71	-48	-63	-65	-24	-10	-35	-46	
Czech Rep.	-65	-61	-42	-46	-48	-29	-15	-20	-14	
Estonia		-73	-62	-62	-28	-3	-4	-20	10	
Hungary	-60	-60	-44	-46	-54	-5	-16	-42	-32	
Latvia		-41	-66	-57	-52	-20	-22	-31	9	
Lithuania		-78	-62	-62	-40	-4	-7	-21	22	
Poland	-66	-55	-29	-40	-26	8	-4	-4	39	
Romania	-45	-70	-9	-38	-48	-5	-20	-32	-4	
Slovak Rep.	-65	-62	-40	-38	-43	-31	-16	-16	-3	
Slovenia				95	50	-13	12			
EU	0	0	0	0	0	0	0	0	0	
World	-53	-51	-52	-50	-28	-1	-6	-29	-32	

Table A.1: *Continued.*

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000(e)
					RYE					
Bulgaria	-55	-74	-43	-65	-64	-1	0	-44	-40	
Czech Rep.	-65	-63	-49	-45	-26	-7	-23	-43		
Estonia		-47	-52	-47	-28	2	6	-14	-22	
Hungary	-65	-65	-52	-56	-59	-11	-30	-46	-46	-48
Latvia		-19	-64	-58	-36	-1	-1	-25	-23	
Lithuania		-67	-63	-68	-36	0	2	-29	-18	
Poland	-68	-77	-66	-42	-44	-39	0	-11	-28	
Romania	-68	-77	-66	-42	-44	-39	0	-11	-28	
Slovak Rep.	-54	-62	-41	-39	-38	-23	-7	-18	-34	
Slovenia		6	13	21	18	28	53	13	-26	
EU	0	0	0	0	0	0	0	0	0	
World	-70	-45	-28	-41	-37	-3	-2	-35	-42	
					SUGAR					
Bulgaria	-51	-55	-54	-50	-51	-56	-50	0	0	
Czech Rep.	-43	-54	-45	-47	-59	-43	-43	-43	-52	
Estonia		-67	-58	-31	-41	-70	-81	-84		
Hungary	-59	-47	-31	-41	-45	-52	-40	-55	-68	
Latvia		0	-45	-30	-33	-33	-54	-62	-64	
Lithuania		0	0	-31	-37	-35	-44	-52	-58	
Poland	-68	-60	-63	-58	-59	-42	-31	-30	-29	
Romania	-87	-60	-76	-60	-68	-75	-75	-82	-83	
Slovak Rep.	-77	-67	-72	-73	-79	-82	-82	-86	-86	
Slovenia	2	-8	-25	-8	4	-3	4	0	0	
EU	0	0	0	0	0	0	0	0	0	
World	-72	-73	-67	-65	-64	-69	-68	-76	-79	
					MILK					
Bulgaria	-73	-69	-48	-56	-50	-66	-52	-38	-52	-30
Czech Rep.	-52	-46	-40	-40	-38	-35	-34	-29	-34	-26
Estonia		-81	-72	-66	-54	-43	-42	-45	-52	
Hungary	-44	-45	-34	-28	-37	-38	-26	-23	-18	
Latvia		-72	-74	-64	-59	-54	-53	-54	-57	
Lithuania		-89	-80	-79	-68	-64	-61	-60	-61	-52
Poland	-72	-61	-56	-63	-54	-45	-44	-45	-52	-32
Romania	-50	-69	-52	-39	-36	-29	-30	-11	-24	
Slovak Rep.	-58	-58	-47	-45	-45	-45	-39	-36	-44	-31
Slovenia	-35	-31	-29	-19	-16	-19	-12	-3	-3	
EU	0	0	0	0	0	0	0	0	0	0
World	-63	-62	-61	-58	-57	-53	-48	-48	-57	-49

Table A.1: *Continued.*

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000(e)
					BEEF					
Bulgaria	-66	-63	-58	-65	-44		-47	-37	-52	
Czech Rep.	-40	-44	-43	-40	-33	-30	-37	-30	-30	-28
Estonia		-88	-66	-63	-59	-53	-55	-48	-50	
Hungary	-49	-50	-49	-45	-41	-46	-48	-43	-36	-37
Latvia		-83	-86	-74	-69	-64	-65	-65	-64	
Lithuania		-91	-79	-72	-67	-63	-55	-53	-60	
Poland	-70	-67	-62	-57	-51	-30	-33	-34	-43	-48
Romania	-55	-39	-50	-58	-50	-51	-48	-24	-52	
Slovak Rep.	-54	-49	-55	-48	-39	-41	-38	-39	-47	-33
Slovenia	-1	-7	-19	-10	13	35	39	37	38	
EU	0	0	0	0	0	0	0	0	0	0
World	-44	-23	-15	-18	-16	-15	-33	-41	-43	-39
					PORK					
Bulgaria	-58	-53	-12	-26	-12	-48	16	34	-7	
Czech Rep.	-35	-34	-9	-7	-9	-6	-20	-15	13	-2
Estonia		-75	-38	-2	-7	-8	10	55	20	
Hungary	-40	-35	-10	0	-1	-21	-10	18	20	-14
Latvia		-50	-19	35	-7	-14	-2	0	3	14
Lithuania		-80	-21	11	7	12	31	75	51	33
Poland	-33	-38	-15	1	-19	-21	-18	11	4	-8
Romania	-32	-31	-2	-9	0	-8	-12	49	-21	
Slovak Rep.	-39	-37	-3	4	4	-5	1	35	14	-2
Slovenia			27	26	31	18	21	45	52	
EU	0	0	0	0	0	0	0	0	0	0
World	-33	-37	-18	-19	-28	-23	-20	-5	-3	-5

Source: National statistics; OECD; Eurostat.

Table A.2: Development of Macroeconomic Indicators in MEMBER (1997 = 100).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Czech Republic											
Exchange rate	1.00	0.99	0.98	0.98	0.97	0.96	0.94	0.93	0.93	0.92	
Capital	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99
Labor	1.00	1.02	1.05	1.08	1.11	1.14	1.18	1.22	1.25	1.29	1.33
Price index of non-ag. intermediates	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.01	1.01	1.01	1.01
GDP	1.00	1.03	1.06	1.09	1.13	1.17	1.22	1.26	1.31	1.35	1.40
CPI	1.00	1.00	1.01	1.01	1.02	1.02	1.02	1.03	1.03	1.03	1.04
Hungary											
Exchange rate	1.00	1.01	1.01	1.01	1.00	0.99	0.94	0.92	0.90	0.88	0.87
Capital	1.00	1.00	1.01	1.01	1.01	1.00	1.00	0.99	0.98	0.97	0.96
Labor	1.00	1.02	1.05	1.07	1.11	1.14	1.19	1.23	1.27	1.32	1.36
Price index of non-ag. intermediates	1.00	1.00	1.00	0.99	0.99	0.98	0.97	0.96	0.96	0.95	
GDP	1.00	1.04	1.09	1.14	1.19	1.26	1.33	1.40	1.47	1.55	1.63
CPI	1.00	1.00	1.00	1.01	1.01	1.01	1.02	1.02	1.02	1.03	1.03
Poland											
Exchange rate	1.00	0.97	0.95	0.92	0.89	0.87	0.83	0.81	0.79	0.78	0.76
Capital	1.00	1.04	1.09	1.13	1.16	1.17	1.18	1.17	1.15	1.12	1.09
Labor	1.00	1.07	1.15	1.23	1.32	1.42	1.53	1.65	1.78	1.92	2.07
Price index of non-ag. intermediates	1.00	0.99	0.97	0.96	0.96	0.95	0.95	0.95	0.95	0.96	
GDP	1.00	1.05	1.11	1.16	1.22	1.29	1.36	1.45	1.54	1.63	1.73
CPI	1.00	1.01	1.01	1.02	1.02	1.02	1.03	1.04	1.04	1.05	1.06
Slovenia											
Exchange rate	1.00	0.99	0.98	0.97	0.96	0.96	0.98	0.97	0.97	0.97	0.97
Capital	1.00	1.03	1.06	1.09	1.11	1.10	1.00	0.99	0.98	0.97	0.96
Labor	1.00	1.00	1.00	1.01	1.02	1.03	1.07	1.08	1.10	1.12	1.14
Price index of non-ag. intermediates	1.00	0.99	0.99	0.98	0.98	0.99	0.99	0.99	0.99	0.99	
GDP	1.00	1.03	1.05	1.08	1.11	1.16	1.23	1.28	1.33	1.38	1.43
CPI	1.00	0.99	0.98	0.98	0.97	0.97	0.97	0.97	0.98	0.98	0.98

Source: Banse (2000).

Table A.3: Development of Macroeconomic Indicators in AGENDAPPP (1997 = 100).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Czech Republic											
Exchange rate	1.00	0.99	0.98	0.98	0.97	0.96	0.92	0.92	0.91	0.91	0.91
Capital	1.00	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.98	0.98
Labor	1.00	1.02	1.05	1.08	1.11	1.14	1.19	1.22	1.26	1.30	1.34
Price index of non-ag. intermediates	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.01	1.01	1.01	1.01
GDP	1.00	1.03	1.06	1.09	1.13	1.17	1.22	1.26	1.31	1.35	1.40
CPI	1.00	1.00	1.01	1.01	1.02	1.02	1.03	1.03	1.04	1.04	1.04
Hungary											
Exchange rate	1.00	1.01	1.01	1.01	1.00	0.99	0.89	0.87	0.86	0.85	0.83
Capital	1.00	1.00	1.01	1.01	1.01	0.99	0.98	0.97	0.97	0.96	0.95
Labor	1.00	1.02	1.05	1.07	1.11	1.14	1.20	1.24	1.28	1.33	1.37
Price index of non-ag. intermediates	1.00	1.00	1.00	0.99	0.99	0.98	0.97	0.96	0.96	0.95	0.95
GDP	1.00	1.04	1.09	1.14	1.19	1.26	1.34	1.42	1.49	1.57	1.64
CPI	1.00	1.00	1.00	1.01	1.01	1.02	1.03	1.03	1.04	1.04	1.04
Poland											
Exchange rate	1.00	0.97	0.95	0.92	0.89	0.87	0.81	0.79	0.77	0.75	0.74
Capital	1.00	1.05	1.09	1.13	1.17	1.20	1.19	1.18	1.16	1.12	1.09
Labor	1.00	1.07	1.15	1.23	1.32	1.42	1.53	1.66	1.79	1.94	2.09
Price index of non-ag. intermediates	1.00	0.99	0.98	0.97	0.96	0.96	0.95	0.95	0.95	0.95	
GDP	1.00	1.05	1.11	1.16	1.22	1.29	1.37	1.45	1.55	1.65	1.75
CPI	1.00	1.01	1.01	1.01	1.02	1.02	1.03	1.04	1.05	1.06	1.08
Slovenia											
Exchange rate	1.00	0.99	0.98	0.97	0.96	0.96	0.97	0.97	0.97	0.97	0.97
Capital	1.00	1.05	1.09	1.12	1.16	1.15	1.13	1.12	1.11	1.09	1.08
Labor	1.00	1.00	1.00	1.01	1.02	1.03	1.07	1.08	1.10	1.12	1.14
Price index of non-ag. intermediates	1.00	0.99	0.99	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.99
GDP	1.00	1.03	1.05	1.08	1.11	1.16	1.23	1.28	1.33	1.38	1.43
CPI	1.00	0.99	0.99	0.98	0.97	0.97	0.98	0.98	0.98	0.98	0.99

Source: Banse (2000).

B Appendix: Elasticities

Table B.1: Elasticities of Yields with Respect to Own Commodity Price.

	EU	Poland
C. Wheat	0.3038	0.15
D. Wheat	0.11	
Barley	0.2170	0.14
Corn	0.2733	0.14
O. Grain	0.3032	0.15
E. Rice	0.2576	0.00
E. Sugar	0.0839	0.04
Soybean	0.3726	0.00
Rapeseed	0.3572	0.20
Sunseed	0.3568	0.00
Milk	0.2786	0.08
Beef	0.29918	0.07
Pork	0.9890	0.52
Poultry	0.3031	0.21
Eggs	0.7211	0.69

Note: The Elasticities of Yields with respect to the prices of intermediates is the negative value of the elasticity of yields with respect to the own price.

Table B.2: Elasticities of Area Allocation and National Herd Size, European Union.

		CW	DW	BL	CN	OG	RI	SU	SB	RS	SF
C. Wheat	CW	0.70002	−0.00155	−0.01255	−0.05302	−0.00100	−0.01084	−0.19996	−0.00058	−0.02095	−0.00332
D. Wheat	DW	−0.15038	0.50000	−0.00022	−0.01992	−0.01927	0.00	−0.01103	−0.00078	−0.00109	−0.01428
Barley	BL	−0.02411	0.00	0.59848	−0.03633	−0.05311	0.00	−0.14364	−0.00580	−0.00685	−0.00347
Corn	CN	−0.12475	−0.00048	−0.04448	0.69863	−0.03207	0.00	−0.07757	−0.00376	−0.01177	−0.00827
O. Grain	OG	−0.00586	−0.00116	−0.16194	−0.07987	0.50066	0.00	−0.00772	0.00	−0.00100	0.00
Rice	RI	−0.02127	0.00	0.00	0.00	0.00	0.15506	−0.01568	−0.01566	−0.01567	−0.01566
Sugar	SU	−0.23654	−0.00013	−0.08843	−0.03900	−0.00156	−0.00087	0.68829	0.00	−0.00607	0.00
Soybean	RS	−0.03149	−0.00043	−0.16314	−0.08648	0.00	−0.03982	0.00	0.60018	0.00	−0.00018
Rapeseed	SF	−0.20969	−0.00011	−0.03568	−0.05009	−0.00171	−0.00737	−0.05136	0.00	0.59952	−0.00054
Sunseed	SM	−0.08725	−0.00385	−0.04740	−0.09236	0.00	−0.01934	0.00	−0.00009	−0.00142	0.49999
Manioc	MN										
CGF	CG										
O. Energy	ER										
O. Protein	PR										
Milk	DM										
SMP											
Butter	BT										
Cheese	CH										
Beef	BF										
Pork	PK										
Poultry	PM										
Eggs	PE										

Table B.2: *Continued.*

		SM	MN	CG	ER	PR	DM	DN	DP	BT	CH
C. Wheat	CW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Wheat	DW										
Barley	BL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn	CN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O. Grain	OG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rice	RI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sugar	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Soybean	RS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rapeseed	SF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sunseed	SM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manioc	MN										
CGF	CG										
O. Energy	ER				2.00						
O. Protein	PR					2.00					
Milk	DM						0.49381	0.00	0.00	0.00	
SMP											
Butter	BT							0.04	0.21	0.31	−0.52
Cheese	CH							0.08	−0.31	−0.40	0.71
Beef	BF						0.09282	0.00	0.00	0.00	0.00
Pork	PK						−0.50280	0.00	0.00	0.00	0.00
Poultry	PM						0.00	0.00	0.00	0.00	0.00
Eggs	PE						0.00	0.00	0.00	0.00	0.00

Table B.2: *Continued.*

		BF	PK	PM	PE	Labor	Capital
C. Wheat	CW	0.00	0.00	0.00	0.00	−0.0658	−0.3304
D. Wheat	DW					−0.0470	−0.2360
Barley	BL	0.00	0.00	0.00	0.00	−0.0714	−0.2538
Corn	CN	0.00	0.00	0.00	0.00	−0.0657	−0.3298
O. Grain	OG	0.00	0.00	0.00	0.00	−0.0617	−0.1814
Rice	RI	0.00	0.00	0.00	0.00	−0.0220	−0.0491
Sugar	SU	0.00	0.00	0.00	0.00	−0.0978	−0.2179
Soybean	RS	0.00	0.00	0.00	0.00	−0.0643	−0.2143
Rapeseed	SF	0.00	0.00	0.00	0.00	−0.0542	−0.1888
Sunseed	SM	0.00	0.00	0.00	0.00	−0.0467	−0.2016
Manioc	MN						
CGF	CG						
O. Energy	ER						
O. Protein	PR						
Milk	DM	0.05821	−0.24737	0.00	−0.09	−0.1750	−0.0402
SMP							
Butter	BT						
Cheese	CH						
Beef	BF	0.50407	−0.26896	0.00	−0.12303	−0.0754	−0.1295
Pork	PK	−0.34287	1.18629	−0.10401	−0.03933	−0.0254	−0.1719
Poultry	PM	0.00	−0.25306	1.52850	−0.05000	−0.1058	−1.1197
Eggs	PE	−0.52183	−0.13086	−0.06838	1.09775	−0.1403	−0.2364

Table B.3: Elasticities of Area Allocation and National Herd Size, Poland.

		CW	BL	CN	OG	RI	SU	SB	RS	SF	SM	MN	CG	ER
C. Wheat	CW	0.59902	−0.01818	0.00	−0.05559	0.00	−0.06	0.00	−0.01679	0.00	0.00	0.00	0.00	0.00
Barley	BL	−0.05031	0.55006	0.00	−0.05669	0.00	−0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn	CN	−0.02214	0.00	0.53576	−0.07683	0.00	−0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O. Grain	OG	−0.05090	−0.02	0.00	0.59666	0.00	−0.05	0.00	−0.02904	0.00	0.00	0.00	0.00	0.00
Rice	RI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sugar	SU	−0.06597	−0.01	0.00	−0.06	0.00	0.56666	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Soybean	RS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rapeseed	SF	−0.06910	−0.00244	0.00	−0.13053	0.00	0.00	0.00	0.79746	0.00	0.00	0.00	0.00	0.00
Sunseed	SM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manioc	MN													
CGF	CG													
O. Energy	ER													2.00
O. Protein	PR													
Milk	DM													
SMP	DP													
Butter	BT													
Cheese	CH													
Beef	BF													
Pork	PK													
Poultry	PM													
Eggs	PE													

Table B.3: *Continued.*

		PR	DM	DN	DP	BT	CH	BF	PK	PM	PE	Labor	Capital
C. Wheat	CW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	−0.1091	−0.3386
Barley	BL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	−0.1002	−0.3109
Corn	CN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	−0.0976	−0.3028
O. Grain	OG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	−0.1087	−0.3373
Rice	RI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
Sugar	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	−0.2049	−0.2228
Soybean	RS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
Rapeseed	SF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	−0.1496	−0.4457
Sunseed	SM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000
Manioc	MN												
CGF	CG												
O. Energy	ER												
O. Protein	PR	2.00											
Milk	DM		0.57927	0.00	0.00	0.00		0.27	−0.30632	0.00	0.00	−0.2917	−0.2483
SMP	DP												
Butter	BT			0.00400	0.21000	0.31000	−0.52000						
Cheese	CH			0.08000	−0.31000	−0.40000	0.71000						
Beef	BF		1.25667	0.00	0.00	0.00		0.48	−1.12797	−0.06	−0.10	−0.2433	−0.2071
Pork	PK		−0.23	0.00	0.00	0.00		−0.18	0.80	−0.03352	−0.08233	−0.1597	−0.1157
Poultry	PM		0.00	0.00	0.00	0.00		−0.05	−0.16	1.23711	0.00	−0.1237	−0.9062
Eggs	PE		0.00	0.00	0.00	0.00		−0.12	−0.63	0.00	1.14432	−0.1463	−0.2464

Table B.4: Elasticities of Income.

		EU	Poland
Wheat	WH	0.3603	0.2760
Barley	BL	0.2801	0.1794
Corn	CN	0.2801	0.1799
O. Grain	OG	0.2800	0.2783
Rice	RI	0.2000	0.3399
Sugar	SU	0.2004	0.1851
Milk	DM	0.5015	0.3083
Powder	DP	0.2400	0.1006
Butter	BT	0.3002	0.3024
Cheese	CH	0.5907	0.5024
Beef	BF	0.2808	0.3101
Pork	PK	0.5611	0.5261
Poultry	PM	0.6004	0.6062
Eggs	PE	0.4403	0.3042
Soybean Oil	SO	0.3800	0.2007
Rapeseed Oil	RO	0.3800	0.2020
Sunflower Oil	SO	0.3800	0.2006

Table B.5: Price Elasticities of Human Consumption with Respect to Prices, European Union.

		WH	BL	CN	OG	RI	SU	SB	MN	DL	DP
Wheat	WH	−0.3954									
Barley	BL		−0.3152								
Corn	CN			−0.3152							
O. Grain	OG				−0.3152						
Rice	RI					−0.2352					
Sugar	SU						−0.2941				
Soybean	SB										
Rapeseed	RS										
Sunseed	SF										
Manioc	MN										
CGF	CG										
O. Energy	ER										
O. Protein	PR										
Milk	DM									−0.6238	0.0927
SMP	DP									0.0010	−0.4747
Butter	BT									0.00	0.2574
Cheese	CH									0.0123	0.1998
Beef	BF										
Pork	PK										
Poultry	PM										
Eggs	PE										
Soybean Oil	SO										
Rapeseed Oil	RO										
Sunflower Oil	SO										

Table B.5: *Continued.*

		BT	CH	BF	PK	PM	PE	SO	RO	FO	Other
Wheat	WH										0.0351
Barley	BL										0.0351
Corn	CN										0.0351
O. Grain	OG										0.0351
Rice	RI										0.0351
Sugar	SU										0.0937
Soybean	SB										
Rapeseed	RS										
Sunseed	SF										
Manioc	MN										
CGF	CG										
O. Energy	ER										
O. Protein	PR										
Milk	DM	0.0043	0.00								0.0253
SMP	DP	0.0222	0.00								
Butter	BT	−0.5690	0.00								
Cheese	CH	0.0185	−0.8313								0.2115
Beef	BF			−0.4588	0.0011	0.0272	0.1010				0.0100
Pork	PK			0.00	−0.6863	0.0486	0.0666				0.0487
Poultry	PM			0.00	0.00	−0.6167	0.0062				0.0100
Eggs	PE			0.0204	0.00	0.00	−0.4707				0.0100
Soybean Oil	SO							−0.3979	0.00	0.0079	0.0100
Rapeseed Oil	RO							0.00	−0.3992	0.0091	0.0100
Sunflower Oil	SO							0.0091	0.0103	−0.4324	0.0330

Table B.6: Price Elasticities of Human Consumption with Respect to Prices, Poland.

		WH	BL	CN	OG	RI	SU	SB	MN	DL	DP
Wheat	WH	−0.3189									
Barley	BL		−0.1894								
Corn	CN			−0.1902							
O. Grain	OG				−0.2883						
Rice	RI					−0.3499					
Sugar	SU						−0.3542				
Soybean	SB										
Rapeseed	RS										
Sunseed	SF										
Manioc	MN										
CGF	CG										
O. Energy	ER										
O. Protein	PR										
Milk	DM									−0.6343	0.00
SMP	DP									0.00	−0.3137
Butter	BT									0.0335	0.00
Cheese	CH									0.0124	0.00
Beef	BF										
Pork	PK										
Poultry	PM										
Eggs	PE										
Soybean Oil	SO										
Rapeseed Oil	RO										
Sunflower Oil	SO										

Table B.6: *Continued.*

		BT	CH	BF	PK	PM	PE	SO	RO	FO	Other
Wheat	WH										0.0429
Barley	BL										0.0100
Corn	CN										0.0103
O. Grain	OG										0.0100
Rice	RI										0.0100
Sugar	SU										0.2692
Soybean	SB										
Rapeseed	RS										
Sunseed	SF										
Manioc	MN										
CGF	CG										
O. Energy	ER										
O. Protein	PR										
Milk	DM	0.1717	0.0358								0.1185
SMP	DP	−0.0008	−0.0009								
Butter	BT	−0.3449	−0.0011								
Cheese	CH	0.00	−0.5248								0.2147
Beef	BF			−0.3803	0.00	0.0601	0.00				0.0100
Pork	PK			0.0087	−0.9810	0.4361	0.00				0.0100
Poultry	PM			0.00	0.00	−0.7703	0.1540				0.0100
Eggs	PE			0.00	0.00	0.0508	−0.5644				0.0100
Soybean Oil	SO							−0.6676	0.4565	0.0004	0.0100
Rapeseed Oil	RO							0.2408	−0.4605	0.0077	0.0100
Sunflower Oil	SO							0.00	0.00	−0.3551	0.1545

Table B.7: Elasticities of Feed Demand with Respect to Feed Prices, European Union.

		WH	BL	CN	OG	SM	RM	FM	MC	CG	ER	PR	DP
DAIRY													
Wheat	WH	−1.7460	0.3000	0.3000	0.1000	−0.0140	0.0300	0.0300	0.0000	0.5000	0.4000	0.1000	0.0000
Barley	BL	1.0041	−2.6811	0.4980	0.1000	0.0190	0.0300	0.0300	0.0000	0.5000	0.4000	0.1000	0.0000
Corn	CN	0.6049	0.3000	−2.0009	0.1000	−0.0140	0.0300	0.0300	0.0000	0.5000	0.4000	0.0500	0.0000
O. Grain	OG	0.1114	0.0333	0.0553	−0.4660	0.0190	0.0190	0.0190	0.0000	0.0050	0.1040	0.1000	0.0000
Soymeal	SM	−0.0278	0.0113	−0.0138	0.0338	−0.6865	0.2000	0.2000	0.0000	0.2000	−0.1170	0.2000	0.0000
Rapemeal	RM	0.2212	0.0661	0.1097	0.1257	0.3300	−1.9248	0.4000	0.0000	0.3890	−0.1170	0.4000	0.0000
Sunmeal	FM	0.2176	0.0650	0.1079	0.1237	0.7500	0.9000	−2.8362	0.0000	0.3890	−0.1170	0.4000	0.0000
Manioc	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CGF	CG	1.2968	0.3874	0.6431	0.0116	0.2615	0.1368	0.1391	0.0000	−3.2763	0.2000	0.2000	0.0000
O. Energy	OE	0.3735	0.1116	0.1852	0.0871	−0.0551	−0.0148	−0.0151	0.0000	0.0720	−0.7545	0.0100	0.0000
O. Protein	OP	0.0839	0.0251	0.0208	0.0753	0.0846	0.0455	0.0462	0.0000	0.0647	0.0090	−0.4549	0.0000
SMP	SP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BEEF													
Wheat	WH	−1.8880	0.3000	0.5000	0.1000	0.0100	0.0300	0.0300	0.0000	0.4000	0.4000	0.1000	0.0180
Barley	BL	1.1138	−2.7970	0.5902	0.1000	0.0100	0.0300	0.0300	0.0000	0.4000	0.4000	0.1000	0.0230
Corn	CN	0.9436	0.3000	−2.2866	0.1000	0.0100	0.0300	0.0300	0.0000	0.4000	0.4000	0.0500	0.0230
O. Grain	OG	0.1103	0.0297	0.0584	−0.3614	0.0100	0.0100	0.0100	0.0000	0.0500	0.0500	0.0100	0.0230
Soymeal	SM	0.0312	0.0084	0.0165	0.0283	−1.4535	0.4000	0.4000	0.0000	0.0500	−0.0410	0.2100	0.3500
Rapemeal	RM	0.2534	0.0683	0.1343	0.0766	1.0826	−3.1042	1.0000	0.0000	0.3000	−0.0410	0.2000	0.0300
Sunmeal	FM	0.2522	0.0679	0.1336	0.0762	1.0772	0.8000	−2.8961	0.0000	0.3000	−0.0410	0.2000	0.0300
Manioc	MC	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CGF	CG	1.1821	0.3184	0.6264	0.1340	0.0473	0.1050	0.1055	0.0000	−3.0255	0.3000	0.2000	0.0068
O. Energy	OE	0.4159	0.1120	0.2204	0.0471	−0.0137	−0.0050	−0.0051	0.0000	0.1055	−0.8011	−0.1000	0.0239
O. Protein	OP	0.0922	0.0248	0.0244	0.0084	0.0620	0.0218	0.0219	0.0000	0.0624	−0.0886	−0.7598	0.5305
SMP	SP	0.0078	0.0027	0.0053	0.0091	0.0487	0.0015	0.0016	0.0000	0.0010	0.0100	0.2500	−0.3377

Table B.7: *Continued.*

		WH	BL	CN	OG	SM	RM	FM	MC	CG	ER	PR	DP
PORK													
Wheat	WH	−1.3100	0.3000	0.3000	0.0000	0.1000	0.0300	0.0300	0.2000	0.0500	0.2000	0.1000	0.0000
Barley	BL	0.1093	−1.1831	0.0638	0.0000	0.0300	0.0300	0.0300	0.5000	0.0700	0.2000	0.1500	0.0000
Corn	CN	0.6851	0.4000	−1.9751	0.0000	0.0500	0.0300	0.0300	0.5000	0.0300	0.2000	0.0500	0.0000
O. Grain	OG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Soymeal	SM	0.1008	0.0830	0.0221	0.0000	−1.2958	0.4000	0.4000	−0.0500	0.0300	0.0100	0.3000	0.0000
Rapemeal	RM	0.4943	1.3568	0.2164	0.0000	6.5408	−9.6783	0.6000	−0.0500	0.0800	0.0400	0.4000	0.0000
Sunmeal	FM	0.5138	1.4104	0.2250	0.0000	6.7994	0.6237	−10.0423	−0.0500	0.0800	0.0400	0.4000	0.0000
Manioc	MC	0.6136	4.2108	0.6717	0.0000	−0.1522	−0.0093	−0.0090	−5.2856	0.0300	0.0300	−0.1000	0.0000
CGF	CG	1.4859	5.7106	0.3904	0.0000	0.8849	0.1443	0.1388	0.2906	−9.4456	0.2000	0.2000	0.0000
O. Energy	OE	0.4372	1.2000	0.1914	0.0000	0.0217	0.0053	0.0051	0.0214	0.0147	−2.0968	0.2000	0.0000
O. Protein	OP	0.1596	0.6573	0.0350	0.0000	0.4753	0.0388	0.0373	−0.0520	0.0107	0.1461	−1.5080	0.0000
SMP	SP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
POULTRY													
Wheat	WH	−1.6610	0.0000	1.0000	0.0000	0.0500	0.0010	0.0000	0.4000	0.0000	0.0100	0.2000	0.0000
Barley	BL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Corn	CN	0.5433	0.0000	−1.2043	0.0000	0.0500	0.0010	0.0000	0.5000	0.0000	0.0100	0.1000	0.0000
O. Grain	OG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Soymeal	SM	0.0494	0.0000	0.0910	0.0000	−0.4724	0.0010	0.0000	−0.2000	0.0000	0.0310	0.5000	0.0000
Rapemeal	RM	0.0020	0.0000	0.0037	0.0000	0.0020	0.0113	0.0000	−0.1000	0.0000	0.0310	0.0500	0.0000
Sunmeal	FM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Manioc	MC	2.5508	0.0000	5.8684	0.0000	−1.2902	−0.3176	0.0000	−6.5624	0.0000	0.0010	−0.2500	0.0000
CGF	CG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
O. Energy	OE	0.0450	0.0000	0.0828	0.0000	0.1411	0.0694	0.0000	0.0007	0.0000	−0.3490	0.0100	0.0000
O. Protein	OP	0.2027	0.0000	0.1866	0.0000	0.5127	0.0252	0.0000	−0.0397	0.0000	0.0023	−0.8898	0.0000
SMP	SP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table B.7: *Continued.*

		WH	BL	CN	OG	SM	RM	FM	MC	CG	ER	PR	DP
EGGS													
Wheat	WH	−1.7940	0.0000	1.0000	0.1000	0.0500	0.0500	0.0000	0.4000	0.0500	0.0500	0.0940	0.0000
Barley	BL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Corn	CN	0.4427	0.0000	−1.2207	0.1000	0.0500	0.0500	0.0000	0.4500	0.0050	0.0050	0.1180	0.0000
O. Grain	OG	0.4600	0.0000	1.0392	−1.5543	0.0100	0.0100	0.0000	0.0100	0.0050	0.0100	0.0100	0.0000
Soymeal	SM	0.1067	0.0000	0.2410	0.0046	−0.4903	0.0500	0.0000	−0.4000	0.0520	0.0520	0.3840	0.0000
Rapemeal	RM	0.1233	0.0000	0.2786	0.0054	0.0578	−0.5682	0.0000	−0.0240	0.0520	0.0250	0.0500	0.0000
Sunmeal	FM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Manioc	MC	2.9002	0.0000	7.3708	0.0158	−1.3595	−0.0705	0.0000	−8.6958	−0.0110	0.0500	−0.2000	0.0000
CGF	CG	10.0956	0.0000	2.2807	0.2195	4.9216	4.2562	0.0000	−0.3063	−21.4672	0.0500	−0.0500	0.0000
O. Energy	OE	0.1846	0.0000	0.0417	0.0080	0.0900	0.0374	0.0000	0.0255	0.0009	−0.4380	0.0500	0.0000
O. Protein	OP	0.1171	0.0000	0.3319	0.0027	0.2241	0.0252	0.0000	−0.0343	−0.0003	0.0169	−0.6833	0.0000
SMP	SP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table B.8: Elasticities of Feed Demand with Respect to Feed Prices, Poland.

		WH	BL	CN	OG	SM	RM	FM	MC	CG	ER	PR	DP
DAIRY													
Wheat	WH	−0.4671	0.0416	0.0333	0.1665	0.0250	0.0291	0.0000	0.0362	0.0000	0.0754	0.0459	0.0000
Barley	BL	0.3141	−0.7211	0.0390	0.2789	0.0112	0.0112	0.0000	0.0162	0.0000	0.0253	0.0154	0.0000
Corn	CN	0.2482	0.0386	−0.7209	0.2791	0.0000	0.0112	0.0000	0.0243	0.0000	0.0759	0.0308	0.0000
O. Grain	OG	0.0600	0.0133	0.0135	−0.2491	0.0300	0.0300	0.0000	0.0225	0.0000	0.0451	0.0225	0.0000
Soymeal	SM	0.1809	0.0107	0.0000	0.6033	−0.8575	0.0643	0.0000	−0.0214	0.0283	−0.0971	0.0643	0.0189
Rapemeal	RM	0.2351	0.0119	0.0121	0.6720	0.0716	−1.0630	0.0000	−0.0213	0.0297	−0.0963	0.1291	0.0190
Sunmeal	FM	0.5221	0.0309	0.0313	0.6332	0.4498	0.4056	−1.1699	−0.0585	−0.0399	−0.6630	−0.0950	−0.0466
Manioc	MC	0.5221	0.0309	0.0470	0.8998	−0.0426	−0.0380	0.0000	−1.0284	−0.0523	0.0000	−0.2834	−0.0505
CGF	CG	0.2465	0.0237	0.0148	0.5139	0.0964	0.0909	0.0000	−0.0896	−0.9481	0.0415	0.0000	0.0000
O. Energy	OE	0.3480	0.0154	0.0470	0.5765	−0.0619	−0.0551	0.0000	0.0000	0.0000	−0.7726	−0.0798	−0.0237
O. Protein	OP	0.3480	0.0154	0.0313	0.4739	0.0673	0.1214	0.0000	−0.1493	0.0000	−0.1313	−0.8059	0.0264
SMP	SP	0.1740	0.0154	0.0157	0.5322	0.1113	0.1004	0.0000	−0.1493	0.0000	−0.2188	0.1482	−0.7317
BEEF													
Wheat	WH	−0.4412	0.1410	0.0000	0.0235	0.0666	0.0681	0.0000	0.0101	0.0109	0.0822	0.0292	0.0000
Barley	BL	0.0813	−0.9308	0.0000	0.0603	0.1898	0.1942	0.0000	0.0287	0.0310	0.2345	0.0834	0.0132
Corn	CN	0.0495	0.2449	−0.5379	0.0000	0.0586	0.0599	0.0000	0.0000	0.0000	0.0724	0.0257	0.0000
O. Grain	OG	0.0000	0.0432	0.0000	−0.3532	0.0662	0.0677	0.0000	0.0100	0.0108	0.1091	0.0291	0.0000
Soymeal	SM	0.0771	0.3817	0.0000	0.1859	−0.9262	0.3935	0.0156	−0.0700	0.0943	−0.5721	0.3169	0.1001
Rapemeal	RM	0.0771	0.3817	0.0000	0.1859	0.3848	−1.0013	0.0147	−0.0444	0.0891	−0.6048	0.4193	0.0946
Sunmeal	FM	0.0771	0.3817	0.0000	0.1859	0.3848	0.3719	−0.8477	−0.1008	0.0543	−0.8239	0.2557	0.0577
Manioc	MC	0.0771	0.3817	0.0000	0.1859	−0.4631	−0.3004	−0.0270	−0.1212	−0.0590	0.6707	−0.2643	−0.0835
CGF	CG	0.0514	0.2544	0.0000	0.1239	0.3848	0.3719	0.0000	−0.0364	−1.0339	−0.0549	−0.0585	−0.0139
O. Energy	OE	0.0771	0.3817	0.0000	0.2479	−0.4631	−0.5006	−0.0270	0.0820	−0.0109	0.1869	0.0150	0.0000
O. Protein	OP	0.0514	0.2544	0.0000	0.1239	0.4810	0.6508	0.0157	−0.0606	−0.0218	0.0280	−1.5956	0.0705
SMP	SP	0.0257	0.1272	0.0000	0.0620	0.4810	0.4649	0.0112	−0.0606	−0.0163	0.0467	0.2231	−1.3660

Table B.8: *Continued.*

		WH	BL	CN	OG	SM	RM	FM	MC	CG	ER	PR	DP
PORK													
Wheat	WH	−0.6675	0.1573	0.0393	0.0629	0.2452	0.0729	0.0000	0.0157	0.0000	0.0393	0.0243	0.0000
Barley	BL	0.2638	−1.0609	0.1148	0.2031	0.2754	0.0819	0.0000	0.0133	0.0000	0.0694	0.0273	0.0000
Corn	CN	0.3235	0.5632	−1.0980	0.1190	0.0530	0.0158	0.0000	0.0000	0.0000	0.0134	0.0000	0.0000
O. Grain	OG	0.0756	0.1456	0.0174	−0.6027	0.2467	0.0493	0.0000	0.0000	0.0000	0.0388	0.0152	0.0000
Soymeal	SM	0.7560	0.5062	0.0199	0.6326	−1.7776	0.0412	0.0000	−0.0356	0.0000	−0.1746	0.0240	0.0000
Rapemeal	RM	0.7560	0.5062	0.0199	0.4256	0.1387	−1.6074	0.0000	−0.0402	0.0000	−0.1974	0.0000	0.0000
Sunmeal	FM	0.7560	0.5062	0.0199	0.3945	0.1387	0.0000	−1.3296	−0.0591	−0.0186	−0.2903	−0.1032	−0.0136
Manioc	MC	1.0010	0.5062	0.0199	0.3945	−0.7339	−0.2466	0.0000	−0.8585	−0.0228	0.0863	−0.1205	−0.0222
CGF	CG	0.5040	0.3375	0.0132	0.2630	0.0925	0.0000	0.0000	−0.0236	−1.1018	−0.0296	−0.0466	0.0000
O. Energy	OE	0.6413	0.6749	0.0265	0.5261	−0.9239	−0.3105	0.0000	0.0221	0.0000	−0.5902	−0.0420	−0.0129
O. Protein	OP	0.5040	0.3375	0.0132	0.2630	0.1618	0.0000	0.0000	−0.0393	−0.0147	−0.0535	−1.1772	0.0000
SMP	SP	0.2520	0.1687	0.0000	0.1315	0.1156	0.0000	0.0000	−0.0393	−0.0110	−0.0892	0.0491	−0.5813
POULTRY													
Wheat	WH	−0.7401	0.1505	0.1075	0.1075	0.2902	0.0215	0.0000	0.0000	0.0000	0.0322	0.0215	0.0000
Barley	BL	0.6398	−1.3330	0.1297	0.2075	0.2491	0.0300	0.0000	0.0000	0.0000	0.0418	0.0225	0.0000
Corn	CN	0.3644	0.1034	−1.1908	0.3115	0.2876	0.0346	0.0000	0.0000	0.0000	0.0483	0.0260	0.0000
O. Grain	OG	0.1981	0.0900	0.1693	−0.7553	0.2055	0.0196	0.0000	0.0000	0.0000	0.0395	0.0212	0.0000
Soymeal	SM	0.7338	0.1481	0.2145	0.2820	−1.4102	0.0512	0.0000	0.0000	0.0144	−0.0987	0.0590	0.0000
Rapemeal	RM	0.5630	0.1848	0.2676	0.2782	0.5299	−1.6914	0.0000	0.0000	0.0000	−0.1705	0.0309	0.0000
Sunmeal	FM	0.6484	0.1848	0.2676	0.4022	0.5299	0.0268	−1.5857	0.0000	−0.0286	−0.3196	−0.1171	0.0000
Manioc	MC	0.4456	0.1687	0.3345	0.5027	−0.7708	−0.1223	−0.0398	−0.5762	−0.0211	0.1709	−0.0922	0.0000
CGF	CG	0.2670	0.0924	0.1338	0.2011	0.3532	0.0178	−0.0118	0.0000	−0.6395	−0.1309	−0.2814	0.0000
O. Energy	OE	0.6056	0.1848	0.2676	0.4022	−0.7333	−0.1223	−0.0398	0.0000	−0.0396	−0.4821	−0.0478	0.0000
O. Protein	OP	0.3755	0.0924	0.1338	0.2011	0.4074	0.0206	−0.0136	0.0000	−0.0791	−0.0445	−1.0913	0.0000
SMP	SP	0.2643	0.0462	0.1738	0.2612	0.4416	0.0290	−0.0147	0.0000	−0.0594	−0.1205	0.0393	−1.0575

Table B.8: *Continued.*

		WH	BL	CN	OG	SM	RM	FM	MC	CG	ER	PR	DP
EGGS													
Wheat	WH	−0.9698	0.2473	0.0927	0.3606	0.2060	0.0155	0.0000	0.0000	0.0000	0.0000	0.0309	0.0000
Barley	BL	0.7379	−1.4821	0.0899	0.3144	0.2589	0.0207	0.0000	0.0000	0.0000	0.0127	0.0367	0.0000
Corn	CN	0.6434	0.2091	−1.3102	0.2199	0.1811	0.0145	0.0000	0.0000	0.0000	0.0000	0.0257	0.0000
O. Grain	OG	0.7158	0.2091	0.0629	−1.3889	0.3055	0.0244	0.0000	0.0000	0.0000	0.0150	0.0433	0.0000
Soymeal	SM	0.5887	0.2479	0.0746	0.4397	−1.4972	0.0251	0.0000	0.0000	0.0000	−0.0225	0.1247	0.0133
Rapemeal	RM	0.5070	0.2277	0.0685	0.4040	0.2887	−1.5283	0.0000	0.0000	0.0000	−0.0522	0.0749	0.0000
Sunmeal	FM	0.4372	0.2789	0.0839	0.4946	0.4242	0.0222	−1.3570	−0.0126	0.0000	−0.0926	−0.2519	−0.0269
Manioc	MC	0.4944	0.3486	0.1049	0.6183	−0.5029	−0.0497	−0.0428	−0.7585	0.0000	0.0452	−0.2240	−0.0335
CGF	CG	0.3253	0.1394	0.0419	0.2473	0.2828	0.0148	0.0000	0.0000	−0.5754	−0.0279	−0.3961	−0.0444
O. Energy	OE	0.4715	0.2789	0.0839	0.4946	−0.5139	−0.1040	−0.0428	0.0000	0.0000	−0.5784	−0.0768	−0.0191
O. Protein	OP	0.3504	0.1394	0.0419	0.2473	0.4949	0.0259	−0.0202	0.0000	0.0000	−0.0133	−1.2821	0.0210
SMP	SP	0.4139	0.0697	0.0210	0.1237	0.3535	0.0185	−0.0144	0.0000	0.0000	−0.0222	0.1408	−1.0991

C Appendix: Ex-Ante Simulations of the EU-15

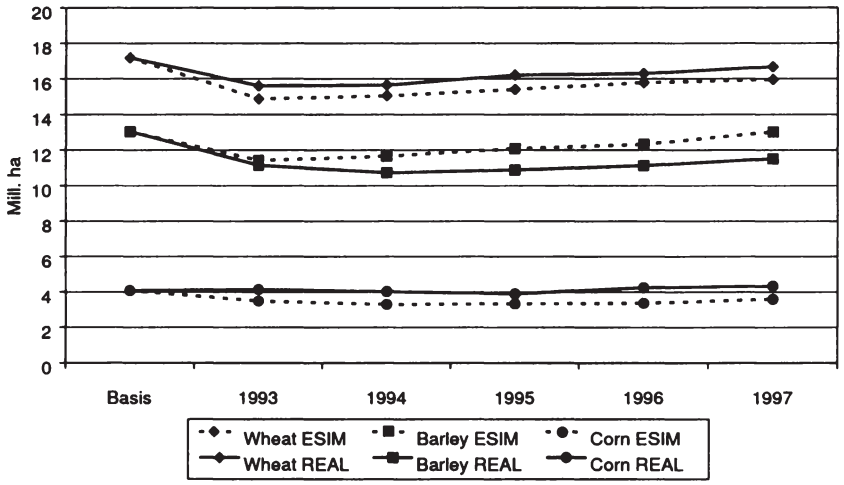

Figure C.1: Development of Real and Simulated Area Harvested of Wheat, Barley and Corn in the EU, 1993–97. Source: Nölle (2000) p. 30.

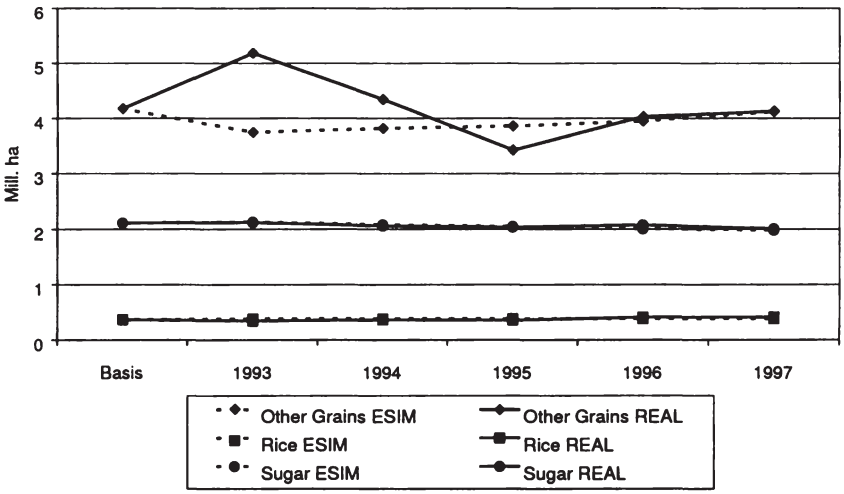

Figure C.2: Development of Real and Simulated Area Harvested of Other Grains, Rice and Sugar in the EU, 1993–97. Source: Nölle (2000) p. 32.

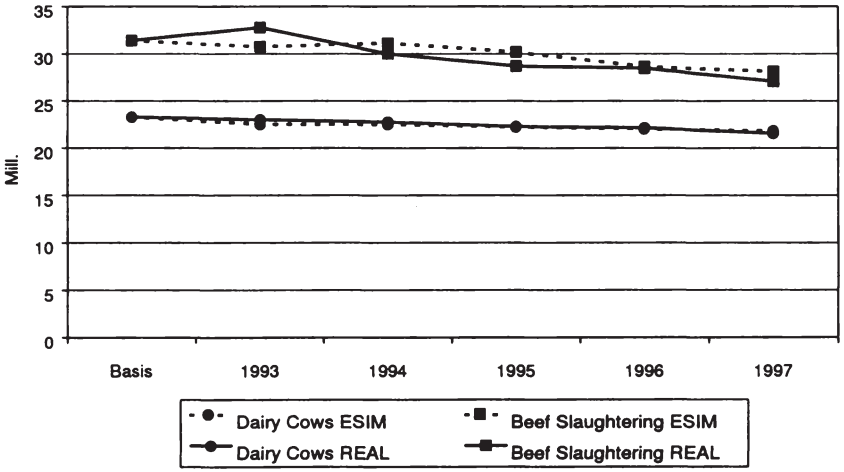

Figure C.3: Development of Real and Simulated Area National Cattle Herds in the EU, 1993–97. Source: Nölle (2000) p. 36.

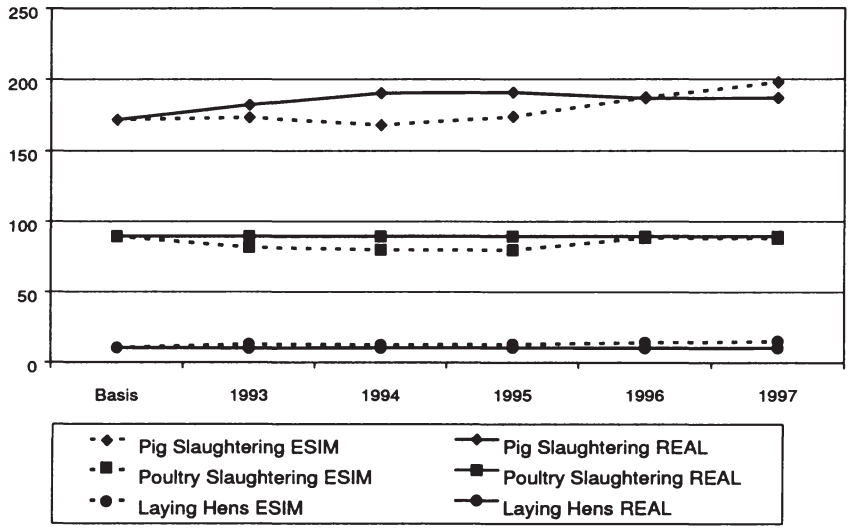

Figure C.4: Development of Real and Simulated National Herds for Pork, Poultry and Layer Hens in the EU, 1993–97. Source: Nölle (2000) p. 39.

D Appendix: Selected Scenario Results by Country

Table D.1: Development of World Market Prices in NON-ACCESSION (EUR/ton).

	1997	2010	% Change
Wheat	110.42	114.45	3.6
Barley	82.21	88.65	7.8
Corn	95.83	95.83	0.0
O. Grain	65.68	69.14	5.3
Rice	207.52	219	5.5
Sugar	334.76	356.84	6.6
Soybean	225.93	215.97	−4.4
Rapeseed	259.21	266.41	2.8
Sunseed	270.59	277.85	2.7
Soymeal	172.48	173.89	0.8
Rapemeal	141.8	138.12	−2.6
Sunmeal	115.78	112.8	−2.6
Manioc	65.68	48.36	−26.4
CGF	74.43	64.11	−13.9
O. Energy	87.57	88.93	1.6
O. Protein	87.57	88.93	1.6
SMP	1344.26	1319.88	−1.8
Butter	1331.91	1467.87	10.2
Cheese	1873.41	2259.22	20.6
Beef	1129.35	1196.48	5.9
Pork	1218.03	1272.01	4.4
Poultry	1000.89	897.59	−10.3
Eggs	808.85	823.21	1.8

Table D.2: Scenario Results: NON-ACCESSION, European Union.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	180.90	190.21	210.84	225.35
of which				
Wheat	88.10	93.19	105.96	114.71
Coarse grains	92.81	97.02	104.88	110.64
Oilseeds	12.31	13.60	14.91	15.74
Sugar*	16.24	16.88	16.88	16.88
Milk	121.29	121.29	123.17	123.17
Butter	1.776	1.787	1.721	1.729
Beef	8.05	8.46	8.76	8.97
Pork	16.34	18.76	20.16	20.52
Poultry	7.83	8.34	8.73	8.88
Eggs	5.50	7.30	7.87	8.26
Total Domestic Use, Mill. tons				
Cereals	165.31	179.72	186.50	189.52
of which				
Wheat	74.80	82.70	85.14	85.88
Coarse grains	90.51	97.02	101.36	95.62
Oilseeds	24.14	24.98	26.95	27.78
Sugar	12.91	13.18	13.53	13.59
Milk	121.29	121.29	123.17	123.17
Butter	1.651	1.667	1.672	1.693
Beef	7.27	7.68	7.98	8.19
Pork	15.38	17.80	19.21	19.56
Poultry	7.26	7.77	8.16	8.31
Eggs	5.34	6.60	6.77	6.78
Net Exports, Mill. tons				
Cereals	15.60	10.49	24.34	35.83
of which				
Wheat	13.30	10.49	20.81	28.84
Coarse grains	2.30	0.00	3.53	15.02
Oilseeds	−11.83	−11.38	−12.04	−12.04
Sugar	3.32	3.70	3.35	3.29
Butter	0.12	0.12	0.05	0.04
Beef	0.78	0.78	0.78	0.78
Pork	0.95	0.95	0.95	0.95
Poultry	0.57	0.57	0.57	0.57
Eggs	0.16	0.70	1.10	1.48

* Includes C-quota sugar.

Table D.3: Scenario Results: NON-ACCESSION, Poland.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	25.88	28.01	30.88	32.95
of which				
Wheat	8.77	9.64	10.77	11.59
Coarse grains	17.12	18.37	20.11	21.36
Oilseeds	0.71	0.78	0.86	0.92
Sugar*	2.12	2.06	2.33	2.53
Milk	12.01	12.34	13.58	14.58
Butter	0.16	0.16	0.16	0.16
Beef	0.47	0.46	0.50	0.54
Pork	2.01	2.24	2.47	2.64
Poultry	0.47	0.49	0.51	0.53
Eggs	0.43	0.46	0.51	0.54
Total Domestic Use, Mill. tons				
Cereals	27.08	28.61	31.38	33.44
of which				
Wheat	9.39	9.91	10.96	11.77
Coarse grains	17.70	18.70	20.42	21.67
Oilseeds	0.91	0.91	0.91	0.91
Sugar	1.65	1.71	1.91	2.08
Milk	12.01	12.34	13.58	14.58
Butter	0.16	0.16	0.16	0.18
Beef	0.43	0.44	0.50	0.54
Pork	1.87	1.91	2.24	2.54
Poultry	0.49	0.54	0.71	0.87
Eggs	0.43	0.44	0.50	0.55
Net Exports, Mill. tons				
Cereals	−1.20	−0.60	−0.50	−0.49
of which				
Wheat	−0.62	−0.27	−0.19	−0.19
Coarse grains	−0.58	−0.33	−0.31	−0.31
Oilseeds	−0.19	−0.12	−0.05	0.01
Sugar	0.46	0.35	0.42	0.45
Butter	0.00	0.00	−0.01	−0.02
Beef	0.04	0.02	0.01	0.00
Pork	0.15	0.33	0.23	0.10
Poultry	−0.02	−0.05	−0.19	−0.34
Eggs	0.00	0.02	0.01	0.00

* Includes C-quota sugar.

Table D.4: Development of World Market Prices in CAP-1992 (EUR/ton).

	1997	2010	% Change
Wheat	110.42	112.34	1.7
Barley	82.21	78.82	−4.1
Corn	95.83	94.93	−0.9
O. Grain	65.68	68.29	4.0
Rice	207.52	218.94	5.5
Sugar	334.76	353.81	5.7
Soybean	225.93	216.57	−4.1
Rapeseed	259.21	275.87	6.4
Sunseed	270.59	289.59	7.0
Soymeal	172.48	175.72	1.9
Rapemeal	141.80	143.40	1.1
Sunmeal	115.78	121.01	4.5
Manioc	65.68	66.73	1.6
CGF	74.43	77.56	4.2
O. Energy	87.57	88.93	1.6
O. Protein	87.57	88.93	1.6
SMP	1344.26	1341.58	−0.2
Butter	1331.91	1425.02	7.0
Cheese	1873.41	2238.76	19.5
Beef	1129.35	1138.31	0.8
Pork	1218.03	1290.04	5.9
Poultry	1000.89	884.78	−11.6
Eggs	808.85	858.96	6.2

Table D.5: Scenario Results: CAP-1992, European Union.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	180.905	201.434	224.223	240.24
of which				
Wheat	88.098	97.738	110.437	119.533
Coarse grains	92.806	103.696	113.786	120.703
Oilseeds	12.307	13.566	14.769	15.508
Sugar*	16.238	16.733	16.744	16.751
Milk	121.288	121.288	121.288	121.288
Butter	1.776	1.785	1.767	1.755
Beef	8.046	8.527	8.998	9.325
Pork	16.338	17.081	17.989	18.515
Poultry	7.825	7.774	8.081	8.222
Eggs	5.499	6.857	7.227	7.533
Total Domestic Use, Mill. tons				
Cereals	165.307	170.747	176.761	179.756
of which				
Wheat	74.800	78.070	80.381	81.127
Coarse grains	90.507	92.678	96.380	90.280
Oilseeds	24.137	25.166	27.009	27.747
Sugar	12.914	13.178	13.530	13.588
Milk	121.288	121.288	121.288	121.288
Butter	1.651	1.667	1.672	1.693
Beef	7.267	7.185	7.395	7.421
Pork	15.384	16.299	16.925	17.213
Poultry	7.259	7.885	8.270	8.419
Eggs	5.344	6.306	6.513	6.505
Net Exports, Mill. tons				
Cereals	15.598	30.687	47.463	60.480
of which				
Wheat	13.298	19.668	30.057	38.406
Coarse grains	2.300	11.019	17.406	30.423
Oilseeds	−11.830	−11.600	−12.240	−12.240
Sugar	3.324	3.555	3.214	3.163
Butter	0.124	0.117	0.095	0.062
Beef	0.779	1.343	1.603	1.903
Pork	0.954	0.783	1.064	1.302
Poultry	0.566	−0.110	−0.189	−0.197
Eggs	0.155	0.551	0.714	1.028

* Includes C-quota sugar.

Table D.6: Scenario Results: CAP-1992, Poland.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	25.884	28.483	31.535	33.520
of which				
Wheat	8.766	7.265	8.139	8.727
Coarse grains	17.118	23.340	25.736	27.272
Oilseeds	0.712	0.528	0.584	0.617
Sugar*	2.117	2.297	2.415	2.415
Milk	12.007	14.502	14.739	14.749
Butter	0.162	0.207	0.205	0.203
Beef	0.475	0.606	0.562	0.532
Pork	2.012	2.348	2.496	2.666
Poultry	0.468	0.533	0.586	0.632
Eggs	0.427	0.188	0.192	0.209
Total Domestic Use, Mill. tons				
Cereals	27.085	27.736	29.351	30.752
of which				
Wheat	9.389	10.294	11.211	12.026
Coarse grains	17.695	15.698	16.326	16.853
Oilseeds	0.905	0.910	0.910	0.910
Sugar	1.653	1.530	1.709	1.861
Milk	12.007	14.502	14.739	14.749
Butter	0.158	0.127	0.141	0.155
Beef	0.431	0.375	0.422	0.465
Pork	1.866	1.688	2.044	2.400
Poultry	0.490	0.469	0.591	0.714
Eggs	0.431	0.539	0.607	0.665
Net Exports, Mill. tons				
Cereals	−1.201	0.747	2.184	2.768
of which				
Wheat	−0.623	−3.029	−3.072	−3.299
Coarse grains	−0.577	7.642	9.409	10.419
Oilseeds	−0.193	−0.381	−0.326	−0.293
Sugar	0.463	0.767	0.706	0.554
Butter	0.004	0.081	0.063	0.048
Beef	0.044	0.231	0.140	0.067
Pork	0.146	0.660	0.453	0.266
Poultry	−0.022	0.064	−0.004	−0.082
Eggs	−0.004	−0.352	−0.414	−0.457

* Includes C-quota sugar.

Table D.7: Development of World Market Prices in AGENDA (EUR/ton).

	1997	2010	% Change
Wheat	110.42	115.02	4.2
Barley	82.20	88.66	7.9
Corn	95.83	95.34	−0.5
O. Grain	65.67	69.13	5.3
Rice	207.58	218.98	5.5
Sugar	334.76	353.29	5.5
Soybean	225.92	216.20	−4.3
Rapeseed	259.20	268.12	3.4
Sunseed	270.59	287.48	6.2
Soymeal	172.48	174.38	1.1
Rapemeal	141.80	138.15	−2.6
Sunmeal	115.77	115.59	−0.2
Manioc	65.67	48.81	−25.7
CGF	74.43	64.58	−13.2
O. Energy	87.56	88.93	1.6
O. Protein	87.56	88.93	1.6
SMP	1344.25	1424.77	6.0
Butter	1331.91	1450.45	8.9
Cheese	1873.41	2075.26	10.8
Beef	1129.35	1184.76	4.9
Pork	1218.02	1292.55	6.1
Poultry	1000.89	885.89	−11.5
Eggs	808.85	829.42	2.5

Table D.8: Scenario Results: AGENDA, European Union.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	180.905	190.768	210.767	217.99
of which				
Wheat	88.098	93.882	106.856	111.214
Coarse grains	92.806	96.886	103.911	106.780
Oilseeds	12.307	13.644	15.138	15.553
Sugar*	16.238	16.883	16.883	16.883
Milk	121.288	121.288	123.186	123.186
Butter	1.776	1.787	1.721	1.729
Beef	8.046	8.367	8.860	8.985
Pork	16.338	18.597	20.336	20.575
Poultry	7.825	7.922	8.256	8.326
Eggs	5.499	7.494	8.145	8.338
Total Domestic Use, Mill. tons				
Cereals	165.307	179.167	186.570	188.126
of which				
Wheat	74.800	82.411	85.055	85.446
Coarse grains	90.507	96.756	101.515	98.713
Oilseeds	24.137	24.807	27.066	27.481
Sugar	12.914	13.178	13.530	13.559
Milk	121.288	121.288	123.186	123.186
Butter	1.651	1.667	1.672	1.693
Beef	7.267	7.915	8.352	8.434
Pork	15.384	17.819	19.135	19.266
Poultry	7.259	8.057	8.480	8.556
Eggs	5.344	6.519	6.685	6.687
Net Exports, Mill. tons				
Cereals	15.598	11.601	24.198	29.868
of which				
Wheat	13.298	11.471	21.801	25.767
Coarse grains	2.300	0.130	2.396	8.067
Oilseeds	−11.830	−11.162	−11.928	−11.928
Sugar	3.324	3.705	3.353	3.324
Butter	0.124	0.120	0.049	0.036
Beef	0.779	0.452	0.507	0.551
Pork	0.954	0.779	1.201	1.309
Poultry	0.566	−0.135	−0.223	−0.230
Eggs	0.155	0.975	1.460	1.652

* Includes C-quota sugar.

Table D.9: Scenario Results: AGENDA, Poland.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	25.884	27.144	29.784	30.646
of which				
Wheat	8.766	7.359	8.427	8.771
Coarse grains	17.118	21.764	23.493	24.061
Oilseeds	0.712	0.594	0.674	0.698
Sugar*	2.117	2.350	2.412	2.412
Milk	12.007	14.513	14.753	14.760
Butter	0.162	0.207	0.197	0.198
Beef	0.475	0.614	0.573	0.557
Pork	2.012	2.454	2.590	2.691
Poultry	0.468	0.548	0.607	0.631
Eggs	0.427	0.219	0.236	0.247
Total Domestic Use, Mill. tons				
Cereals	27.085	30.618	32.846	33.750
of which				
Wheat	9.389	10.908	11.844	12.282
Coarse grains	17.695	17.739	18.902	19.321
Oilseeds	0.905	0.910	0.910	0.910
Sugar	1.653	1.530	1.709	1.784
Milk	12.007	14.513	14.753	14.760
Butter	0.158	0.127	0.145	0.152
Beef	0.431	0.386	0.438	0.460
Pork	1.866	1.793	2.220	2.406
Poultry	0.490	0.474	0.598	0.659
Eggs	0.431	0.550	0.618	0.648
Net Exports, Mill. tons				
Cereals	−1.201	−3.474	−3.063	−3.104
of which				
Wheat	−0.623	−3.549	−3.418	−3.510
Coarse grains	−0.577	4.024	4.591	4.740
Oilseeds	−0.193	−0.315	−0.236	−0.213
Sugar	0.463	0.820	0.703	0.628
Butter	0.004	0.081	0.052	0.046
Beef	0.044	0.229	0.135	0.096
Pork	0.146	0.661	0.370	0.285
Poultry	−0.022	0.075	0.009	−0.028
Eggs	−0.004	−0.331	−0.381	−0.401

* Includes C-quota sugar.

Table D.10: Development of World Market Prices in LIBERAL (EUR/ton).

	1997	2010	% Change
Wheat	110.94	110.80	−0.1
Barley	89.55	88.00	−1.7
Corn	98.80	97.15	−1.7
O. Grain	66.80	70.29	5.2
Rice	207.90	219.39	5.5
Sugar	361.00	370.56	2.6
Soybean	225.78	215.55	−4.5
Rapeseed	251.09	253.68	1.0
Sunseed	271.93	275.18	1.2
Soymeal	172.22	173.75	0.9
Rapemeal	135.78	134.70	−0.8
Sunmeal	112.33	110.96	−1.2
Manioc	42.22	42.83	1.5
CGF	56.50	57.42	1.6
O. Energy	87.57	88.93	1.6
O. Protein	87.57	88.93	1.6
SMP	1393.22	1436.06	3.1
Butter	1812.27	1931.19	6.6
Cheese	2057.40	2225.31	8.2
Beef	1546.23	1589.20	2.8
Pork	1256.96	1283.62	2.1
Poultry	1202.88	1119.69	−6.9
Eggs	793.45	767.72	−3.2

Table D.11: Scenario Results: LIBERAL, European Union.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	166.881	199.285	222.276	238.23
of which				
Wheat	88.258	104.863	118.244	127.659
Coarse grains	78.623	94.422	104.032	110.569
Oilseeds	13.026	15.874	17.184	18.046
Sugar*	12.918	16.883	16.883	16.883
Milk	96.215	99.555	104.403	107.299
Butter	1.513	1.509	1.505	1.504
Beef	5.689	6.010	6.390	6.641
Pork	20.036	21.713	23.069	23.944
Poultry	5.484	5.411	5.290	5.143
Eggs	7.079	9.876	10.437	10.809
Total Domestic Use, Mill. tons				
Cereals	177.364	187.379	193.332	196.238
of which				
Wheat	76.988	81.123	84.010	85.186
Coarse grains	100.376	106.255	109.323	102.813
Oilseeds	24.139	24.933	26.944	27.805
Sugar	15.343	15.883	16.203	16.212
Milk	96.215	99.555	104.403	107.299
Butter	2.634	2.654	2.663	2.638
Beef	14.423	14.360	14.587	14.572
Pork	19.953	20.821	21.454	21.514
Poultry	10.037	10.954	12.007	12.619
Eggs	6.059	6.719	6.885	6.883
Net Exports, Mill. tons				
Cereals	−10.483	11.907	28.944	41.991
of which				
Wheat	11.271	23.739	34.235	42.474
Coarse grains	−21.753	−11.833	−5.291	7.756
Oilseeds	−11.113	−9.059	−9.759	−9.759
Sugar	−2.425	1.000	0.680	0.670
Butter	−1.120	−1.145	−1.157	−1.134
Beef	−8.734	−8.350	−8.196	−7.930
Pork	0.082	0.892	1.615	2.431
Poultry	−4.553	−5.543	−6.717	−7.476
Eggs	1.020	3.158	3.553	3.926

* Includes C-quota sugar.

Table D.12: Scenario Results: LIBERAL, Poland.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	24.308	26.309	29.006	30.949
of which				
Wheat	8.718	9.507	10.533	11.269
Coarse grains	15.590	16.801	18.472	19.680
Oilseeds	0.735	0.791	0.867	0.920
Sugar*	1.862	1.790	2.051	2.243
Milk	12.524	13.019	14.504	15.549
Butter	0.183	0.182	0.181	0.180
Beef	0.531	0.533	0.598	0.645
Pork	2.330	2.558	2.781	2.934
Poultry	0.396	0.424	0.458	0.477
Eggs	0.272	0.269	0.299	0.323
Total Domestic Use, Mill. tons				
Cereals	31.423	33.318	36.567	38.897
of which				
Wheat	10.062	10.620	11.788	12.711
Coarse grains	21.361	22.698	24.780	26.186
Oilseeds	0.916	0.917	0.918	0.918
Sugar	1.844	1.916	2.123	2.302
Milk	12.524	13.019	14.504	15.549
Butter	0.148	0.151	0.169	0.185
Beef	0.438	0.451	0.506	0.556
Pork	1.810	1.882	2.238	2.581
Poultry	0.525	0.566	0.731	0.899
Eggs	0.534	0.569	0.636	0.698
Net Exports, Mill. tons				
Cereals	−7.114	−7.009	−7.561	−7.948
of which				
Wheat	−1.344	−1.113	−1.254	−1.441
Coarse grains	−5.771	−5.896	−6.307	−6.506
Oilseeds	−0.180	−0.126	−0.051	0.002
Sugar	0.017	−0.126	−0.072	−0.060
Butter	0.036	0.031	0.012	−0.004
Beef	0.093	0.082	0.093	0.089
Pork	0.521	0.676	0.543	0.353
Poultry	−0.129	−0.141	−0.273	−0.422
Eggs	−0.263	−0.299	−0.337	−0.375

* Includes C-quota sugar.

Table D.13: Scenario Results: MEMBER, Czech Republic.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	6.603	7.272	8.252	8.951
of which				
Wheat	3.651	4.012	4.566	4.948
Coarse grains	2.952	3.260	3.686	4.003
Oilseeds	0.564	0.678	0.780	0.848
Sugar*	0.542	0.563	0.612	0.653
Milk	2.983	2.985	3.063	3.207
Butter	0.073	0.073	0.070	0.067
Beef	0.166	0.159	0.166	0.174
Pork	0.475	0.564	0.663	0.729
Poultry	0.137	0.136	0.138	0.132
Eggs	0.148	0.159	0.178	0.191
Total Domestic Use, Mill. tons				
Cereals	6.699	7.366	8.251	8.949
of which				
Wheat	3.746	4.106	4.565	4.947
Coarse grains	2.912	3.260	3.686	4.002
Oilseeds	0.581	0.695	0.797	0.865
Sugar	0.484	0.393	0.340	0.313
Milk	2.983	2.935	3.063	3.207
Butter	0.049	0.050	0.052	0.055
Beef	0.164	0.159	0.166	0.174
Pork	0.488	0.471	0.481	0.506
Poultry	0.143	0.147	0.163	0.184
Eggs	0.135	0.134	0.142	0.156
Net Exports, Mill. tons				
Cereals	−0.095	−0.095	0.001	0.002
of which				
Wheat	−0.095	−0.095	0.001	0.002
Coarse grains	0.040	0.000	0.000	0.001
Oilseeds	−0.017	−0.017	−0.017	−0.017
Sugar	0.058	0.171	0.272	0.340
Butter	0.024	0.023	0.018	0.011
Beef	0.002	0.000	0.000	0.000
Pork	−0.014	0.093	0.183	0.223
Poultry	−0.006	−0.012	−0.026	−0.052
Eggs	0.014	0.025	0.036	0.035

* Includes C-quota sugar.

Table D.14: Scenario Results: MEMBER, Hungary.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	11.244	12.456	13.923	15.408
of which				
Wheat	4.389	4.882	5.486	6.099
Coarse grains	6.855	7.574	8.438	9.309
Oilseeds	0.883	1.055	1.423	1.693
Sugar*	0.492	0.417	0.450	0.486
Milk	1.998	1.931	2.000	2.105
Butter	0.015	0.015	0.014	0.014
Beef	0.074	0.070	0.072	0.075
Pork	0.360	0.417	0.565	0.680
Poultry	0.374	0.376	0.463	0.511
Eggs	0.388	0.409	0.514	0.589
Total Domestic Use, Mill. tons				
Cereals	9.592	10.018	11.971	13.434
of which				
Wheat	3.046	3.233	3.891	4.414
Coarse grains	6.545	6.785	8.080	9.019
Oilseeds	0.599	0.117	0.717	0.987
Sugar	0.399	0.397	0.393	0.398
Milk	1.998	1.931	2.000	2.105
Butter	0.020	0.020	0.021	0.021
Beef	0.070	0.070	0.072	0.075
Pork	0.287	0.285	0.279	0.295
Poultry	0.250	0.261	0.276	0.304
Eggs	0.271	0.272	0.262	0.275
Net Exports, Mill. tons				
Cereals	1.652	2.439	1.953	1.975
of which				
Wheat	1.342	1.649	1.595	1.684
Coarse grains	0.310	0.789	0.358	0.290
Oilseeds	0.284	0.939	0.706	0.706
Sugar	0.092	0.020	0.057	0.089
Butter	−0.005	−0.006	−0.006	−0.007
Beef	0.005	0.000	0.000	0.000
Pork	0.073	0.132	0.286	0.385
Poultry	0.124	0.115	0.187	0.207
Eggs	0.117	0.137	0.252	0.314

* Includes C-quota sugar.

Table D.15: Scenario Results: MEMBER, Poland.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	25.884	28.320	31.328	33.398
of which				
Wheat	8.766	9.742	10.921	11.668
Coarse grains	17.118	18.577	20.407	21.729
Oilseeds	0.712	0.881	1.125	1.290
Sugar*	2.117	1.891	2.039	2.233
Milk	12.007	11.221	11.204	11.665
Butter	0.162	0.161	0.157	0.157
Beef	0.475	0.402	0.361	0.349
Pork	2.012	2.331	2.823	3.233
Poultry	0.468	0.463	0.588	0.767
Eggs	0.427	0.475	0.585	0.685
Total Domestic Use, Mill. tons				
Cereals	27.085	28.759	33.054	36.984
of which				
Wheat	9.389	10.029	11.706	13.282
Coarse grains	17.695	18.730	21.348	23.702
Oilseeds	0.905	0.906	0.906	0.907
Sugar	1.653	1.694	1.841	1.977
Milk	12.007	11.221	11.204	11.665
Butter	0.158	0.161	0.163	0.179
Beef	0.431	0.402	0.434	0.479
Pork	1.866	1.773	1.915	2.096
Poultry	0.490	0.494	0.589	0.700
Eggs	0.431	0.414	0.429	0.454
Net Exports, Mill. tons				
Cereals	−1.201	−0.439	−1.727	−3.586
of which				
Wheat	−0.623	−0.287	−0.785	−1.613
Coarse grains	−0.577	−0.153	−0.941	−1.972
Oilseeds	−0.193	−0.025	0.219	0.384
Sugar	0.463	0.197	0.198	0.256
Butter	0.004	0.000	−0.006	−0.022
Beef	0.044	0.000	−0.073	−0.129
Pork	0.146	0.557	0.908	1.137
Poultry	−0.022	−0.031	−0.002	0.067
Eggs	−0.004	0.061	0.156	0.232

* Includes C-quota sugar.

Table D.16: Scenario Results: AGENDAPPP, Czech Republic.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	6.603	6.364	7.271	7.924
of which				
Wheat	3.651	3.189	3.732	4.101
Coarse grains	2.952	3.492	3.893	4.205
Oilseeds	0.564	0.700	0.802	0.861
Sugar*	0.542	0.671	0.671	0.672
Milk	2.983	3.767	3.848	3.848
Butter	0.073	0.088	0.084	0.084
Beef	0.166	0.223	0.249	0.251
Pork	0.475	0.348	0.349	0.370
Poultry	0.137	0.262	0.303	0.309
Eggs	0.148	0.129	0.142	0.153
Total Domestic Use, Mill. tons				
Cereals	6.699	7.559	8.057	8.531
of which				
Wheat	3.746	4.384	4.518	4.708
Coarse grains	2.912	2.490	2.680	2.776
Oilseeds	0.581	0.717	0.819	0.878
Sugar	0.484	0.475	0.374	0.315
Milk	2.983	3.767	3.848	3.848
Butter	0.049	0.048	0.049	0.052
Beef	0.164	0.168	0.173	0.182
Pork	0.488	0.638	0.689	0.752
Poultry	0.143	0.111	0.118	0.130
Eggs	0.135	0.148	0.156	0.172
Net Exports, Mill. tons				
Cereals	−0.095	−1.195	−0.787	−0.608
of which				
Wheat	−0.095	−1.195	−0.787	−0.608
Coarse grains	0.040	1.002	1.213	1.429
Oilseeds	−0.017	−0.017	−0.017	−0.017
Sugar	0.058	0.196	0.298	0.357
Butter	0.024	0.040	0.035	0.033
Beef	0.002	0.055	0.076	0.069
Pork	−0.014	−0.290	−0.339	−0.382
Poultry	−0.006	0.151	0.185	0.179
Eggs	0.014	−0.019	−0.014	−0.018

* Includes C-quota sugar.

Table D.17: Scenario Results: AGENDAPPP, Hungary.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	11.244	12.253	14.470	16.223
of which				
Wheat	4.389	5.137	6.207	7.047
Coarse grains	6.855	7.828	9.090	10.093
Oilseeds	0.883	0.729	0.888	1.018
Sugar*	0.492	0.494	0.494	0.494
Milk	1.998	2.260	2.317	2.317
Butter	0.015	0.020	0.019	0.019
Beef	0.074	0.094	0.107	0.109
Pork	0.360	0.394	0.431	0.487
Poultry	0.374	0.634	0.868	0.986
Eggs	0.388	0.343	0.444	0.508
Total Domestic Use, Mill. tons				
Cereals	9.592	10.386	11.701	12.750
of which				
Wheat	3.046	2.937	3.154	3.464
Coarse grains	6.545	6.704	7.692	8.358
Oilseeds	0.599	0.387	0.654	0.784
Sugar	0.399	0.276	0.251	0.244
Milk	1.998	2.260	2.317	2.317
Butter	0.020	0.017	0.017	0.017
Beef	0.070	0.058	0.058	0.059
Pork	0.287	0.307	0.311	0.328
Poultry	0.250	0.223	0.229	0.261
Eggs	0.271	0.281	0.265	0.279
Net Exports, Mill. tons				
Cereals	1.652	1.867	2.769	3.472
of which				
Wheat	1.342	2.200	3.053	3.583
Coarse grains	0.310	1.124	1.398	1.735
Oilseeds	0.284	0.342	0.234	0.234
Sugar	0.092	0.218	0.243	0.250
Butter	−0.005	0.003	0.002	0.002
Beef	0.005	0.036	0.049	0.050
Pork	0.073	0.087	0.120	0.158
Poultry	0.124	0.411	0.639	0.725
Eggs	0.117	0.062	0.178	0.229

* Includes C-quota sugar.

Table D.18: Scenario Results: AGENDAPPP, Poland.

	1995–97	2002	2008	2012
Production, Mill. tons				
Cereals	25.884	28.001	31.753	33.936
of which				
Wheat	8.766	7.664	9.166	10.066
Coarse grains	17.118	22.371	24.846	26.256
Oilseeds	0.712	0.617	0.752	0.838
Sugar*	2.117	2.295	2.412	2.412
Milk	12.007	14.508	14.747	14.766
Butter	0.162	0.207	0.197	0.198
Beef	0.475	0.651	0.598	0.544
Pork	2.012	2.362	2.531	2.798
Poultry	0.468	0.501	0.680	0.919
Eggs	0.427	0.212	0.238	0.273
Total Domestic Use, Mill. tons				
Cereals	27.085	29.871	31.950	34.395
of which				
Wheat	9.389	10.418	11.214	12.344
Coarse grains	17.695	17.508	18.663	19.846
Oilseeds	0.905	0.910	0.910	0.911
Sugar	1.653	1.445	1.479	1.558
Milk	12.007	14.508	14.747	14.766
Butter	0.158	0.121	0.132	0.141
Beef	0.431	0.369	0.396	0.429
Pork	1.866	1.671	1.878	2.127
Poultry	0.490	0.434	0.495	0.579
Eggs	0.431	0.513	0.525	0.559
Net Exports, Mill. tons				
Cereals	−1.201	−1.870	−0.197	−0.460
of which				
Wheat	−0.623	−2.754	−2.048	−2.278
Coarse grains	−0.577	4.863	6.183	6.410
Oilseeds	−0.193	−0.293	−0.158	−0.073
Sugar	0.463	0.850	0.933	0.854
Butter	0.004	0.086	0.065	0.057
Beef	0.044	0.282	0.202	0.115
Pork	0.146	0.691	0.653	0.670
Poultry	−0.022	0.066	0.185	0.340
Eggs	−0.004	−0.300	−0.287	−0.285

* Includes C-quota sugar.

CeGE-Schriften

Das CeGE – Center for Globalization and Europeanization of the Economy – wurde 1999 von der Wirtschaftswissenschaftlichen Fakultät der Georg-August-Universität Göttingen gegründet. Das Zentrum dient als Forum zur internationalen und interdisziplinären Zusammenarbeit bei der Analyse ökonomischer Fragestellungen von europäischer oder globaler Bedeutung. In den CeGE-Schriften werden Forschungsergebnisse aus Dissertationen, Habilitationen und anderen Forschungsprojekten des Zentrums veröffentlicht.

Band 1 Axel Gerloff: Wechselkurspolitik in Mittel- und Osteuropa. Eine theoretische Analyse unter besonderer Berücksichtigung der Erfahrungen der zehn Kandidaten für eine EU-Osterweiterung. 2001.

Band 2 Ingo Konrad: Zur Integration ausgewählter mittel- und osteuropäischer Länder in die währungspolitische Ordnung Europas. 2002.

Band 3 Axel Hennighausen: Wegekostenfinanzierung und Lenkung im deregulierten europäischen Verkehrsmarkt. 2002.

Band 4 Wolfgang Münch: Effects of EU Enlargement to the Central European Countries on Agricultural Markets. 2002.

Peter Lang · Europäischer Verlag der Wissenschaften

Karl Bruckmeier / Wiking Ehlert (eds.)

The Agri-Environmental Policy of the European Union

The Implementation of the Agri-Environmental Measures within the Common Agricultural Policy in France, Germany, and Portugal

Frankfurt/M., Berlin, Bern, Bruxelles, New York, Oxford, Wien, 2001.
264 pp., 34 tab., 8 graf.
Work – Technology – Organization – Society. Edited by Wiking Ehlert and György Széll. Vol. 11
ISBN 3-631-37512-3 · pb. € 40.40* / US $ 35.95 / £ 25.–
US-ISBN 0-8204-5356-0

Integrating environmental aims in the agricultural policy of the European Union was a main aim of the 1992 CAP-reform. This book presents a study of the socio-economic framing conditions as well as the attitudes and orientations within the agricultural population towards the European agri-environmental policy. It is based on a research project in three member countries, France, Germany, and Portugal, where more than 600 farmers have been interviewed. The results indicate that a change towards more ecologically sustainable forms of agricultural production requires much broader political and social support to grow beyond the dimensions of a marginal green subsector of agriculture.

Frankfurt/M · Berlin · Bern · Bruxelles · New York · Oxford · Wien
Distribution: Verlag Peter Lang AG
Moosstr. 1, CH-2542 Pieterlen
Telefax 00 41 (0) 32 / 376 17 27

*The €-price includes German tax rate
Prices are subject to change without notice

Homepage http://www.peterlang.de