

Risto Vaittinen

TRADE POLICIES AND INTEGRATION – EVALUATIONS WITH CGE -MODELS

HELSINKI SCHOOL OF ECONOMICS

ACTA UNIVERSITATIS OECONOMICAE HELSINGIENSIS

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VAITTINEN, RISTO: TRADE POLICIES AND INTEGRATION – EVALUA-TIONS WITH CGE -MODELS.

Abstract: This monograph studies trade and integration at three levels: national, regional and global. The impacts of trade and integration have been evaluated in three different cases: Finland's accession into the EU, global trade liberalisation set off by the WTO negotiations and the EU's enlargement with the new members from the former socialist Central European countries. Computable general equilibrium (CGE) modelling is used to evaluate the likely outcomes of the policy changes related to these occurrences.

Finnish accession into the EU is evaluated by a single region comparative-static CGE -model of the Finnish economy. Multilateral trade liberalisation within the WTO negotiations is evaluated using GTAP -model developed at University of Purdue in Global Trade Analysis Project. The eastern enlargement of the EU is studied with a recursive dynamic version of the GTAP model.

Key words: Agricultural Policy, CGE modelling, EU's eastern enlargement, Integration, Trade Policy, WTO

Tiivistelmä: Tässä tutkimuksessa arvioidaan kauppaa ja integraatiota kolmella tasolla: kansallisella, alueellisella ja globaalilla. Kaupan ja integraation merkitystä on tarkasteltu kolmen esimerkin valossa, jotka ovat Suomen EU -jäsenyys, WTO kauppaneuvottelut ja EU:n itälaajentuminen Itä-Euroopan entisiin sosialistimaihin. Numeerista yleisen tasapainon (CGE) malleilla on arvioitu näihin tapahtumiin liittyvien politiikkamuutosten todennäköisiä seuraamuksia.

Suomen EU -jäsenyyttä on arvioitu yhden maan komparatiivis-staattisella Suomea kuvaavalla CGE -mallilla. Monenvälisten kauppaneuvottelujen vaikutuksia on arvioitu Purduen yliopistossa kehitellyllä GTAP -mallilla. EU:n itälaajentumista on arvioitu GTAP -mallin rekursiivisesti dynaamisella versiolla.

Asiasanat: CGE -mallit, EU:n itälaajentuminen, Integraatio, Kauppapolitiikka, Maatalouspolitiikka, WTO

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The research for this book was carried out during my tenure at various institutions where I have been fortunate to have worked with many inspiring and fascinating people, some of whom have also been researchers outside the range of my particular study. I am grateful to all these people, but I would like to single out a few individuals here.

The earliest part of this study, on Finland's EU integration, was conducted while I was working at the National Consumer Research Centre (NCRC). This work was partly done in co-operation with Hannu Törmä, and I am deeply indebted to Hannu for introducing me to the methodology of numerical general equilibrium modelling. When I was taking my first steps in the field of CGE–modelling, it was not possible to study the subject in Finland, except from books. At NCRC I was given the opportunity to participate in modelling courses and workshops abroad, and these served to improve and strengthen my knowledge and skills of the subject. I thank Eila Kilpiö for giving me this opportunity. I am also grateful to my colleague, Mika Panzar, for recruiting me to NCRC and for his broad-mindedness which allowed my research interest to be directed toward this research field, somewhat of a deviation from the institute's more conventional approaches to consumer issues.

I had already met Mika when we were both at the Labour Institute for Economic Research, where it was my job to analyse the economic costs of Finnish agricultural policy. The agricultural emphasis in this work dates back to those times. Thus you could say that the Labour Institutive was my training period in applied economic research, and I thank Pekka Korpinen for providing me with this opportunity.

A considerable part of this work deals with global or multi-regional issues, and I am indebted to my supervisor, Pertti Haaparanta, for steering me toward this research area. Much of the analysis on the eastern enlargement was conducted at the Helsinki School of Economics within Pertti's project, "Opening-up of Russia and Eastern Europe", financed by the Academy of Finland. The project also provided me with opportunity to participate in the Monash–model course at the Centre of Policy Studies at Monash University. Thanks to Peter Dixon and his teaching team, Philip Adams, Mark Horridge, Ken Pearson and Maureen Rimmer, I was able to construct a dynamic multi-regional CGE-model.

But it needs to be acknowledged that the section of this paper on the eastern enlargement part was forged into its final form at the Government Institute for Economic Research (VATT), and I wish to thank Jaakko Kiander for encouraging me to incorporate migration and labour market imperfections into the model. The section of the study on WTO relies on research conducted at VATT, where I have been able to revive my interest in agricultural policies. This research was financed by the Ministry of Agriculture. Comments from the study's steering group—Matti Hannula, Panu Kallio, Jukka Kola, Paavo Mäkinen and Jarmo Vaittinen—are gratefully acknowledged.

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Summary

This monograph studies trade and integration at three levels: national, regional and global. The impacts of trade and integration have been evaluated in three different cases: Finland's accession into the EU, global trade liberalisation set off by the WTO negotiations and the EU's enlargement with the new members from the former socialist Central European countries. Computable general equilibrium modelling is used to evaluate the likely outcomes of the policy changes related to these occurrences.

Finnish accession into the EU is evaluated by a single region comparative-static CGE -model of the Finnish economy. Multilateral trade liberalisation within the WTO negotiations is evaluated using GTAP -model developed at University of Purdue in Global Trade Analysis Project. The eastern enlargement of the EU is studied with a dynamic version of the GTAP model, in which recursive dynamics has been formulated as an add-on component to the existing GTAP model.

In chapter 2 Finland's integration into the EU is studied from the trade policy perspective. Membership within the EU implied significant changes in the agricultural policies and commodity taxation in Finland. Unlike for most of the countries, the adoption of a common agricultural policy (CAP) of the EU implied a less protectionist environment for Finnish agriculture. Despite the still remaining and generous subsidization of farmers, the welfare for all consumer groups improves according to model calculations when Finland joined the EU. The adopted CAP framework can said to be more efficient, since it generates larger incomes for farmers with smaller costs to other consumers.

In chapter 3 'Liberalization of Agricultural Trade' as a part of WTO negotiations is studied. The implications of agricultural policy reform on world trade, overall regional effects and specifically the effects for the EU are analysed. The WTO reform boosts world trade. Depending on the product, the expansion of trade is between 10-25%. The most important factor increasing trade is the removal of import barriers. Main beneficiaries of trade liberalisation are the middle-income countries, the EU, the coming new EU members from Central and Eastern European and small industrial OECD countries. Because of this reform, GDP in these regions increases by 0.1-0.2%.

Chapter 4 characterizes the transformation of the new EU member countries from socialist command economies to market oriented economic systems. An integral part of the transition process has been the integration with the EU region. This integration has taken place in the form of trade re-orientation but also in other institutional approximation. Several trade policy changes have facilitated the trade re-redirection. As members of the EU, new entrants are subject to policy measures that would influence their economies significantly. One of these is common agricultural policy (CAP) and the other is policy for 'social cohesion' that is financed by the Structural funds.

Chapter 5 analyses the economic effects of the eastern enlargement of the EU using simulation results of a dynamic computable general equilibrium model. In addition to conventional trade policy impacts such as custom union formation and common agricultural policy, the effects of factor mobility, induced by institutional changes, are analysed. The analysis is based on six different scenarios. According to the results, EU membership will accelerate growth in output, investment and consumption in the candidate countries in all scenarios. However, it turns out that factor mobility effects dominate those of conventional trade policy. Growth in national income will lag behind GDP growth because profits will be paid out to foreign investors. Migration will slow output growth in the candidate countries and accelerate growth in the existing Member States, while the trends in per capita consumption will be reversed; migration increases per capita consumption in the new Member States and reduces it slightly in the existing ones.

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1. Introduction

This monograph studies trade and integration at three levels: national, regional and global. The impacts of trade and integration have been evaluated in three different cases: Finland's accession into the EU, global trade liberalisation set off by the WTO negotiations and the EU's enlargement with the new members from the former socialist Central European countries. Apart from the introduction, this study consists of four chapters, three of which are ex-ante policy studies. They share a common method of analysis. Computable general equilibrium modelling (CGE) is used to evaluate the likely outcomes of the policy changes related to these occurrences. Chapter four of this study is an evaluation of the transition process that the new central European members of the EU have experienced coming from a planned to market economies. Walrasian general equilibrium models are not best suited to analyse large institutional changes. The chapter describing transition argues that institutional environment in these economies is stable enough so that CGE -analysis is an appropriate tool to evaluate the policy question at hand. In that chapter the enlargement is not seen as a single occurrence but a longer term process that has facilitated the transition.

Finnish accession into the EU is evaluated by a single region comparative-static CGE -model of the Finnish economy that was originally build by Törmä and Ruther-ford (1992 and 1993). Multilateral trade liberalization within the WTO negotia-tions is evaluated using GTAP -model (Hertel and Tsigas, 1997) developed at University of Purdue in Global Trade Analysis Project. The eastern enlargement of the EU is studied with a dynamic version of the GTAP model. The dynamics has been formulated as an add-on component to the existing GTAP model following closely the example of Dixon and Rimmer (2002) in their approach with a single region MONASH model for Australia.

1.1 CGE modelling

In recent years CGE models have become one of the most widely used tools for the analysis of policies and shocks that involve structural changes in the economy. Tax policy is a typical example of a reform that involves such structural changes. The work by Ballard et al. (1985) is a good example of welldocumented single region CGE-model analysing alternative tax-policy scenarios for the US.

Trade policies have probably been the most studied area within applied CGE analysis. One such pioneering study is by Whalley (1984), which explores trade liberalisation among major world trading areas - the European Economic Community, the United States, Japan, and developing countries. He also examines the formulae for tariff reductions discussed at the Tokyo Round, and evaluates the

Tokyo Round trade agreement. Whalley studies incentives for a retaliatory trade protection 'war' between world trade blocs, and the impact of protectionist policies on North-South trade. Since Whalley's work, trade policy analysis has proliferated. Global trade policy talks of GATT's Uruguay Round have been broadly analysed with multi-regional CGE models as, for instance, in Francois, McDonald and Nordström (1995); Harrison, Rutherford and Tarr (1997); Martin and Winters (1995). Also issues at the WTO's ongoing Doha Round have attracted research interest (for example, Hertel et al. (1999) and Francois, van Meijl and van Tongeren (2003).

Another trade-related topic widely analysed by the proponents of CGE–models is regional integration. For example, the formation of North American Free Trade Area is an issue that has attracted attention, but with a different focus. A broad range of models conducted mostly single-region models but with altering sectoral focus, have been applied to the examination of NAFTA's economic impacts. Francois and Shiells (1994) provide a collection of such studies, along with a survey by the editors of alternative approaches. In the European context, regional integration has been studied by Harrison, Rutherford and Tarr (1996), who have modelled the effects of the completion of the internal market in the European Union on trade, production and market structure. The analysis by Haaland and Norman (1995) is one of the few multiregional CGE studies to evaluate economic impacts of the 1995 accession of the EFTA countries, Austria, Finland, and Sweden into the EU.

During the prolonged period of eastern enlargement to the EU, a number of authors have approached this issue through CGE–modelling techniques. The article by Baldwin, Francois and Portes (1997) is probably one of the most widely quoted analyses. Multi-regional CGE studies focusing entirely on agricultural issues are those by Jensen, Frandsen and Bach (1998) and Jensen and Frandsen (2003). All these studies are conducted in a comparative static framework, albeit Baldwin et al. compare steady states where capital stocks have been adjusted to their long-term levels. Genuinely dynamic analyses of enlargement with single region models are also available: Keuschnigg and Kohler (1998) have conducted a study on Austria, an existing EU member-state, and Piazolo (2000) on Poland, a new Union entrant.

As discussed above, applied general equilibrium models have recently become a common methodology for studying, various economic policy questions. For example, Francois and Reinert (1997) offer a comprehensively survey of CGE analyses applied to trade policy issues. CGE-models contain the necessary data on both the structures and markets of an economy that are needed for similar analyses. Dixon and Parmenter (1996) have described the distinguishing characteristics of computable general equilibrium models:

- 2. They describe how demand and supply decisions made by different economic actors determine the prices of at least some commodities and factors. For each commodity and factor they include equations ensuring that prices adjust so that demands added across all actors do not exceed total supplies. That is, they employ market equilibrium assumptions.
- 3. They produce numerical results (i.e. they are computable). The coefficients and parameters in their equations are evaluated by reference to a numerical database. The central core to of the database of a CGE model is a Social Accounting Matrix (SAM) that shows for a given year the flows of commodities, factors and transfers between industries, households, governments, importers and exporters. The SAM data is usually supplemented by numerical estimates of various elasticity parameters. These may include substitution elasticities between different inputs in production processes, price and income elasticities of demands by households, and foreign elasticities of demand for exported products.

Finland's accession into the EU is evaluated by a single region comparativestatic CGE -model of the Finnish economy that was originally built by Törmä and Ruther-ford (1992 and 1993). The model is, in many respects, similar to the model built by Ballard, et al. (1985). The model is characterised by three set of equilibrium conditions: supply-demand balance for commodity and factor markets, zero profit conditions for producers and income-expenditure balance for domestic consumers and government. The model has 29 industries and 5 types of households. Production technologies and utilities are described by nested CES -functions. Free entry, together with constant returns to scale technologies, entails zero profits and perfect competition in product markets. In foreign trade, the Armington (1969) assumption is used to model intra-industry trade flows in foreign trade. Imported goods are assumed to be differentiated from the domestic ones by the source of origin. The source specific use of any given commodity is based on CES -utility or production functions.

Agricultural trade liberalisation as a part of the WTO negotiations is evaluated using GTAP -model developed at University of Purdue in Global Trade Analysis Project. The model is a relatively standard multi-region, static model that assumes perfectly competitive markets, constant returns to scale technology, a non-homothetic private demand system. Hertel and Tsigas (1997) give a theoretical presentation of the model. GTAP project provides a model compatible global database that contains necessary SAM and behavioural parameter data at global level to conduct the numerical analysis (see Dimaranan et. al., 2002).

The GTAP -model is a multi-regional extension of the single region model used in the first essay. The regional characterisation of expenditure decisions is not as detailed as in the single region model. Data availability sets limits to the manner how public and private sector interactions can be taken into account in the model. Two set of additional equilibrium condition are also imposed. The model needs global equilibrium for tradable commodities and saving-investment decisions (see Hertel, Ianchovichina, and McDonald, 1997).

The connection between the equilibrium in tradable commodities markets and saving investment decisions is the following. From national accounting identities we know that the difference between regional savings and investments is equal to trade balance:

$$S_r - I_r \equiv X_r - M_r, \tag{1.1}$$

where S_r is savings, I_r is investments, X_r is aggregate exports, and M_r is aggregate imports. The subscript r refers to region in the model. The GTAP closure assumes that global savings determine global investments:

$$\sum_{r} \boldsymbol{S}_{r} = \sum_{r} \boldsymbol{I}_{r} \tag{1.2}$$

Since commodity market equilibrium requires that, globally, exports have to equal imports:

$$\sum_{r} X_{r} = \sum_{r} M_{r} \tag{1.3}$$

there has to be some variable that balances the equation (1.2).

In the GTAP investment theory, the regional investments are allocated across regions so that expected rates of returns are made equal. This is a scalar variable that balances global savings and investments. Since GTAP is comparative static model, it does not evaluate whether the expectations are realised or not.

In the GTAP -model, regional allocation of investments and savings are separate decisions. Savings have to equal investments only globally. Changes of regional trade balances, due to some exogenous shock in the system, can be interpreted as an equilibrium outcome of consumer and investor -induced reactions to the shock and not as an indication of dis-equilibrium.

Eastern enlargement of the EU is expected to entail increased factor mobility within the broadened European community. Capital mobility in particular is a genuinely dynamic issue that poses questions that are not satisfactorily treated by conventional comparative static model.

Even though expected rates of returns are specified in comparative-static GTAP the realization of these expectations is not studied since there is no time and hence no next period in the model. One of the distinguishing features of dynamic CGE models is their treatment of expectations. Dynamic CGE-models that explicitly have a time dimension can be recursively solvable or genuinely intertemporal.

In recursive models agents do not acquire information about the future to make current decisions. This type of models uses static or backward-looking expectations and can be solved by one period at time. In inter-temporal models agents' decisions depend on information about the future. The models cannot be solved period by period but rather the whole time path has to be solved simultaneously. Among the global CGE models a dynamic version of GTAP (Ianchovichina and McDougall, 2001), GTEM (Pant, 2002) used in Australian Bureau of Agricultural and Resource Economics(ABARE) belongs to the first category and C-Cubed model (McKibbin and Wilcoxen, 1995) to the latter one. There is a variety of single region inter-temporal CGE models. Malakellis (2000) provides a summary of the characteristics of several of them.

In recursively dynamic models, each solution refers to a time period. Model database is typically a representation of the economy in the current period. There are inter-temporal variables that link current and future periods. For example, investments link current and future capital stocks:

$$K_{t+1} = (1-\delta) \cdot K_t + I_t \tag{1.4}$$

Future capital stock (K_{t+1}) is current capital stock (K_t) less depreciation determined by constant decay (δ) plus current investments (I_t) .

In C-Gubed (McKibbin and Wilcoxen, 1995) model, investments are determined as inter-temporal optimization problem where firms maximize discounted lifetime profit stream. Internal adjustment costs to firm are assumed to be convex and increasing. These costs make the rapid expansion of capital stocks expensive. They constrain unrealistically large, and empirically unobserved, responses in investments to anticipated changes in rentals and asset prices. Only a part of investments are assumed to be determined on the basis of inter-temporal optimization. They are partly assumed to be determined by current profits. This rule for investments is said to apply to liquidity constraint firms. It is also an additional factor that limits the volatility of investments.

In GTEM and dynamic GTAP, investments respond to a deviation from a global target rate of return. Investments are allocated so that ultimately, but not necessarily in each period, regional rates would equal to the global rate possibly increased with a constant risk premium. They both follow an approach where investors are cautious, originally suggested in ORANI -model (Dixon et al., 1982)

In both GTEM and GTAP, regional rates of return may deviate but not sector specific rates. Also employment does not differ from labour supply. In the C-Gubed model, rates of return are equalized but sticky wages cause unemployment variations. Usually the equalization of the rate of return is taken as long-run phenomena. In this sense it is difficult to interpret time paths of these models for annual deviations from baselines but rather as medium term dynamics.

The eastern enlargement of the EU is studied with an alternative dynamic version of the GTAP model. The dynamics has been added in a recursive fashion where the dynamic path has been solved as a sequence of periodic equilibria. Three types of inter-temporal links have been added to the original GTAP -model to connect the model's individual simulation periods: (1) accumulation of fixed capital, (2) accumulation of financial claims and (3) lagged adjustment mechanisms.

In designing the accumulation of physical capital to the model, the example of the Australian single-area MONASH model (Dixon and Rimmer, 2002) was closely followed. The model assumes that in each period the capital is sector-specific. The sector-specific capital stock changes according to the investments targeted on the given sector. Investments are defined as a positive function of the expected return on capital. Investments relative to some reference level are increased only if the expected rate of return becomes higher.

In the GTAP model, regional investments and saving can permanently diverge from each other. This will lead to changes in the region's financial position over time. Changes in the financial position affect payments to the factors of production made abroad and received from abroad. GDP and gross national income (GNI) diverge from one another over time as the domestic and foreign financial positions change. In the design of the accumulation of capital claims the approach of McDougall and Ianchovichina (2001) was used. Their main motivation is to make macro accounting reflect the income distribution effects of the cross-ownership of wealth caused by capital movements.

There are two types of sluggish adjustment in the model. Investment expectations may differ from the actual level of return on capital. Similarly in labour markets, wage demands may diverge from a level consistent with stable prices. The movement of wages towards NAIRU equilibrium is described by means of error-correction mechanisms as set out by Solow (1990). Likewise, expectations in rates of return are adjusted towards equilibrium, following an error-correction mechanism (see Dixon and Rimmer, 2002).

1.2 Main findings of the Study

Chapter 2 entitled 'On the effects of Finland's EU Integration' studies Finland's integration into the EU from a trade policy perspective. Prior to membership, Finland had already signed a free trade agreement in 1973 and a broader agreement on European Economic Area with the EU in 1993. However, membership within the EU implied significant changes in the agricultural policies and commodity taxation in Finland. Unlike for most of the countries, adoption of the common agricultural policy (CAP) of the EU implied a less protectionist environment for Finnish agriculture. On the other hand, to harmonise the commodity taxes to comply with those in the EU, Finland replaced a turn-over tax with the system of value-added taxation.

Finland's EU integration has been evaluated in various CGE studies. The study by Törmä and Rutherford (1993) was the first CGE application in this subject. This study was qualified by improved design in the commodity tax reform by Törmä, Rutherford, and Vaittinen (1995b). The consequences of tax reform in isolation from trade policy shocks were also studied by Törmä, Rutherford and Vaittinen (1995a). The main difference between VAT and the former turn-over tax system was that turn-over taxes were levied on the sales of goods alone. The other difference from the VAT was the limited range of business deductibles. From agricultural policy perspective, the peculiar exemption system, which effectively implied very low - or even in the case of few products negative - tax rates, was applied to food products. This factor was taken into account in the later studies.

Trade in primary agricultural commodities is often very limited. This implied that the regulation of setting of target prices for agricultural products, which was practised in Finland, also necessitated restrictions on trade for processed agricultural commodities and food products. These factors were included in the previously mentioned studies but were taken into account by Vaittinen (1996). Chapter two in this study is an English summary of that work published in Courbis and Welfe (1999).

Compared to the original study by Törmä and Rutherford (1993) chapter two makes two kinds of qualifications in evaluating the consequences of Finland's EU accession: tax changes on food consumption and increased import competition on processed food production. Introduction of the VAT on food consumption effectively increased taxation on food consumption and market integration intensified import competition in food production in addition to causing sizeable reduction in protection of agricultural production. These two factors together implied output decline of 18 per cent on average in food processing industries, whereas in the original study output increased in food processing industries and declined more modestly in (8%) in the study of Törmä, Rutherford, and Vaittinen (1995a).

The model includes five household types, classified by socio-economic status: wage earners, farmers, other entrepreneurs, pensioners and other consumers. On average the welfare gains are 1.1 to 1.5 per cent of consumer income depending on the scenario. This is quite a sizeable improvement, since it is the result of the partial removal of economic distortions in agriculture and food production only. Somewhat surprisingly, farmers seem to be net gainers of the reform in most of the scenarios. Only in the long term scenario, where no domestic subsidies are paid, the welfare effects are modestly negative for farmers.

Basically two factors explain the unexpected result for farmers. Firstly, income from agriculture constitutes only 36% of a representative farm household's income. Thus, increased incomes from other sources compensate the adverse effect of agricultural integration. Especially the forestry sector, which is largely owned by farmers, was expected to expand strongly because of this reform. Secondly the permanent compensation to farmers in the simulations was about 1.4ε billion, whereas the total farm income in the reference period was about 1.2ε . The negotiated farm subsidies clearly more than compensated for the effects of price decreases resulting from the EU integration. Only about one third of the farm subsidies are regular EU subsidies. The majority of subsidies in Finland are paid from domestic sources and are permanent exceptions to common CAP rules.

Despite the generous subsidization of farmers, according to model calculations the welfare for all consumer groups improves when Finland joined the EU. The adopted CAP framework can said to be more efficient, since it generates larger incomes for farmers with smaller costs to other consumers.

The **chapter 3** of the study is entitled 'Liberalization of Agricultural Trade - Global Implications and what it means for the EU'. It evaluates the economic implications of the broad-based liberalisation of agricultural, trade using the simulation results of the GTAP model, which is a multi-regional global numerical general equilibrium model. The study is limited to the liberalisation of agricultural products. This is supported by the fact that industrial tariffs in developed countries have reached a relatively low level. The discrepancy between tariff bounds, which are subject to negotiations and actually applied tariffs in the developing countries, is so large that no significant reductions in industrial tariffs from the point of view of world trade will result from the trade negotiations. The aim of this study is not so much to demonstrate the benefits of trade liberalisation (see e.g. Hertel et al., 1999 and Francois et al., 2003) but to characterise the consequences of a likely reform.

In agricultural commodities, a broad policy package including the elimination of export subsidies, tariff reductions, and cuts in publicly financed domestic support is evaluated. Export subsidies are eliminated completely, effective import duties are reduced by 36 per cent and the value of publicly financed domestic subsidies

is reduced by 20 per cent. The magnitudes of changes are probably in the upper bound of the expected outcome.

The results of the model simulations are decomposed according to the major policy group they belong to. As Harrison, Horridge and Pearson (2000) have pointed out, decomposing the effects of several exogenous shocks is far from trivial in the case of non-linear models. The decomposition is a helpful device to get an idea of the relative importance of the negotiated policies and also their varying importance across regions. Since the foreign trade elasticities are important in determining the model outcomes, systematic sensitivity analysis (see Arndt and Pearson, 1996; DeVuyst and Preckel, 1997) has been performed to increase the reliability of the results.

The implications of agricultural policy reform on world trade, overall regional effects and in particular the effects for the EU are analyzed. The WTO reform boosts world trade. According to model simulations, the volume of agricultural trade grows in almost all product groups. Depending on the product, the expansion of trade is between 10-25% relative to alternative scenario. The growth is most marked for beef and sugar. The most important factor increasing trade is the removal of import barriers. Reduced export subsidies cause a decline in world trade. Here a reduction in subsidised exports from the EU is clearly visible which is not entirely compensated by supply from other regions. To a limited extent, a cut in input subsidies has a trade-reducing effect and for many products it clearly increases trade.

In the model simulations, the main beneficiary of trade liberalisation is the middle-income region that is a diverse group of Latin American and Asian countries. Also the EU, Central and Eastern Europe and other industrial countries gains from policies under study. Agricultural trade liberalisation increases GDP in these regions by 0.1-0.2%. The GDP impact on the USA, Canada and the Australia-New Zealand region is almost non-existent. For the USA and Canada, part of the explanation is that agriculture is a very small sector relative to overall production. The significance of agriculture on GDP is also small in the EU and the group of other industrial countries. But in these regions large-scale agricultural aid in its present form has led to very inefficient agricultural production.

If an equivalent variation for households is used instead of GDP as the yardstick of the reform's success, the benefits are relatively greater for all other parts of the industrial world, except North America. It should be noted that whatever measure is used, the overall economic effects in the United States are almost non-existent even though it was one of the strongest proponents of agricultural trade liberalisation among the negotiating countries. This result is similar to those of Hertel et al. (1999) and Francois, van Meijl and van Tongeren. (2003).

With the improved terms of trade, the Latin American countries belonging to the Mercosur Customs Union and the large group of middle-income countries also benefit from the liberalisation of trade. The effects are also positive for developing countries, although they are relatively small. This is partly because developing countries have only a relatively small share of the world food trade to begin with and they hardly increase their share of this trade. One can say, at least within this framework, that agricultural trade liberalization of any degree is not a solution to development problems.

The study analyses the regional variations of change in foreign trade by commodity. In particular the development in beef, sugar, feed grains and dairy products is focused. Because of the reform EU's share of the world trade for all of these products is decreasing. Typically the EU's looses market area significantly and one or two regions gain mainly in terms of growing exports to these market losses. Most of the growing share of beef trade is accounted for by the USA, Australia - New Zealand and Mercosur regions. Sugar exports increase most in the middle-income and developing countries and in the Mercosur region. In the feed grain trade, the incidence of changes in exports is, if anything, even more restricted than for sugar. LDC region is the only area that is expanding its exports to fill the gap in the EU's declining trade. The changes in exports of dairy products are not as concentrated as for feed grains. The Australia – New Zealand region is clearly the main beneficiary, unequivocally gaining market area lost by the EU.

At the EU level, as a result of the liberalisation of agricultural trade production declines in model simulations in all agricultural sectors apart from oilseeds and other crops. The most pronounced production decline is in sugar, beef and feed grains. Production of oilseeds and other crops increases because resources are released from declining agricultural sectors. From the view point of EU agriculture as a whole, the diverse group of production activities labelled other crops accounts for around 40% of the total value of agricultural production. Growing production in other crops implies that decline in total agricultural production is on average close to two per cent, even though production in the individual sectors is down by almost 20 per cent.

To put the results of the comparative static simulations in perspective, output scenarios of FAPRI have been used to estimate the output levels for the beginning of next decade. Using these figures as a reference we can say that the EU's output in sugar and beef production would be roughly 10 % below the level in 2001, in output for feed grains would be almost at the current level and milk production would be around 5% less than at present. This development in output would hardly be expected to impose unbearable adjustment costs to farmers in meeting these requirements, particularly as they are taking place within a six-year period. **Chapter 4** of the study is entitled 'Transition and Integration of Central and East European Countries'. This chapter characterizes the transformation of the new EU member countries from socialist command economies to market oriented economic systems. This is a revised and extended version from Vaittinen (2000) that has partly been used in Kiander and Vaittinen (2001) and Kiander, Paas and Vaittinen (2002).

At the outset of the reform, severe macro-economic imbalances were inherited by most of the transition economies. One of the immediate tasks of reform was market liberalization that entailed both internal and external liberalization of economic transactions. Internal liberalization implied deregulation of the price system as well as elimination of the subsidies to enterprises. In external liberalization quantitative restrictions and administrative controls of foreign trade were eliminated. Internationally acceptable norms of conduct in foreign trade were adopted when countries became WTO members, with uniform and flat tariff structures applied to imports. Current account convertibility and trans-parent foreign exchange regimes were established.

Contrary to the early expectations of improved efficiency that was to boost the economies to systemic change, the transition countries experienced a decline in economic activity after the reforms were launched. The level GDP at trough was from 18 to 37 % lower relative to year 1989 in central and east European countries.

Several authors (Berg, 1995, Earle, 1995 and Rose, 1995) have questioned the severity of the transitory recession, although the transitory decline in output is generally regarded as evident. The quality of the data for reference year has been questioned since it had been compiled from the earlier net material product system which largely ignored services. Also the capacity of the statistical authorities to record new emerging activities at the early stage of transition was questioned. Although accustomed to recording the activities of large state owned enterprises where the output was declining, the authorities were unfamiliar to do so in the small scale firms that mainly operate in services where output growth was disproportionately taking place. Also the issue of missing prices or quality adjustment in prices was raised since the reference prices used to deflate the quantity series were from the old era.

Several theories have tried to explain the transitory recessions, but only some are reviewed in this study. Old institutions were often dissolved be-fore new ones were created. This might have been a source for co-ordination failures that were characterized as increased transaction costs. These can be thought of as a negative supply shock. This approach has been emphasized by Blanchard (1997) and Coricelli (1998).

Frictions in sectoral re-allocation have been emphasized by Berg (1995). Industry and agriculture were favoured in socialist planning, while services were neglected. When prices did not mimic market allocations, there was a shortage of supply in ser-vices and surplus in favoured commodities. Deregulation of prices would lead to a relative increase in the demand for shortage goods and decline in surplus goods. If there are rigidities in factor market allocation, this is likely to cause a transitory output decline.

Neither of these theories is assumed to be a comprehensive explanation of transitory recession. They are partial and complementing theories. A third factor that is related both to dis-organisation and demand shift is the collapse of Soviet trade with central and east European countries (Berg, 1995 and Rosati, 1995). The whole trading system of these countries (called Council of Mutual Economic Assistance, CMEA) collapsed in a very short period. The trade collapse coincided with the terms of trade deterioration. World Bank (1996) has estimated that Russia subsidized central and east European countries by \$ 18 billion in terms of cheap energy. Loss in the terms of trade, due to change in the system, was about ten per cent of GDP in these countries.

Several empirical studies have tried to isolate the factors behind the U-shaped profile of output during transition (Berg et al., 1999, Havrylysyn et al. 1998 and de Melo et al. 2001). The general conclusion of these studies is that the main force behind the initial decline was adverse initial conditions, especially trade dependence and over-industrialization. The main factor behind the recovery has been the structural reforms, which has been measured by EBRD as composite indicators of progress in transition. Also structural policies entail initial costs. Sharp liberalization has been associated with output declines. This seems to have been a temporary phenomenon that has been compensated by the positive cumulative effects of reforms. There is interaction between initial conditions and reforms, even though, difficult initial conditions slowed down the reforms - i.e. politicians were less prepared and willing to give up the old structures. There is no evidence in these studies that unfavourable initial conditions render the reforms less effective.

The newly accepted members of the EU distinguish themselves in their transition progress - output performance. In 1998 almost all countries had reached or exceeded activity levels achieved in 1991 and their transition score is well above the average among all transition countries. The Baltic States are an exception; their reform score is above average but their output performance is below expectations. As a former state of Soviet Union, they initial conditions were inferior compared to other new entrants.

An integral part of transition process has been the integration of Central and Eastern European countries with Western Europe, especially with the EU region. This integration has taken place in the form of trade re-orientation but also in other institutional approximation. Within only few years, bilateral trade with the EU and central and eastern European countries gained the relative importance it had prior to the Second World War. Export growth, depending on a country, was from 3 to 10 times as fast as it would have been with constant market share (Brenton and Gros, 1997).

Several trade policy changes have facilitated the re-redirection of trade. So called Europe Agreements were signed bilaterally between the EU and central European countries. Central European transition countries have also established a free trade area with EFTA countries.

The Europe Agreements set out a comprehensive framework for the political and economic integration of the CEE countries with the EU. The first of these agreements was signed in 1991 with Hungary, Poland and Czechoslovakia, and subsequently with Bulgaria, Romania and the three Baltic states. From a general economic perspective, the most important issues covered are the establishment of free trade for industrial goods, liberalization of capital movements, and approximation of laws relevant for the EU's internal market and competition policy, and financial co-operation, notably under the Phare Program.

However, the Europe Agreements did fall short of full EU membership in certain important areas. While they included provisions for dismantling quantitative restrictions on agricultural products and improved market access, they did not yet give the CEECs free trade in the agricultural sector. Another economically important area where the CEEC 10 does not have full access to EU markets is labour mobility: migration from the CEEC 10 was still strictly regulated.

At present labour mobility from the new members has been modest. Currently there are about 12 million foreigners living in the EU, of this which about 800 000 are from the new member countries. Total number of foreign workers is 5.3 million, of which 300 000 are from central and eastern Europe (Eurostat, 2000). The scope of migration resulting from the enlargement of the EU is likely to constitute only a minor fraction of the total immigration into the EU (see e.g. Boeri and Brücker, 2000 or European Commission, 2001).

As members of the EU, new entrants are subject to policy measures that would influence their economies significantly. One of these is the common agricultural policy (CAP) and the other is policy for 'social cohesion' that is financed by the Structural funds. About 80 per cent of the EU's budget is earmarked for financing these activities.

In **chapter 5** of this study entitled as 'Eastern Enlargement of the EU: Factor Mobility and Transfers - Which Factors Dominate?' we analyze quantitatively the importance of different aspects of the enlargement. It is important to put different fac-tors in perspective by assessing their relative importance. We do this by using

simulations of a dynamic computable general equilibrium model to evaluate the impacts of the eastern enlargement of the EU. The model used in evaluating the enlargement is an extended and improved version of Vaittinen (1999 and 2000). The extensions cover cross-ownership of capital across regions, unemployment dynamics and migration. Some of the results of the chapter have been previously reported in Kiander and Vaittinen (2001) and Kiander, Paas and Vaittinen (2002).

In the spring of 2004, ten new members are joining the European Union. The total population of the new member candidates is around a quarter of the population of EU today. The economic size of these countries, measured by GDP, is considerably smaller. On average, the per capita income level of the applicant countries is around 40 per cent of that in the EU. Thus the differences in income between the current EU countries and the countries acceding are larger than when Portugal and Greece acceded to the Union. This fact should be kept in mind when the relative magnitudes of the benefits and costs of enlargement are evaluated.

The policy changes, which influence the new member states, cover in addition to traditional trade policy, the establishment common market institutions. Membership within the EU means the harmonisation of economic legislation, industrial standards and norms, common competition and business support policies and the approximation of administrative standards governing business life. Institutional harmonisation lowers the risk premium on investments and channels new investments into the region. For example, Baldwin et al. (1997) have emphasised this aspect in the economic development of the countries of central Eastern Europe. Bilateral factor mobility is expected to increase because of enlargement. Capital has traditionally been more internationally mobile than other factors of production. However, with EU enlargement it is to be expected that labour will also migrate from the new low-income member states to the area of the member states of the present Union.

Altogether six scenarios are used to characterize enlargement of the EU. The first and second scenarios attempt to sketch out the consequences of the policy changes without any changes in the factor mobility. The first scenario analyses the effects of traditional trade policy. In the second scenario also income transfers from the EU's structural funds are taken into account. The third scenario analyses the option under which foreign investments in the new member states grow with the increased economic policy credibility brought by EU membership. Last three scenarios evaluate the significance of migration for economic development given different assumptions about the propensity to labour force movements.

According to the model simulations, the countries of central and Eastern Europe will gain substantially from EU membership. For the EU's current member states, who are basically financing the bill, the economic costs will be small.

It turns out that the conventional trade policy effects of enlargement are of minor importance compared to the effects of factor mobility, which are induced by institutional changes that boost business confidence and on the other hand remove obstacles to labour mobility.

Increased investor confidence is of major significance for growth in overall production in the new member states. The growth in foreign investments gives strong impetus for growth in production, but the effect on the factor incomes is substantially smaller. Domestic savings falls short of investments and foreign ownership of capital increases. Part of the profits, induced by enlargement, is ploughed back to the foreign investors.

The free movement of labour is the issue that has raised the most discussion and concern in the EU's eastern enlargement. Big differences in wages and incomes will encourage people to move. In alternative scenarios the economic effects of different scales of migration are quantified. The migration of labour from the new member states to the current EU area reduces economic growth as measured by GDP in the new member states. A contracting labour force reduces their growth. However, the effect of migration is not only negative. The outflow of labour increases the salary level and per capita incomes in the new member states, which is seen in the form of significant growth in private consumption under all the migration scenarios compared to a situation with no migration.

The economic effects of the eastern enlargement of the EU on the existing member states will be smaller by an order of magnitude. In terms of national income, however, the costs of enlargement for the incumbent EU members are very small - only around 0.2 per cent compared to incomes in the basic growth path.

Following enlargement, the increasing capital incomes from the new member states produced by direct investments will compensate for the effects arising from the slowing in GDP growth. As a result of the growth in capital incomes, the calculations presented in this study actually show the costs of enlargement to be somewhat smaller than they would be without increasing capital movements.

In the current member states, too, inward migration will affect changes in per capita consumption. Even in the lowest migration scenario, per capita consumption declines around twice as much as without migration. However, the decline is only 0.3 per cent compared to the basic growth path. In the maximum migration scenario the change in consumption is just short of one per cent, whilst the growth in population and GDP is 2.5 per cent.

2. On the Effects of Finland's EU Integration

The purpose of this study is to evaluate the resource allocation and welfare effects caused by changes in trade policy due to Finland's access to the EU. The impacts of trade policy changes are analysed by using a static computable general equilibrium model of the Finnish economy. The method chosen enables us to highlight the overall repercussions of a particular reform. The computable general equilibrium exercise carried out in this paper is a limited one in its nature. No effects, whatsoever, of monetary integration implied by the Maastricht treaty are tried to be quantified in this study.

2.1 Introduction

Finland has had a free trade agreement with the EU since 1973, which covered practically all other categories of foreign trade except agricultural and food products. Finland had also signed an agreement on European Economic Area together with other EFTA countries in 1993. With this agreement large part of common market legislation was extended to guide the economic activity between the EU and EFTA countries. In this regard, the main trade policy consequence of the EU membership to the Finnish economy was the harmonization of agricultural policy to the framework of common agricultural policy (CAP).

The main interest here is to evaluate the efficiency and welfare effects of this policy shift. This study is organized as follows. In section two we briefly compare the previous Finnish agricultural policy to that of EU and give a quantitative review of the differences in the magnitude of subsidization. In section three there is short description of the model and calibration of the policy shock. In section four the simulation results are analyzed, while section five summarizes the main conclusions.

2.2 Changes in the Finnish Trade Policy due to the EU Membership

Agriculture has been heavily regulated and protected, both in Finland and the EU. Before Finland's membership, the regulation of agriculture was based on the Farm Incomes Act, which guaranteed comparable development in agricultural incomes as in wage incomes. The main instrument used to guarantee this goal, was a target price system¹. Target prices for main agricultural products were negotiated annually between farmers' representatives and government, and they were guaranteed through the control of external trade. Imports of agricultural products were deterred mainly by non-tariff barriers to trade in order to make

¹ Institutional details of this former system are described in OECD (1989).

certain that external competition could not weight down domestic prices. Export subsidies were used to balance the excess supply in domestic markets.

All the elements of earlier Finnish system are also present in the EU's common agricultural policy. Trade policy measures limit the access of external supply to domestic markets, and high domestic prices are maintained by subsidizing exports to the world markets. Although agricultural policies have been rather similar both in Finland and the EU, the level of protection has been considerably higher in Finland. This is partly due to less favourable climatic conditions, which induce higher production costs in Finland compared to the EU. The main principal difference between the EU and Finland was the magnitude of the rate of protection. Depending on product category the internal prices in the EU have been from 40 to 60 percent lower than the respective prices in Finland² at the time of Finland's EU accession. Naturally the institutions to implement the policies differend.

External trade has been regulated mostly by various forms of non-tariff barriers to trade both in Finland and the EU. Integration in this type of markets means the adoption of common rules against third parties and abolition of barriers in bilateral trade. In order to quantify the effects of integration, one has to have data on internal prices from both markets, which are sheltered by trade policy measures. In the case of agricultural products it is fairly straight forward to estimate price differences in the Finnish and EU markets. The data for parameterization of agricultural integration has been relatively easily accessible, because prices and quantities of agricultural production are well documented (e.g. OECD, 1996), reflecting fact that number of products included in these calculations is small.

However, to parameterize completely the consequences of the change in agricultural policies, one has to take into account the changes in the protection of food industries as well. To estimate price differences in food processing industries is much more demanding task: First, because a larger number of goods has to be included in the calculations of industry level price differences, and second, there is no ready made database on this information³. The method of measuring protection in food manufacturing is shortly discussed in next section where the calibration of the integration shock is described.

The consequences of common agricultural policy from the point of view of Finnish agriculture imply lower production prices and adjustment to new market situation. This has already been analysed (see e.g. Törmä and Rutherford, 1993 and Törmä; Rutherford and Vaittinen, 1995b) by using a computable general equilibrium model of Finnish economy. However this analysis has only partially

² Price differences are measured using OECD's (1996) data on PSE (Producer Subsidy Equivalent) and CSE (Consumer Subsidy Equivalent).

³ Details on measuring the scale of the border protection in Finland are described in Vaittinen (1996).

parametrised the changes resulting from the shift in agricultural policy, because the analysis does not extend to the new market situation in food processing industries. The contribution of this study is to evaluate the effects of Finland's EU integration to the food manufacturing by measuring the impacts of reduced boarder protection in this sector as well.

2.3 Modelling the Impact of Trade Policy Changes in Finland's Entry into the EU

The simulations in this work have been carried out using a computable general equilibrium model of Finland - GEMFIN. The model has been originally constructed by Hannu Törmä and Thomas Rutherford for applied policy analysis. The model has been previously used to evaluate income tax-reform (Törmä and Rutherford, 1992), consumption tax reform (Törmä, Rutherford, and Vaittinen, 1995a) and the adoption of common agricultural policy of the EU (Törmä and Rutherford, 1993; Törmä, Rutherford and Vaittinen, 1995b).

The model is of the same genre as the one built by Ballard et al (1985), although several Finnish institutional features have been modeled⁴. The present version of the model has 29 sectors and 5 types of consumer households. The sectoral breakdown has a special focus on agriculture and food manufacturing. The production technology and utility are assumed to be of nested CES form. The particular functional form exhibits constant returns to scale and is homothetic, i.e. factor proportions or consumption shares are independent of the scale of a given activity. Zero profits are assumed in production, which together with constant returns to scale imply perfect competition. In foreign trade the Armington assumption is used to model the intra-industry trade flows in external trade i.e. competing imported goods are assumed to be differentiated from the domestic ones. The building blocks of the model as well as the functional forms are described in the appendix of the paper.

2.3.1 Computable General Equilibrium Model for Finland: GEMFIN

The methodology for calibrating the GEMFIN to the data of Finnish national economy, can be illustrated by using a Social Accounting Matrix⁵. The SAMmatrix demonstrated in *figure 2.1* is an accounting description of income and expenditure flows. Each of the income components in the model has a corresponding expenditure item. The input-output matrix describes the exchange between industries. The columns describe the demand of goods of a particular industry for intermediate products that is income to a respective branch. The rows describe

⁴ For details see Törmä and Rutherford (1993).

⁵ The SAM-matrix forms the basic material for the calibration of the model. Using a SAM-matrix, one can describe the flows within the national economy - the formation and use of income in households - and the interchange of households and public sector with respect to income transfers and taxation.

the use of intermediate products of a particular industry that is expenditure of a respective branch.

The GEMFIN-model has 29 sectors that have been disaggregated especially for the analysis of agricultural policy. The model contains six agricultural sectors and seven food industry branches⁶. The other industrial fields of operation are defined according to the two-digit level SIC-classification, and non-industrial fields as one-digit level aggregates.

Final commodity demand - i.e. consumption, investments, export and public expenditures - is described in the columns following the input-output matrix. For the final product demand, public demand and investments have been modelled as one commodity composed in a fixed proportion of the sectoral outputs. Consumption demand and exports are more elaborately modelled. This is explained in the appendix. In the model there are 15 consumption commodities in a household's consumption bundle. The correspondence of consumption demand categories and the output classification has been achieved through a fixed coefficient transition matrix.



Figure 2-1: Data Description of a CGE -model Using a SAM -matrix

The rows after the intermediate input matrix describe import, commodity and production factor taxation, and income formation divided into labour, capital and

⁶ The sectoral disaggregation is described in the appendix.

land incomes. Taxes and production factor incomes together give the value added. As part of the value added, incomes provided by primary production factors are divided into labour incomes and operational surplus.

No accounting on land incomes is provided in national accounting statistics. In the current research, the land and capital income were imputed from operational surplus according to relative asset values in agriculture. The asset values of capital and arable land were taken from the study of Ala-Mantila (1992).

Income distribution statistics reveal the production factor incomes received by the various types of households, and, on the other hand, paid income taxes. Household survey reveals how the available incomes within each household group have been allocated as commodity demands. In the GEMFIN-model version adopted in the integration simulations, households have been divided into five groups according to socio-economic classification: Employees, farmers, entrepreneurs, pensioners and other consumers

The model has three sources of savings: the differences between exports and imports, public expenditures and incomes, and investments and savings of private households. In order to satisfy the accounting identities, their sum must be zero. When calibrating the reference state, the surplus or loss of each specific set can be interpreted as a positive or negative initial endowment. In comparative-static exercises, one must ascertain that the budget constraint is satisfied. When incomes and expenditures are balanced, the balancing of the two sets mentioned above is enough to balance a third. The GEMFIN-model assumes that investments are determined by savings. On the other hand, the equality of the government's income and expenditure after a change in policy parameters is guaranteed by adjusting indirect taxes. Thus all comparative-static exercises guarantee external balance.

2.3.2 Calibration of the Policy Shifts in Finnish EU Integration

Table 2.1 lists the main elements which are taken into account in the parameterization of Finland's EU integration in the GEMFIN model. Border prices are assumed to decline to EU's average level on the internal markets. Since Finland is assumed in the model, to be a small open economy⁷, this change is characterized as an exogenous sift in external prices.

⁷ The small open economy assumption in this context means that the activities of the Finnish economy are assumed to have no effects on the rest of the world.

TABLE 2-1: Parameterisation of the EU Integration in GEMFIN Simulations

Reduction of boarder prices to the level of the EU's internal trade CAP reform support to Finnish farmers 5.3 billion FIM and national Nordic support 3.2 billion FIM Farm subsidies are modelled as lump sum transfers Net payments to EU budget 1.4 billion FIM Change of the turn-over tax system to value added tax Abolition of cumulative elements in consumption taxation Removal of 'basic production deduction' on food consumption Tax rate on average 22%, on food consumption 17% and for certain exceptions 6 or 12 %

The price differences

In agriculture, price differences have been measured by a nominal assistance coefficient in OECD's CSE calculations for the year 1995 (OECD, 1996). For the food processing sectors own estimates of tariff equivalents are used. The procedure used to create these figures is shortly summarised below.

TABLE 2-2: Reduction in Finnish Border Prices	due	to
the EU Integration		

Milk and Beef	-39.4 %
Pork	-42.2 %
Poultry and eggs	-44.7 %
Grains	-61.1 %
Other Crops	-41.5 %
Other Agriculture	-47.1 %
Meet Processing	-35.5 %
Milk Processing	-20.6 %
Mill and Bakery Products	-23.7 %
Sugar, Chocolate and Candies	-20.6 %
Other Food Products	-31.5 %

Sources: Agricultural sectors: OECD (1996), Food manufacturing: own calculations

The price wedge, which non-tariff barriers create, has been estimated as tariff equivalents. Various sources of data have been used to get these figures. The database of UNCTAD's Trade Analysis and Information System has been used to identify the product lines where non-tariff barriers have been applied. Statistics Finland produces quantity and price data on Finnish industrial production using the same commodity classification (8-digit level HS commodity nomenclature). The prices available from this source are factory-gate prices excluding taxes, but including production subsidies. The reference prices of EU's internal markets are taken as 12 country average of EU's internal trade. This information has been taken from EUROSTAT'S COMEXT database. Finally the commodity specific tariff equivalents have been aggregated to five industrial branches⁸ using aggre-

⁸ The industry aggregation used here is the same as that used in Finnish CGE-model applied to study the welfare consequences of adopting the rules of EU's Common Agricultural policy to the Finnish agriculture (see Törmä, Rutherford and Vaittinen, 1995b).

gation key from Statistics Finland. The sector specific declines in the boarder prices reflecting integration are given in table 2.2.

Agricultural subsidies

Within the framework of common agricultural policy, Finnish farmers are entitled to obtain the so-called CAP-reform subsidies. These subsidies are paid as compensation to the target price cuts in EU that took place in 1992-1996. These subsidy payments are linked to fixed amount of land or number of animals. In this study they are modelled as lump-sum transfers, which may be characterized as having no incentive effects in production⁹.

In the simulations we are interested in analysing the effects of institutional change. Transitory support measures, which are paid in five-year period 1995-99, are not taken into account. During membership negotiations, Finland was granted the right to pay the so-called Nordic support as well as support for severe difficulties to farmers in the southern region.^{10,11}An alternative subsidy system, where only CAP-reform support, is paid is also calculated.

Consumption taxes

A noticeable policy change, because of EU, was the consumption tax reform introduced already in 1994. In preparing the access to EU, as a preliminary measure, Finland converted her turn-over tax system to the value-added tax for taxing consumption. The basic differences between tax systems are that turn over tax was mainly levied on the sale of goods alone and the range of business deductibles was more limited.

In general, only one tax rate was applied to all items in the former system. However, the treatment of agricultural products formed a peculiar exception. The sales of agricultural products ware exempt from turn-over tax. Despite this fact, the food industry was allowed to calculate the tax content of their agricultural inputs as if the tax were paid at the normal rate, effectively permitting a lower taxation on food. To make things even more complicated, this primary production deduction varied with different product categories. In certain livestock prod-

⁹ Strictly speaking the CAP-reform subsidies are not lump sum in their nature. They do not provide incentives to increase production but they might give a disincentive not to re-allocate production in an optimal way in response to changes in relative prices. This results from the fact that there are, for example, fixed specific hectare premiums for different crops. This might cause a situation when it is not profitable to among crops, because of fixed premiums, even though it marginally might otherwise be so.

¹⁰ Detailed description of different forms of support is given in Kettunen, 1996.

¹¹ Both forms of these subsidies are assumed to be permanent, although the support for severe difficulties has to be negotiated separately with EU and it is negotiated for limited periods. The reason for modelling these forms of support as permanent measures is based on the expression of strong political will by the Finnish government to maintain these subsidies.

ucts there was overcompensation in the deduction. For beef, veal and pork it was 1.35 times, and for milk 1.6 times the imaginary tax. Consequently, the effective tax rate in food products was on average about 12 percent, even though the nominal tax rate of food consumption was 22 percent.

The simulation scenarios

Two types of scenarios have been used in the analysis of Finland's integration to EU. The first scenario, which, later on in the text, is labelled as 'medium term', is characterized by inter-sectorally mobile labour force, where wage adjusts to clear the labour markets. In this scenario it is also assumed that arable land can frictionlessly be allocated among different agricultural activities. Capital is assumed to be a fixed factor in medium term but inter-sectorally mobile in 'long term' scenario. In both of the scenarios it is assumed that public sector balances its budget by adjusting commodity taxation as a response to the shock. Private capital formation is assumed to be determined by savings in a conventional neoclassical manner.

The modelling exercises are a-temporal in their nature. The medium-term results should be interpreted to have taken place in a time frame when labour markets have completely adjusted to the integration shock. This would be expected to happen in three to five years. Capital re-allocation is a much slower process, which would take place in a period of ten to fifteen years.

2.4 Resource Allocation and Welfare Effects of the EU Integration

In this section we present the main results of integration simulations. Because integration removes barriers to trade between Finland and the EU, the reform will be welfare improving. One advantage of the model used in this study is the possibility to elaborate the gains among different types of households. For the reason that consumption patterns and sources of income vary between different household types, it is not self-evident that all consumer groups are gainers in this reform.

Overall gains on integration come from two sources: increased efficiency in production and from consumption caused by changes in relative prices. Increased efficiency is reflected in factor incomes, which shift the budget constraints of different household types. This section advances so that first we evaluate the consequences of integration on production structure and resource allocation, next we look at the effects on consumption, and finally we describe the effects to welfare for different types of households.

Changes in the production structure

Integration reduces the rate of protection both in agriculture and in food processing industries. In food industries the effects are twofold. On the one hand, it increases competition by reducing border protection, but on the other hand, it also reduces production costs. Main source of intermediate products used in food processing is agriculture, where decline in the rate of protection is even more dramatic.

Table 2.3 presents the implications for production structure in eight aggregated¹² sectors on medium and long-term scenarios. As the simulation results indicate, the need for adjustment is the largest in agriculture where in medium-term equilibrium, production is about 12 % lower than at the reference state. Relative price reduces the rate of return on capital in agriculture. As capital is reallocated in the long-term scenario, the production effect is magnified. In the long-run equilibrium, the level of production is almost 50 % less than in the reference state.

	Medium term	Long term		
AGRICULTURE	-11.7%	-48.8%		
OTHER PRIMARY PRODUC-	0.2%	2.4%		
TION				
FOOD INDUSTRIES	-8.2%	-18.6%		
OTHER INDUSTRIES	2.2%	5.4%		
UTILITIES, CONSTRUCTION	1.7%	3.3%		
AND HOUSING				
DISTRIBUTION SERVICES	1.8%	1.9%		
Trade, restaurants and hotels				
TRANSPORTATION AND	1.7%	3.3%		
FINANCIAL SERVICES				
OTHER SERVICES	1.9%	1.9%		

TABLE 2-3: Changes in Production Reflecting the EU –Integration

The same pattern of adjustment can also be found in food production, although changes are proportionally smaller both in the medium and long term. The reason for this is that, even though, external protection is decreased, raw material costs are reduced simultaneously due to price reductions in agriculture.

'Other industries'¹³ is a group, which gains most from integration. The changes in production in medium term are of the same magnitude as those implied by simulations where tax reform was evaluated in isolation (see Törmä, Rutherford and Vaittinen, 1995 a). This implies that the need for labour reallocation in me-

¹² The model has 29 production sectors, but the results here are aggregated to six sectors, using Laspayres indexes for presentational convenience.

¹³ This aggregate includes manufacturing sectors, excluding food, and production of energy.

dium term because of lower protection does not have large impact on the economy.

The other main sector gaining in the medium term is distribution services. It benefits indirectly from integration, because it uses, as intermediate inputs, products whose prices are reduced. Production of distribution services are by their nature locally produced, so integration does not have direct impact on their market situation.

In the long-term scenario, capital re-allocates to equate the return across sectors. This magnifies the medium-term effects in agriculture, food and other industries, so that equilibrium production declines in the first two sectors and expands in other industries in comparison to the medium-term effects.

The long-term effects are proportionally largest for other primary production, which consists mainly of forestry, mining and quarrying. The effect is second largest for 'other industries' followed by utilities construction and housing and transportation and financial services. The differences in medium- and long-run results in output changes can partly be explained by factor intensities of production. Since agriculture and food processing are relatively capital-intensive sectors, the decline in these activities benefits other capital-intensive industries.

The relatively large difference in medium- and long-term production responses in other primary production is, to some extent, caused by the induced demand for paper and pulp industry. Paper and pulp industry is the most capital intensive of the manufacturing sectors included in the category other industries. Because of this, the long-term favourable effects of capital reallocation apply especially to this sector, which uses the products of forestry in its intermediate demand.

Changes in consumption patterns

Table 2.4 describes the effects of integration on seven consumption categories. The most noticeable changes are in the consumption of food and of clothing and footwear. Consumer prices of food decline in medium term about 12 percent, so general equilibrium elasticity of food consumption is around 0.6. In textiles and footwear, the demand elasticity is almost double of that in food products. The effects on textiles and footwear are of same magnitude as in the value added tax reform simulations (see Törmä, Rutherford and Vaittinen, 1995 a, p.22).

An interesting detail to note in the food consumption is the fact that in the longterm scenario, changes are much smaller, and the consumer price decline is about half of that in the medium-term scenario. There are two reasons for this. Domestic and foreign goods in this model are imperfect substitutes, so that cost structure changes can be reflected in prices, which do not have to follow perfectly foreign product prices in the same category. Second, consumption and produc-
tion goods do not have one-to-one relationship and each consumer good aggregate has components of several production-goods categories. Because of this, in the long term, the consumer good prices reflect not only the immediate changes in producer prices caused by the integration, but also the induced changes in the prices of factors of production.

	Medium ter	m	Long term		
	Changes in quantities	Changes in prices	Changes in quantities	Changes in prices	
FOOD	(%)	(%)	(%)	(%)	
FOOD	7.9	-12.2	0.4	-0.0	
CLOTHING AND FOOTWEAR	7.5	-4.4	10.6	-5.2	
HOUSING AND HOUSEHOLD EQUIPMENT	0.0	2.9	0.3	4.2	
HEALTH CARE	-1.2	4.3	-0.7	4.4	
TRANSPORTATION	1.5	-0.9	2.8	-1.4	
RECREATION AND CULTURE	2.0	-1.5	2.9	-1.7	
OTHER SERVICES	-1.2	2.9	-1.2	3.7	

TABLE 2-4: Effects of the EU Integration on Consumption

Changes in welfare among different household types

Welfare changes have been measured by compensating variation, a money metric value that can be taken away from an individual after an economic change, while leaving him in terms of income in the same position¹⁴. In GEMFIN model there are five types of households, making it possible to look at the distributional effects of a reform in addition to its overall efficiency effects.

Two policy alternatives of income transfers have been evaluated in this study. In the first case, Nordic support and other national exceptions to CAP, subsidies are taken into account. In the other case only CAP-reform transfers to farm households have been considered.

In table 2.5 the welfare effects of integration for different types of households are described as relative changes. The average change in household welfare is 1.1 and 1.4 % in the medium and long term respectively, which in absolute monetary terms is about seven and nine billion Finnish marks. There are small differences in the average figures of the national and CAP-reform alternatives. Although income transfers as such are assumed to be lump-sum in nature, the small aggregate welfare losses are due to increased commodity taxation, which is needed to finance these increased transfers.

¹⁴ In relative terms compensating variation is $CV = \frac{U_1 - U_0}{U_0}$, where U refers to utility function, 0 to the reference state and 1 to equilibrium state after reform.

However, the distributional aspects in this respect are much more important than the aggregate efficiency losses. For example in the medium-term scenario wage earner gains are reduced to two-thirds compared to the alternative transfer policy. In the case of national transfers, the gains are about half for other entrepreneurs. Pensioners and other consumers do not gain anything, when domestic agricultural transfers are taken into account. In this case, the main beneficiaries are surprisingly the farmers.

			•				
	Medium term		Long term				
	Domestic subsi-	Only CAP sub- sidies	Domestic subsi-	Only CAP sub-			
WAGE EARN- ERS	1.0	1.7	1.0	1.8			
FARMERS	6.6	0.5	5.8	-0.4			
OTHER EN- TERPRE-	0.8	1.4	1.6	2.3			
NEURS							
PENSIONERS	0.0	0.4	1.0	1.3			
OTHER CON-	0.0	0.4	0.0	0.5			
SUMERS							
ON AVERAGE	1.1	1.2	1.4	1.5			

Table 2-5: Welfare Effects of the EU Integration

This somewhat unexpected result of farmers gaining the most from EU integration needs closer reflection. First of all, only one representative farm household is specified in the simulation model. We know that in different product categories in agriculture the need for downward adjustment in production varies (Törmä, Rutherford and Vaittinen, 1995b). Second, adjustment is also assumed to be costless, i.e. no transition costs to the equilibrium are taken into consideration in the welfare figures. On the other hand, in these calculations, the transitory support in five-year adjustment period is not taken into account. Third, labour markets in the medium term scenario are assumed to be in equilibrium, which effectively means that all labour released from agriculture is absorbed elsewhere into the economy.

Despite the reservations given above, there are several reasons which support the view, that the above result is not so unconvincing. Income from agriculture forms only 36% of representative farm households total income receipts (Income distribution statistics, 1992). Partly the loss of agricultural income is compensated to farmers as other forms of increased income. For example, one could see from table 4.1 that other primary production expands relatively strongly. Large part of this sector is forestry, owned largely by farmers. On the other hand, the compensation, being considered as permanent subsidy to farmers is 8.5 billion Finnish marks. This is a considerable amount of money, when compared to agricultural income, which totalled in 1994 to about seven billion marks. The reason for this

huge compensation is that the nominal losses for farmers were calculated from gross production.

As has been shown elsewhere (Sovala, 1994 and Vaittinen, 1994) the value added of agricultural production calculated at EU prices was negative before Finland's membership in the EU. In the simulation model used in this study, production would not take place unless it covers the cost involved in that activity. The structural changes in agriculture, implied by this study, are sufficient to generate some positive factor income from agricultural activities. The changes implied here transforms agriculture from a loss-making operation to an economically viable activity. In this sense it is not at all surprising to observe that farmers are a group that gains because of EU membership, particularly when it is remembered that price reductions are compensated by direct income support.

Despite the generous subsidies for farmers, when national support is included in the calculations, the welfare of all consumer groups increase in the long run. One can say that the new agricultural subsidy system adopted, when Finland joined the EU, is more efficient that the old one because it generates same level of farm income with a smaller cost for consumers.

2.5 Conclusions

The major immediate impact of Finland's access to the EU has been the vast reduction in agricultural protection. Adjustment to these changes in market conditions implies reduced production in agricultural and food production relative to other sectors in Finnish economy. In the immediate future this structural change is distributed relatively evenly across other branches of economic activity. However, in longer-time frame when capital re-allocation has completely taken place, integration seems to favour capital-intensive production.

Since integration removes obstacles to trade, it is welfare improving. Depending on the time frame under review, the welfare improvement is between one and one and a half percent relative to consumer income. The household classification used in this study indicates that all types of households benefit or at least are not losers in the integration process. A major share of the welfare gains is expected to take place in the near future after the EU membership.

Appendix to Chapter 2

A2.1 Building Blocks of GEMFIN -model

GEMFIN is a static open economy computable general equilibrium model of Finland, designed to investigate tax and trade policy issues. In the model formulation the effects of Finnish exports and imports on international prices are ignored. The Model is formulated as a system of nonlinear equations corresponding to three classes of equilibrium conditions associated with an Arrow-Debreau general equilibrium: supply-demand balance for commodity and factor markets, price-cost relations for producers, and income -expenditure balance for domestic consumers and government. The model is formulated using GAMS programming language and solved MPSGE solution system. MPSGE as a subsystem to GAMS is reviewed by Rutherford (1997).

This appendix provides an algebraic summary of the equilibrium conditions for the generic model in which (i) all factors are inter-sectorally mobile and (ii) domestic, imported and exported varieties of all commodities are differentiated. For the sake of brevity, certain details of the model are summarized verbally. The interested reader is referred to the GAMS-MPSGE source code for details. The code used in Törmä, Rutherford and Vaittinen (1995 b) can be found from the web-site: www.gams.com/projects/dk/wshop1/suomi.htm.

Equilibrium conditions

For each class of commodity i (i = 1,...,29) there are three associated markets, one for goods produced for domestic markets, second for exported goods and third for imported goods. Goods supplied for domestic markets (D_i) are used as intermediates in production, consumed by households (C_{ih}) or by government ($G_{i.}$)

$$D_{i} = \sum_{j=1}^{29} a_{ij}^{D} Y_{j} + \sum_{h=1}^{5} C_{ih}^{D} + G_{i}^{D} \perp p_{i}^{D}.$$
(A2.1)

In equation (1) the intermediate demand depends on activity level Y_j in respective industry and coefficient a_{ij}^{D} , which is responsive to relative price between imported and domestic varieties. The index, h, (h = 1,...5) refers to household type. Market clearing conditions for imported varieties are analogous to domestic markets:

$$M_{i} = \sum_{j=1}^{29} a_{ij}^{M} Y_{j} + \sum_{h=1}^{5} C_{ih}^{M} + G_{i}^{M} \perp p_{i}^{M}.$$
(A2.2)

The market clearing condition for labour is:

$$\sum_{h=1}^{5} \overline{L}_h - l_h = \sum_{j=1}^{29} L_j \quad \perp \quad w$$
(A2.3)

where \overline{L}_h is the total time endowment of labour for household *h*, l_h is leisure demanded by household and L_j is labour demanded by sector *j*.

The market clearing condition for capital is:

$$\sum_{h=1}^{5} \overline{K}_{h} = \sum_{j=1}^{29} K_{j} \quad \perp \quad r$$
(A2.4)

where \overline{K}_h is the capital endowment of household *h*, and K_j is capital demanded by sector *j*.

The market clearing condition for land is:

$$\sum_{h=1}^{5} \overline{N}_h = \sum_{j=1}^{7} N_j \quad \perp \quad n$$
(A2.5)

where \overline{N}_h is the land endowment of household *h*, and N_j is capital demanded by sector *j*.

In the small open economy framework, CIF import prices and FOB export prices are exogenous and unaffected by the level of imports and exports. In all simulations trade balance is kept fixed. The trade balance condition is:

$$\sum_{i=1}^{29} \overline{p}_i^X X_i = \sum_{i=1}^{29} \overline{p}_i^M M_i + \overline{B} \perp \mu,$$
 (A2.6)

in which \overline{p}_i^X and \overline{p}_i^M are exogenous international prices of exports X_i and imports M_i of sector *i*. \overline{B} is exogenously given net capital account surplus specified in the reference state. Since only relative prices matter in a model like this, the real exchange rate μ is taken as a numeraire in the model. Balance of trade equation as such is redundant in the model and determined household and government budget constraints by Walras' law.

Functional forms

Two aggregation functions are used to characterize technology. One characterizing transformation possibilities on output side between domestic and export supplies and the other characterizing substitution possibilities in input side between alternative combinations of primary factors of production. In the model these substitution possibilities are assumed to be separable i.e. optimal domestic-export combination of output is independent of the choice in primary factor inputs.

An index of Y_i measures the aggregate level of activity for inputs and outputs in sector *i*. The domestic-export output transformation function is based on a constant elasticity of transformation (CET) form:

$$Y_{i} = \left(\alpha_{i}^{D} D_{i}^{\frac{\epsilon_{i}-1}{\epsilon_{i}}} + \alpha_{i}^{X} X_{i}^{\frac{\epsilon_{i}-1}{\epsilon_{i}}}\right)^{\frac{\epsilon_{i}}{\epsilon_{i}-1}}$$
(A2.7)

where α_i^{D} and α_i^{X} are share parameters and ε is the transformation elasticity between domestic and exported varieties of goods produced in sector *i*. On the input side technology is characterized by fixed coefficient Leontief function for intermediate inputs and value added:

$$Y_{i} = \min\left[\frac{S_{1}}{a_{1i}}, \dots, \frac{S_{j}}{a_{ji}}, V_{i}(L_{i}, K_{i}N_{i})\right], i = 1, \dots 29 \text{ and } j = 1, \dots 29$$
 (A2.8)

where each intermediate input is constant elasticity of substitution Armington aggregate of domestic and imported good:

$$S_{i} = \left(\beta_{i}^{D} D_{i}^{\frac{\sigma_{i}^{m}}{\sigma_{i}^{m}}} + \beta_{i}^{M} M_{i}^{\frac{\sigma_{i}^{m}}{\sigma_{i}^{m}}}\right)^{\frac{\sigma_{i}}{\sigma_{i}^{m-1}}}$$
(A2.9)

in which σ_i^M is Allen elasticity of substitution between the domestic and imported variety of good *i*.

The value added is a two-level nested constant elasticity of substitution (CES) production function:

$$V_i(L_i, K_i, N_i) = \left[\delta_i^L L_i^\rho + \left(\delta_i^K K_i^\gamma + \delta_i^N N_i^\gamma\right)^{\frac{\rho}{\gamma}}\right]^{\frac{1}{\rho}}$$
(A2.10)

where $\rho = \frac{\sigma_i^{L-1}}{\sigma_i^{L}}$ and $\gamma = \frac{\sigma_i^{K-1}}{\sigma_i^{K}}$, in which σ_i^{L} is Allen elasticity of substitution between labor and capital land composite and σ_i^{K} is Allen elasticity of substitution between capital and land. The CES and CET functions have exactly the same algebraic formula. The difference is in the parameters. In CES we assume that $\frac{\sigma_{\ell}^{L}-1}{\sigma_{\ell}^{L}} > -1$ and $\frac{\sigma_{\ell}^{L}-1}{\sigma_{\ell}^{L}} \neq 0$ and in CET $\frac{e-1}{e} < -1$.

The advantage of MPSGE is that it automatically produces derived demands for these functional forms (see Rutherford, 1997). The study by Dixon et al (1992) is useful reference for interested reader, where derived demands and other helpful manipulations of these conventional functions are presented.

Consumer Income and Demand

Three-level nested CES describes consumer utility. At the top level, savings trade off with current consumption. At the next level leisure demand trades off with goods consumption, which at the final level is a simple CES aggregate of different consumer commodities:

$$U_{h}(l_{h}, C_{1h}, \dots, C_{1h}) = \left\{ \theta_{sh} C_{sh}^{\rho} + \left[\theta_{Lh} l_{h}^{\gamma} + \left(\sum_{i \neq s} \theta_{ih} C_{ih}^{\varepsilon} \right)^{\frac{\gamma}{\varepsilon}} \right]^{\frac{\rho}{\gamma}} \right\}^{\overline{\rho}}$$
(A2.11)

1

 $\rho = \frac{\sigma_h^L - 1}{\sigma_h^L}$, $\gamma = \frac{\sigma_h^L - 1}{\sigma_h^L}$, and $\varepsilon = \frac{\sigma_i^c - 1}{\sigma_i^c}$, in which σ_h^s is Allen elasticity of substitution between tween saving, C_{sh} , and consumption, σ_h^L is Allen elasticity of substitution between leisure, l_h , and goods consumption, C_{ih} , and σ_i^c is Allen elasticity between different consumption commodities. Consumption commodities on the other hand are Leontief composites of Armington aggregates of domestic and imported commodities:

$$C_i = \min\left(\frac{S_1}{b_{i1}}, \dots, \frac{S_j}{b_{ij}}\right)$$
 $i = 1, \dots, 15 \text{ and } j = 1, \dots, 29.$ (A2.12)

Armington aggregators are assumed to be the same for all agents in the economy.

Given the factor and commodity prices consumer demand functions are determined as a solution to the following problem:

$$\max U_{h}(I_{h}, C_{1h}, \dots, C_{ih})$$
s.t. $\sum_{i=1}^{16} p_{i}C_{ih} = I_{h}(I_{h})$
(A2.13)

where, *i*, is the number of commodities <u>including</u> savings and h is the number of households and

$$I_{h} = \overline{w} \Big(\overline{L}_{h} - l_{h} \Big) + \overline{r} \overline{K}_{h} + \overline{n} \overline{N}_{h} + \overline{TR}_{h} - \overline{T}_{h} - \Big[\Big(w - \overline{w} \Big) \Big(\overline{L}_{h} - l_{h} \Big) + \Big(r - \overline{r} \Big) \overline{K}_{h} + \Big(n - \overline{n} \Big) \overline{N} \Big] \tau_{h}$$
(A2.14)

The first line in equation (A2.14) relates net taxes on income to gross endowment earnings plus transfers, \overline{TR}_h less benchmark income tax revenue \overline{T}_h . Bar above the factor prices refers to reference state values. The term τ_h captures the marginal tax which applies to increases in income from the benchmark level.

As in the case of factor demands, consumer demand function formulation and calibration at the reference state are automated by MPSGE. The study by Ballard et al (1985) presents explicit solution to a problem in equation (A2.13) and demonstrates how it is calibrated to household expenditure and labour supply data.

A2.2 Statistical Sources:

COMEXT, Database for Community's External Trade and Trade between Member States1992, Eurostat.
Producer and Consumer Subsidy Equivalent Database, OECD.
TRAINS, Trade Analysis and Information System, UNCTAD.
Yearbook of Finnish Industry parts1 and 2, 1994, Statistics Finland.
Income distribution statistics,1992, SVT, Statistics Finland.
Foreign Trade of Finland1992, SVT, Statistics Finland.

Production sectors in GEMFIN model	Private consumption categories in GEM- FIN model						
Milk and beef							
Pork	Grain and grain products						
Poultry and eggs	Meat and meat products						
Grains	Milk, cheese and eggs						
Other crops	Butter and other fats						
Other agricultural production	Potatoes						
Forestry, fishing and hunting	Sugar						
Mining and quarrying	Other food consumption						
Slaughtering and meat processing	Beverages						
Milk processing	Clothing and footwear						
Mill and bakery goods	Housing						
Sugar, chocolate and candies	Household equipment						
Other foodstuffs	Health care						
Fodder	Transportation						
Beverages	Recreation and culture						
Textile, wearing apparel and leather industries	Other goods and services						
Wood and wood products							
Paper and paper products							
Fertilizers and pesticides							
Other chemicals and chemical products							
Metal industries							
Other manufacturing industries							
Electricity, gas, heating and water services							
Building and construction							
Trade, restaurants and hotels							
Transport, storage and communication							
Financing, insurance and business services							
Rented and owner-occupied dwellings							
Other private services							

A2.3 Production and Consumption Categories in GEMFIN

3. Liberalisation of Agricultural Trade - Global Implications and What it Means for the EU

The WTO Ministerial Meeting in Doha in November 2001 set out a procedure on the ongoing round of negotiations for removing trade barriers. The Doha meeting put together a working programme for the WTO's Millennium Round: a similar project had failed two years earlier in Seattle. As regards agriculture, the meeting's resolution confirms a commitment to a significant extension of market access, a reduction in all forms of export subsidies – with the aim of ultimately abolishing them – and a major reduction in domestic subsidies distorting trade.

3.1 Introduction

This study evaluates the economic implications of the broad-based liberalisation of agricultural trade using the simulation results of the GTAP global numerical general equilibrium model. The study examines the overall global economic effects of trade liberalisation and, for the EU, more precise sector-specific consequences of the reform. The study is restricted to agricultural trade since it is anticipated that the negotiations will reach concrete results in that sector. On the other hand, agricultural questions are also an interesting subject of analysis because the negotiations embrace an unusually wide spectrum of views on the matters for discussion. The EU appears to have ended up in a situation in the negotiations where it has very few allies supporting its views (see Bjørnskov and Lind, 2002).

Limiting the study to the liberalisation of agricultural products is supported by the fact that industrial tariffs in developed countries have reached a relatively low level. Apart from Australia and New Zealand, average tariffs in industrial countries are a few percentage points of the value of the imports. For developing countries, the negotiating situation has to be assessed by recognising that the WTO negotiations affect tariff bindings that impose a ceiling on import duties. For these countries, the bindings are well in excess of the duties that they levy in reality. Even considerable reductions in tariff bindings would not necessarily lead to changes in the foreign trade policy actually pursued by them as regards imports of industrial products (Francois et al., 2000). Probably no significant reductions in industrial tariffs from the point of view of world trade will result from the trade negotiations.

As regards services, the current material does not permit us to study of the effects of the removal of trade barriers in this sector. For the free movement of services, it is often a question of removing barriers to foreign service providers who wish to establish themselves in another country. By their nature, many services require physical proximity of operation. Thus it is more a question of direct investments and movement of the factors of production than foreign trade as such (Francois et al., 2000).

The study employs the GTAP model to evaluate the effects of agricultural trade liberalisation by simulating a policy shock in which export subsidies are eliminated completely, effective import duties are reduced by 36 per cent and the value of publicly financed domestic subsidies is reduced by 20 per cent. The 66 regions and 57 sectors in the material in the GTAP database have been aggregated for the model simulations into 11 regions and 17 sectors, where the emphasis in commodities is on agricultural and food industry products, and in regions that are the key market areas for the EU.

The overall economic effects of agricultural trade liberalisation are measured in fixed-price GDP and fixed-price per capita consumption. In the model simulations, middle-income countries, the EU, central and eastern European countries and other industrial countries benefit most from trade liberalisation, where liberalisation leads to GDP growth of 0.1-0.3%. If fixed-price consumption is used, as a supplementary indicator, to measure of the success of the reform, the benefits are relatively greater for the entire industrial world, except Canada and the USA.

In the model simulations, the volume of world agricultural trade grows as a result of the WTO reform in almost all product groups. Depending on the product, the growth in trade is between 10-25% and is most marked for beef and sugar. The most important factor increasing trade is the removal of import barriers. Reduced export subsidies cause a decline in world trade. Here the reduction in subsidised exports from the EU is clearly visible, and it has not been compensated entirely by supply from other regions. To a limited extent, a cut in input subsidies has a trade-reducing effect while it clearly increases it for many products.

The study is structured as follows. Section two briefly sketches the situation of agricultural trade following the Uruguay Round. Section three examines the research method and material. Section four presents the simulation results and section five offers some final remarks.

3.2The Agricultural Trade Policy Environment Following the Uruguay Round

After the Second World War, world trade in industrial products was liberalised under the aegis of the GATT in eight different negotiating rounds. Duties among the main industrial countries have declined from an average of around 40% after the war to less than a tenth of that level. The GATT agreement¹⁵ has provided a

¹⁵ The GATT (General Agreement on Tariffs and Trade) is an agreement between the state parties, and not an institution. Before the WTO was established, implementation and monitoring of the GATT was the

general set of trade rules and an agreement on the procedure to amend these rules. The GATT Uruguay Round brought agricultural products within the general trade rules. The conditions for international agricultural trade were laid down in the Uruguay Round's Agreement on Agriculture¹⁶ under three main headings: market access, export competition and international agricultural subsidies.

The aim was to make *market access* more transparent by the tariffication of nontariff trade barriers. Upper limits were imposed by country on customs duties. It was agreed for developed countries that these would be reduced in steps between 1995 and 2000 by 36 per cent. For developing countries the reduction was 24 per cent with an implementation period of ten years from 1995-2004. In tariffying non-tariff trade barriers, the level of border protection was measured in duty equivalents, which were defined by product as the difference between the domestic producer price and world market price averages in 1986-89. For agricultural products, the difference between world market prices and domestic producer prices at the start of the period was generally much smaller than what the agreed tariffs committed the countries to (Ingco, 1995).

Because the GATT agreements committed the parties to respect the maximum agreed tariffs, rather than the duties actually in use, the tariff bindings were in fact significantly higher than those applied by the countries in their agricultural trade. This type of 'airy' tariffication left the countries with upward flexibility in setting their import protection for typically highly protected sensitive products (Ingco, 1995).

To avoid tariffication that could lead to a reduction of trade when the intention of the Agreement was to expand it, tariff quotas were formulated in connection with market access-promoting measures. Tariff quotas are a two-tier tariff system, and constitute an oddity which runs counter to the spirit and aim of the agreement. Low tariffs are applied up to the quota import total, and high tariffs are imposed on imports exceeding that level. Although the aim of the agreement was to make trade barriers transparent, the tariff quota system introduced something quite different (see Francois et al., 2000).

Of the customs nomenclature for agricultural products, in the EU, for example, eight per cent are subject to quotas. The tariff level within the quota, is on average 8%; otherwise 49% (OECD, 2001). The use of quotas is most common in Iceland, Norway and Switzerland, but even in the USA the number of items falling within quotas represents 10% of the import nomenclature for agricultural products. Between 1995-98 the average utilisation rate of quotas in the OECD was 65 per cent. In the EU it was over 70% over the same period. The pattern of

responsibility of a Geneva-based secretariat. At the final meeting of the Uruguay Round, a formal organisation – the WTO – was set up, one of its tasks being to monitor the GATT agreement.

¹⁶ URAA (Uruguay Round Agreement on Agriculture).

the fill rate of quotas displays two peaks: the fill rate was over 80 per cent for over half the quotas and below 20 per cent for around a quarter of quotas.

To promote *export competition* the agreement obliged parties to reduce export subsidies for agricultural production by 36 per cent from the reference year value and the level of exports, which benefited from subsidies in the reference year, by 21 per cent. This was the most significant single measure in the Uruguay Round in reducing agricultural subsidies.

National support

The Uruguay Round also included a clause on maximum levels of domestic support in agriculture, and commitment to a 20 per cent reduction in support ceilings over the period of the agreement. The agreement defines the level of support using the Aggregate Measurement of Support (AMS)¹⁷. The reference value used for AMS is the support levels for the years 1986-88. Both the EU and the USA included elements in this reference support that were not subject to reduction in the support reduction period.

AMS is composed of domestic (budget) subsidies and market price support. In crude terms, budget subsidies are income transfers from taxpayers to agricultural producers and market price support represents income transfers from consumers to agricultural producers. Budget-financed support is divided into three types: market-distorting support subject to reductions, minimally distorting support, which is not subject to reductions, and support linked to production cuts, which is also not subject to AMS restrictions. In WTO jargon, prohibited support is referred to as 'amber box', permitted support is 'green box' and support that is distorting but permissible under certain preconditions is 'blue box'.

The GATT Agreement classifies as green box support public services directed at agriculture, food security, domestic food aid, income support not linked to production and support for pension arrangements as part of structural change programmes. Other permitted forms of support are investment support as part of structural change programmes and payments in connection with environmental programmes or regional support programmes. It is questionable whether the latter forms of support can be considered only moderately distorting (see Roberts, Podbury and Hinchy, 2001).

In order to get the USA and the EU on board, a separate agreement was reached on so-called 'blue box' support, which is also excluded from the AMS restrictions. By its nature it is trade-distorting, but the parties agreed to measures to reduce the level of subsidised production. Support is paid on the basis of fixed

¹⁷ A good description of the details and concepts of the GATT's Uruguay Round Agreement on Agriculture can be found in IATRC (1994).

acreage or animal numbers and on 85% of production in the base period. In practice, 'blue box' support aims to maintain the agricultural production structure as it has evolved under high price subsidies. Only increased production reduces the amount of support per unit produced.



Figure 3-1: AMS and PSE support in the EU, Japan and the USA

Market price support represents the difference between what producers receive and consumers pay in protected markets compared to a system of totally unrestricted market access. The price difference can be maintained by restricting market access, by subsidising exports to sell excess production abroad and by intervention purchases on the domestic market.

Figure 3.1 shows the path of the Aggregate Measurement of Support under the GATT Agreement and of PSE support for the EU, Japan and the USA¹⁸ as calculated by the OECD during the period of the Uruguay Round. For AMS, the averages for the years 1986-88 references values which formed the benchmark for the 20 % reduction in subsidies as pledged by the countries. For the EU and the USA, AMS subsidies for 1995 are considerably below the support level of reference years. The reason for this is that the EU did not apply acreage or livestock unit subsidies in the reference period. These were introduced only in the early 1990s to compensate for the reduction in other elements of support. Correspondingly, in the USA, much of the support paid to agriculture – the co-called defi-

¹⁸ Agricultural support is largely concentrated to the rich industrial countries. The share of agricultural subsidies paid by the EU, Japan and the USA is around 80 per cent (OECD, 2000).

ciency payment – was converted first into blue box support. Subsequently it became a form of payment fulfilling the criteria of green box support (see e.g. Roberts et al., 2001). The EU's Agenda 2000 reform of the Common Agricultural Policy of 1999 is an example of support that has been converted from the targeted AMS-type to forms of subsidy that are not subject to cutbacks.

Although the GATT Uruguay Round managed to link agricultural products to general trade rules, the results in terms of trade liberalisation and reduction of harmful trade subsidies were very limited. The significance of the round was to establish a framework for future trade rounds of negotiations.

3.3 Method and Data

This study assesses the implications of the liberalisation of agricultural trade using simulations produced by a multi-regional numerical general equilibrium model. This methodology has established itself in evaluating trade policy-related issues of this type¹⁹. The GTAP model²⁰, which is used in this study, is a conventionally designed multi-regional numerical general equilibrium model (see Hertel, Ianchovichina and McDonald, 1997). The advantage of using it is the database produced by the GTAP project that supports the model. Version 5 of the database contains input-output sectoral descriptions for 66 regions or countries, including 57 commodities/sectors. This sectoral classification makes the GTAP well suited for evaluating the agricultural issues of the WTO negotiations because agricultural products and sectors based on natural resources are comprehensively represented in the model. The sectoral classification contains 12 agricultural sectors and 8 food-processing sectors.

Inter-regional economic linkages are described by bilateral trade flows between sectors. Apart from trade-flow material, the database contains information on regional trade policy instruments and their effects on differences between world market and user prices. Apart from services, the trade barrier data contains information on tariffs, quotas, anti-dumping duties and agricultural subsidies.

3.3.1 Main Features of the GTAP Model

The standard GTAP model (see Hertel and Tsigas, 1997) is a static, multiregional numerical general equilibrium model with constant returns to scale production technology and perfect competition. Inter-regional links are described by bilateral trade flows. Pricing is characterised as perfect competition, although the

¹⁹ See Francois and Reinert (1997) for a manual on the use of numerical models for evaluating trade policy.

²⁰ The GTAP model and several applications are available on the project's website: http://www.agecon.purdue.edu/gtap. Hertel and Tsigas (1997) provide a description of the theory of the model. Dimaranan and McDougall (2002) provide a description of version 5 of the database.

commodities produced are regionally differentiated. The regional differentiation of commodities enables intra-industry trade to be taken into account. The GTAP model is produced and solved using GEMPACK software (Harrison and Pearson, 1996).

The GTAP model divides regionally available commodities into three groups. Tradable commodities are produced from primary and intermediate product inputs for domestic and foreign consumption and for use as intermediate product inputs. The primary factors of production – land, labour and capital – are non-tradable production factor endowments owned by regional households. Non-tradable means here that the factors of production do not move from one country to another.

There is also one regionally specific investment commodity in the model. In the model, investments accumulate to the capital stock following the simulation period. In a static model, however, this period is outside the scope of the model's examination horizon. The purpose of this investment commodity in the model is to function as an investment target for expenditure allocated as savings.

The central elements of the model are formed from modelling the determination of (i) commodity market equilibrium, (ii) factor market equilibrium, (iii) house-hold demand, (iv) investments and (v) public demand.

Commodity markets

In equilibrium, demand corresponds to supply in all commodity markets. Markets are assumed to be competitive, so that the price received by the producer corresponds to the marginal costs of production. Owing to taxes and subsidies, the prices paid by purchasers and received by producers differ. From the purchaser's perspective, domestically produced and imported commodities in the same product category are separate products. Imported commodities are also differentiated on the basis of production region. Tradable commodities are regionally differentiated and their regional demand is derived from CES production or utility functions as in Armington (1969). The differentiation of imported commodities enables exports and imports of a commodity in an individual sector to appear simultaneously in the modelling of foreign trade.

Production factor markets

Demand for the factors of production comprises two main groups: intermediate products and primary inputs– labour, land and capital. In each sector the choice of the factors of production is based on minimising costs at a given level of production. The choice of the factors of production is limited by three-stage produc-

tion technology²¹. At the first level aggregated primary factors of production and intermediate product inputs are used in a fixed relationship to each other (Leon-tieff technology). At the second level the primary factors of production are a CES aggregate of labour, land and capital. Correspondingly, each intermediate product group is a CES aggregate of a domestic and imported commodity. At the third level import commodities in each product group are an aggregate CES function of import commodities from various regions. The supply of primary factors of production is given at the regional level and they are not the subject of international trade.

Household demand

Each region has a representative household. The total income of the region is distributed in constant shares into private consumption, public consumption and savings, based on a Cobb-Douglass-type regional utility function. The household buys commodities by product group, maximising its benefit at a given expenditure constraint. Private consumption is allocated to tradable commodities according to constant elasticities in differences (CDE) utility function. The form of the CDE is a parsimonious way to parametrise, using a small number of parameters, the varying budget shares of commodities in consumption, and the possible complementarity between commodities. One advantage of describing consumer behaviour with the CDE function is that characterising the entire demand system with it requires information only on the commodities' own price and income elasticities. The properties and applications of the functional form are described by Hertel et al. (1991). The product groups are CES aggregates of domestic and imported commodities. Imported commodities used in consumption are correspondingly composed of CES aggregates of imported commodities from various regions.

Determination of investments

Regional investments and savings are separate decisions in the GTAP model. Regional investments are funded from the global savings pool. Each region saves a constant share of its income into this pool. Regional investments are determined by their relative yield. Regions where the relative yield on capital is growing receive a relatively larger share of the savings available for investments and vice versa.

In the GTAP model, regional savings depend on household expenditure decisions and regional investments on investment decisions taken based on the expected yield. Thus in equilibrium regional, savings and investments can differ in magni-

²¹ Dixon et al. (1992) analyse the use of multi-level CES functions in numerical general equilibrium models.

tude. The balance of payments does not need to be balanced. The average yield on capital varies so that savings and investments are globally equivalent.

Public demand

Total public demand is determined as a constant share of the region's income. Demand for individual product groups is constant in terms of expenditure, being based on Cobb-Douglass expenditure functions. The allocation of public consumption between domestic and imported commodities is determined in the same way as for private consumption.

3.3.2 Sensitivity of the Model Simulations

Evaluation of the economic policy options based on the model results is subject to various forms of uncertainty. Central to these is the uncertainty related to the size of the model's behavioural parameters. Also the range of exogenous shocks affecting the determination of the model results may only be known within certain limits. However, the simulations' sensitivity relative to the random fluctuation of the parameters or shocks can be analysed systematically (see DeVyust and Preckel, 1997).

The policy changes that are the target of the study often result from the interaction of many factors. Dividing the overall effects into the sum of the contributory factors is interesting, for example from the cost and effectiveness point of view or in evaluating otherwise the significance of the various contributory policy option factors. In a complex environment this tends not to be a trivial question. Harrison et al. (2000) have demonstrated how GEMPACK software can decompose the effects of several variables into their component parts in very general situations.

Systematic sensitivity analysis

Often the model's principal parameters or exogenous shocks are key to determining the simulation results, but usually the exact value of these is not known. The significance of this uncertainty to the simulation results can be evaluated by statistical methods. In the Monte Carlo method the value of the variables giving rise to the uncertainty is selected at random and the reliability of the results in relation to the uncertainty is characterised using the mean values and standard deviations of the simulation results. Precise results would require a large number of repetitions. An alternative way is to ask – at a given distribution of uncertain parameters or exogenous variables – what are the best observation points in a case with a limited number of simulations so that the parameters of the distribution of the simulation results can be calculated in a reliable way. This is what a systematic sensitivity analysis is about. The three main contributory factors in the method are:

- Evaluation or assumption of the distribution of uncertain parameters or variables,
- Design of a discrete approximation for this distribution and
- Solving the model at selected points of the discrete distribution and weighting of the simulation results according to the point probabilities of the simulation results.

One procedure for selecting the point values of specified parameters is Gaussian quadrature. Gaussian quadrature is a discrete counterpart to a multinomial continuous distribution, the first d moments of which are exactly matched with the continuous distribution. DeVyust and Preckel (1997) present the Gaussian method and evaluate its advantages over alternative ways of conducting systematic sensitivity analysis.

Systematic sensitivity analysis with GEMPACK can use Stroud's or Liu's quadrature, which has three first moments. If N variables fluctuate independently, there are 2N observation points in Stroud's quadrature and a maximum of 4N observation points in Liu's quadrature. In SSA calculations the model is solved in the case of Stroud's quadrature 2N times and in Liu's quadrature a maximum of 4N times (see Arndt and Pearson, 1996). In the methods using GEMPACK, it is assumed that uncertain parameters or shocks follow a symmetrical distribution. The uncertainty can be evaluated either in relation to the exogenous shocks or parameters but not to both at the same time. In the case of several parameters or shocks, one also has to assume that their variation is either completely independent or completely correlated.

Armington elasticities in foreign trade

In this study, in evaluating a policy simulation reducing agricultural trade barriers, foreign trade price reactions are key in determining the results. The robustness of the results is evaluated using a systematic sensitivity analysis by assuming the elastisticies of trade to be random variables. In the GTAP model, foreign trade demand is characterised as a two-stage decision problem. This is depicted in figure 3-1. At the upper decision-making level a choice is made between a domestic and an imported commodity. Variations in the allocation of demand are affected by the relative price of the domestic product and the imported aggregate. The magnitude of the price reaction is determined by the substitution parameter σ_d . The aggregate import price is calculated as a CES function of the individual import regions' prices. At the second decision-making level imported, commodities are selected in relation to different regions of origin. This decision is affected by the relative prices of regional products, in which the magnitude of the price reaction is affected by the parameter σ_{M} . The expected values of the parameters used in the sensitivity analyses and the ranges assumed for them are given in the table in annex 2.

Decomposing simulations in respect of exogenous shocks

The results of policy simulations generally represent the compound effect of several exogenous shocks. When a policy change – or any change in an exogenous variable at issue in the model – is comprised of several contributory factors, it is natural to inquire what the relative significance of each partial component is. The problem of evaluating the relative significance of different factors can be illustrated in the case of one endogenous and several exogenous variables. If the relationship of the endogenous variable Z and the exogenous variables $X_1, X_2, ..., X_n$, can be represented by the non-linear function

$$Z = F(X_1, X_2 \dots X_n), (3.1)$$

then the change Z relative to the exogenous shocks X_i is represented by

$$dZ = F_1 dX_1 + F_2 dX_2 + \dots + F_n dX_n,$$

jossa $F_i = \frac{\partial F}{\partial X_i}$ (3.2)

The partial derivates in equation (2) stress the effect of the exogenous variables precisely only in the neighbourhood of the reference point because the partial derivates are dependent on the point at which they are evaluated. There are various numerical methods for evaluating the outcome of equation (2) precisely, but decomposing the result requires the partial derivates to be evaluated beyond the range of the exogenous variables. Harrison et al. (2000) demonstrate that this is not a trivial problem. One way to estimate the contribution of different variables is to calculate the changes in Z in relation to individual X_i variables. In this case the magnitude of individual contributions depends on the order of calculation. In the case of a non-linear model the sign of the impact of an individual variable can alter depending on the order of calculation. One way to bypass this problem is to calculate the mean value over all the individual orders. Harrison et al. (2000) demonstrate that if the endogenous variable (Z) to be explained is a quadratic function of the exogenous variables (X_1, \dots, X_i) , the integral of the partial derivates is the arithmetic mean calculated over different orders.. They further demonstrate that if the partial derivates F_{i0} and F_{i1} specified by the vectors $\tilde{X}_0 = (X_{10}, X_{20}, \dots, X_{n0})$ and $\tilde{X}_1 = (X_{11}, X_{21}, \dots, X_{n1})$ describing pre-simulation and postsimulation values of the exogenous variables:

$$F_{i0} = \frac{\partial F\left(\tilde{X}_{0}\right)}{\partial X_{i}} ja \quad F_{i1} = \frac{\partial F\left(\tilde{X}_{1}\right)}{\partial X_{i}}, \qquad (3.3)$$

are interpreted to be linearly specified in relation to each other, the weights of F_i can be calculated as a general numerical integration problem.

3.3.3 Data Used

In the study, the 66 regions and 57 sectors in version 5 of the GTAP database were aggregated²² for the model simulations into 11 regions and 17 sectors, with the main emphasis on agricultural and food industry products. The significance of the regions in the study for world trade in the main food product categories in 1997 is detailed in table 1. In version 5 of the database, production subsidies are divided up in accordance with OECD statistics and allocated to both input and output subsidies. This is different from the earlier versions of the GTAP database, where all subsidies other than export subsidies were classified as ad valorem subsidies to production. Export subsidies are included in the database on the basis of WTO notifications.

	Wheat	Feed grains	Oilseed products ¹	Sugar ¹	Other vegetable products	Beef ¹	Other meat prod- ucts ¹	Dairy products ¹	Proc- essed foods	Average
Australia and New Zealand	15.8	2.1	0.7	6.7	3.5	32.8	4.5	28.3	2.7	5.8
USA	30.7	54.6	27.8	0.8	15.7	27.2	23.0	4.8	15.1	19.1
Canada	24.9	6.2	5.3	1	1.8	7.2	10.1	2.0	4.0	5.1
Mercosur ²	11.1	13.3	22.7	18.4	10.3	10.8	9.4	3.0	6.0	10.2
Mediterranean region ³	1.2	0.6	1.9	0.6	7.3	0.6	1.1	0.7	2.6	3.1
Middle-income countries ⁴	0.9	0.8	15.0	34.1	22.1	1.4	8.3	1.6	15.9	14.8
Developing countries ⁴	0.2	10.8	11.5	15.2	25.0	3.2	6.7	0.8	13.7	13.8
European Union⁵	11.1	7.8	9.8	17.1	8.1	12.5	25.5	46.3	26.9	19.0
Central and eastern European countries (CEECs) ⁶	1.1	1.9	1.7	2.9	0.9	1.3	9.2	4.4	2.5	2.5
Countries of the former Soviet Union (CIS)	3.0	1.8	1.9	2.9	4.0	2.6	0.9	3.7	2.8	2.8
Other industrial countries	0.0	0.0	1.7	0.4	1.2	0.5	1.2	4.4	7.8	3.8
Commodity's share of world trade (%)	4.5	3.7	12.7	3	22.0	4.2	6.5	4.3	39.1	
Average tariffs in world trade (%)	21.9	32.2	8.8	30.0	8.3	24.5	16.7	45.1	13.5	15.6

Table: 3-1. Regional	shares of worl	d trada in f	innde (in	ner cent)	1007
Table. 3-1. Regional	Shares of worr	u traue m n	00us (III	per ceril).	1997

Source: GTAP 5 database, own calculations.

¹ Primary production and processing added together. For dairy production only trade in processed products.² Customs union of Argentina, Brazil, Paraguay and Uruguay. Chile and Bolivia are associate members.³ Northern African countries in the GTAP database and Turkey.⁴ Middle-income countries in south-eastern Asia and Latin America (excl. Mercosur). ⁵ Calculations do not internal trade in the European Union.⁵ Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia.

The last column in the table represents the share of the region in total trade in foods. The row after individual commodities' share of trade by region gives the percentage shares of each commodity of world food trade. The last row gives percentage average of the tariff levels applied to commodities in world trade.

Measured by market shares, the USA and the EU are almost equally large as suppliers of foods to world markets. Their share of world trade in agricultural

²² The sectoral and regional aggregations composed from the GTAP5 database are described in the annex to the study.

products and foods is around a fifth. However, the regions differ in the structure of the commodities they supply. The USA is the principal supplier of cereals and oilseeds. In beef markets, too, its share is almost as large as that of the Australia-New Zealand region, which is the largest supplier to world markets in this commodity group. The European Union is the principal world trade supplier of processed foods and dairy products and other meat products.

The distribution of world trade in foods is presented in the penultimate line of the table. The bottom line gives the average tariff levels applied to trade in commodities. Processed foods represent the most significant group in terms of value of trade. Their value of all trade is around 40 per cent. This is a very heterogeneous commodity category, spanning trade in fruits, vegetables, nuts and fibres. The third most important category is oilseed products and the fourth white meat production.



Figure 3-2: The correlation between import protection and world trade

The average tariff level levied on the three largest commodity groups in world food trade is lower than the trade share-weighted mean for trade in foods as a whole, which for the present data is 15.6%. The products that are subject to relatively low tariffs account for a significant share of the world's food trade. The correlation between trade barriers and the share of world trade is illustrated in figure 3-2, which shows that trade shares and tariff levels have a clear negative

dependency. Over half of the variation in trade shares can be 'explained' by variations in tariff rates.

In addition to being protected by high external tariffs, agriculture is also subsidised by national support. Table 3-2 illustrates the significance of agricultural subsidies. In industrial countries, agricultural productions share of GDP is only 1-3 per cent. In middle-income countries this share is between 5 and 10 per cent and in developing countries it is almost 20 per cent of GDP. The industrial countries²³ share of world agricultural production is just over a quarter, but their share of world trade in agricultural products is over half. In 1997 the aggregate value of agricultural subsidies in the world was 80 billion US\$. The value of subsidies paid is almost sixfold the accrued agricultural income in countries like Australia or Canada.

	Australia and New Zealand	United States	Canada	Mercosur -countries	Mediter- ranean countries	Middle- income countries	Develop- ing countries	Euro- pean Union	CEE coun- tries	CIS coun- tries	Other indus- trial coun- tries	To- tal/Avera ge
Share of agricultural production of GDP (%)	3.4	1.2	2.2	9.6	5.8	8.0	18.2	2.4	6.9	2.7	1.4	4.0
Share of world agri- culture ¹ (%)	1.3	9.4	1.1	10.5	6.7	11.8	34.4	15.7	1.9	1.4	5.8	100.0
Share of world agri- cultural trade (%)	8.9	23.0	6.2	10.4	3.5	12.7	14.0	14.2	2.5	3.3	1.2	100.0
Share of world agri- cultural subsidies (%)	0.5	22.1	1.9	0.8	1.1	3.3	1.6	57.6	1.6	1.0	8.4	79954.0 ²
Input subsidies	0.5	20.9	1.7	0.0	1.3	3.9	0.0	63.5	0.6	0.0	7.5	64885.0^2
Commodity subsidies	1.0	40.5	4.5	6.1	0.9	0.0	12.9	5.3	7.8	7.7	13.2	9791.0 ²
Export subsidies	0.4	2.3	0.0	0.3	0.2	1.2	0.1	81.9	2.4	1.0	10.1	5278.0^{2}
Subsidies relative to value added (%) World subsidies rela-	3.1	17.4	11.3	0.6	1.3	2.5	0.4	25.6	6.6	6.0	13.5	8.2
tive to region's agri- cultural income ³ (%)	592.5	78.8	579.3	73.9	114.8	75.3	26.7	44.4	409.2	586.2	160.9	

Table 3-2: Agriculture and agricultural subsidies: key figures

¹As measured by GDP,² Million 1997 US\$,³ Total world subsidies divided by GDP in agriculture for the region.

Source: GTAP 5 database, own calculations

Capital or land use-based input subsidies are a significant form of subsidies. In 1997 almost 65 billion US\$ were paid in input subsidies and their share of all subsidies was over 80 per cent. The share of commodity subsidies of all subsidies was over 10 per cent and they were paid to the tune of around 10 billion US\$. The share of export subsidies was only around 7 per cent of total subsidies, representing in excess of 5 billion US\$.

²³ The calculations in this study include Australia and New Zealand, the USA, Canada and the EU.

The EU was the largest payer of agricultural subsidies. Its share of paid subsidies was almost 60 per cent. The second largest subsidiser of agriculture was the USA, its share of world subsidies paid to agriculture being around 20 per cent. The third region whose relative share of subsidies is larger than its relative share of world agricultural income is the region of other industrial countries. In the material in the model, Norway, Japan and Switzerland are the principal countries in this regional aggregate.

In the EU, subsidies are concentrated on input and export subsidies. The EU's share of these is larger than its share of all subsidies in the world. In the region of the rest of the world, the focus is on export and commodity subsidies. On the other hand, the USA pays around 40 per cent of all commodity subsidies in the world.

AGENDA 2000

The baseline year in the GTAP 5 database is 1997. Inter-regional trade flows and GDP for the entire economy are from that year. For trade and economic policy instruments, the information in the database is more recent. For the EU, it was not possible to take the Agenda 2000 reform into account in the database, as the reform was not agreed until mid-1999. From the viewpoint of the WTO negotiations, however, the reform is central because it represents a typical transition from the subsidy types proscribed by the GATT agreement, to subsidies that are not subject to restrictions under current practice.

The Agenda 2000 reform represents a continuation of the agricultural reforms implemented previously by the EU. These sought to move the emphasis of support from high producer prices maintained via trade policy instruments to quantitatively limited subsidies based on livestock numbers and acreage. The reform was motivated by three factors. First, it is a means of preparing for the EU's eastern enlargement, which will put pressure on the costs of maintaining high producer prices. Second, it helps to convert agricultural support into a system that is less vulnerable to the decisions of the WTO negotiating round. The third reason is that without reform the EU would have been unable to honour its agricultural trade commitments under the Uruguay Round.

The intervention prices for cereals, which had been maintained by agricultural policy measures, are cut by 15 per cent over the period 2000-2003. This is partially offset by an increase in acreage allowances. Acreage allowances are defined as tonnes per hectare on the basis of historical crop levels. The acreage-based support for oilseeds and protein plants is reduced to the same level as cereals.

Beef intervention prices are cut by 20 per cent over the period 2000-2003. Part of the price reductions are compensated through subsidies based on fixed number of livestock. Along with the price cuts, a slaughter premium is introduced.

	Export	subsidies	Impor	t protection	Production subsidies			
	1999	Agenda 2000	1999	Agenda 2000	1999	Agenda 2000		
Wheat	9.9	0	12.4	0	36.7	41.8		
Feed grains	39.8	18	44.2	21.7	34.7	42.5		
Oilseeds	0	0	0	0	52.3	47.9		
Other crops	1.2	1.2	6.9	6.9	1.5	1.5		
Raw sugar	76.6	76.6	76.6	76.6	-2.8	-2.8		
Raw milk ¹	0	0	0	0	8.2	20.9		
Cattle	82.5	56.4	111.2	81	18	29.7		
Other animals	15.6	15.6	0.8	0.8	8.3	8.3		
Natural re- sources	-0.6	-0.6	0.1	0.1	0.5	0.5		
Processed beef products	68.8	44.7	53	31.1	0.6	0.6		
Other processed meat products	12	12	18.7	18.7	0.7	0.7		
Processed dairy products	83.4	62.8	116.3	92.1	1	1		
Vegetable oils and fats	0	0	0	0	0.4	0.4		
Sugar products	76.6	76.6	39.1	39.1	0.8	0.8		
Processed foods	-0.1	-0.1	9.9	9.9	-9	-9		
Manufacturing	-0.4	-0.4	3.8	3.8	-2.1	-2.1		
Services	-0.6	-0.6	0	0	-2.5	-2.5		

Table 3-3: Import tariffs, export and production subsidies in the EU

¹Milk supplied from farms to dairies, which is not an internationally tradable commodity. Source: GTAP 5 database, Francois and Strutt (1999) own calculations.

Reform of the dairy sector will start in 2005, when producer prices will be reduced by 15 per cent over three years. This will be partially compensated by direct subsidies, the allocated according to historical milk quotas. In addition, support will be increased by means of so-called national envelopes on a differentiated, country-by-country basis. At the same time, milk quotas will be increased by 1.5 per cent in the period 2005-07. By 2007 the milk quota will increase overall by 2.4%, because the quota for five EU countries is set to increase from the beginning of the millennium.

Table 3-3 presents the EU's import protection, export subsidies and production subsidies as of 1999, and an estimate of the situation following Agenda 2000. The Agenda itself has implications for import protection and export subsidies for cereals, cattle rearing, beef and processed dairy products. The reform will cause export subsidies to decrease, but production subsidies will increase.

The effects of the Agenda 2000 reform on export subsidies and import protection have been derived by simulating the reform's effects using the GTAP model. In the simulations producer prices have been exogenised and export subsidies and

import protection have been adjusted so as to yield the requisite producer prices. The change in production subsidies is assumed to be exogenous and the author's own calculations are used to determine these. They are dealt with in more detail in the Vaittinen (2001). Table 3-3 shows that, for cereals, beef and processed dairy products, the Agenda 2000 reform shifts the focus of agriculture policy from import protection to production subsidies.

For wheat the resultant situation is one in which trade policy instruments are not applied at all to support the agricultural sector. On the other hand, the acreagebased production subsidies increase to over 40 per cent of the value of production. For beef, production subsidies increase by 10 percentage points. Milk production has been supported by primary processed products such as milk powder and butter being marketed to the world with export subsidies.

These subsidies will be replaced by direct support for raw milk production within the prevailing milk quotas. In terms of its effects on production, the change in the subsidy structure is almost neutral in respect of all sectors. Cereal production will decrease by a few per cent, beef production will remain more or less unchanged and milk production will increase slightly (see Vaittinen, 2001). The study does not seek to evaluate the proposal made in the Agenda 2000 mid-term review to move over to WTO-style 'green box' support, i.e. support with a minimum distorting effect on production.

3.4 Liberalisation of Agricultural Trade

This section evaluates the effects of the liberalisation of agricultural trade using the GTAP model. The effects are evaluated by simulating a policy shock in which export subsidies are abolished altogether, effective import tariffs are reduced by 36 per cent and the value of domestic support is cut by 20 per cent. The starting point used for the trade policy actions is the design of the prevailing trade policy instruments prevailing following the Uruguay Round. The analysis does not evaluate possible reductions in industrial tariffs or the removal of trade barriers in services trade.

In the model analyses, import protection is interpreted as regional commodityspecific tariff equivalents. The complex regulatory system introduced under the Uruguay Round is not modelled, instead cuts in import protection are analysed in the standard way (cf. Hertel et al., 1999).

In a similar framework Hertel, et al. (1999) have analysed a more comprehensive trade reform. In their analysis, they concentrate on characterising the general features of trade liberalisation and focus less on sectoral and regional effects than what is done in the present study. In their regional aggregation the European Un-

ion is included into western Europe, and they do not take account of the effects of EU policy changes on trade policy instruments.

The study evaluates the liberalisation of agricultural trade in a policy package in which it is assumed that export subsidies are abolished altogether, import protection is reduced by 36% and production subsidies are cut by 20%. The effects of a policy shock of this type are evaluated in two ways. First, the aim is to evaluate the relative significance of different elements of the policy package so as to shed light on the discussion of the role of various subsidy components in the liberalisation of agricultural trade. In parallel, the significance of the uncertainty relating to the magnitude of the parameters determining the sensitivity of foreign trade reactions to the simulation results is evaluated.

In econometric studies, estimates of the substitution elasticities of imported commodities are relatively low. On the other hand, experience shows that the effects of trade policy reforms on changes in the terms of trade are small, which points to substantial price elasticity in the demand for commodities (see Dimaranan et al., 2002). Also, Gelhar's (1994) study, which evaluates the structural implications of changes in the supply of the factors of production, shows that high elasticities are used to explain changes in the structure of trade.

3.4.1 Macro Effects by Region

Table 4-1 details the overall economic effects of agricultural trade liberalisation. These can be found in relation to changes in imports and exports in fixed-price GDP terms. The change in welfare is evaluated by the change in consumption as measured by the equivalent variation²⁴. The variations in the terms of trade are also given. The results are reported as percentage change deviations from the reference equilibrium.

At the overall economic level, the effects of the liberalisation are relatively limited. The most significant changes, as measured by fixed-price GDP, are found for the middle-income country group, the EU, CEE countries and other industrial countries, where GDP grows by 0.1-0.2% relative to the reference equilibrium. Terms of trade improve in the CEE countries, remain fairly stable in the EU region and weaken somewhat for other industrial countries. The change in consumption, as measured by the equivalent variation, is greater than the increase in GDP.

In the model analyses the change in fixed-price GDP measures the increased efficiency in the allocation of resources, i.e. the return yielded by the factors of pro-

²⁴ Equivalent variation is a monetary measure of change in welfare. It evaluates the change in welfare as measured by consumption expenditure as a result of policy action if the commodities consumed had to be paid for at the prices existing before the policy.

duction. The benefit resulting from the change in the terms of trade indicates increased income resulting from an expansion in imported commodities at a given domestic output. In addition to the change in income resulting from the increase in production, the equivalent variation takes into account the effect of the change on consumer prices. If - owing to the altered policy - consumers obtain the desired basket of commodities at a lower cost than before, consumption can be increased at a given level of incomes. If consumption grows relative to GDP, consumption possibilities outstrip incomes at new relative prices.

	Aus- tralia and New Zea- land	United States	Can- ada	Merco- sur coun- tries	Mediter- ranean coun- tries	Middle- income coun- tries	Devel- oping coun- tries	Euro- pean Union	CEE coun- tries	CIS coun- tries	Other industrial coun- tries
Fixed-price GDP (% change) Expected value	-0.01	0	0.02	0.05	0.08	0.23	0.08	0.13	0.14	-0.05	0.15
standard deviation	0	0	0.01	0.01	0.01	0.03	0.01	0.01	0.02	0.01	0.02
Fixed-price imports (% change) Expected value	2.34	0.46	0.27	2.07	1.13	1.33	1.36	0.13	1.2	0.11	0.8
standard deviation	0.27	0.06	0.05	0.25	0.18	0.1	0.22	0.06	0.18	0.19	0.06
Fixed-price exports (% change) Expected value	0.66	0.41	0.23	1.49	1.31	1.19	1.37	0.3	1.06	0.05	0.77
standard deviation	0.1	0.06	0.04	0.27	0.2	0.09	0.22	0.05	0.19	0.15	0.09
Terms of trade (% change) Expected value	1.44	0.11	0.04	0.6	-0.34	-0.11	-0.03	-0.01	0.17	0.06	-0.12
standard deviation	0.18	0.02	0.02	0.06	0.03	0.02	0.02	0.02	0.04	0.06	0.02
Fixed-price consumption (% change) Expected value	0.28	0.02	0.05	0.13	0.04	0.35	0.12	0.18	0.29	-0.08	0.26
standard deviation	0.03	0	0.01	0.01	0.02	0.04	0.01	0.01	0.03	0.01	0.02

Table 4-1: Overall economic effects of the liberalisation of agricultural trade by region

In the EU, the benefits of agricultural liberalisation accrue largely from increased efficiency in the allocation of resources. The terms of trade weaken somewhat, but per capita private consumption grows 0.05 per cent more than overall incomes. In other industrial countries GDP grows at roughly the same rate as in the EU. The terms of trade weaken slightly more, but the increase in consumption relative to the increase in incomes is almost double at 0.26 per cent. This effect can be considered fairly significant considering the small size of the agricultural sector in these countries (cf. table 3-2). In CEE countries the improved terms of trade have a slightly positive effect on welfare. There the change in relative consumer prices has a more pronounced effect in increasing consumer welfare.

Measured in GDP the effects of trade reform in the USA, Canada and Australia-New Zealand regions is almost imperceptible. For the USA and Canada part of the explanation is the fact that agriculture is an extremely small sector relative to overall production. Its share of GDP in the USA is just over one per cent and only around two per cent in Canada. Although both countries support agriculture with budget funds and import protection, the order of magnitude in these countries is nonetheless different than in the EU and other industrial countries (cf. table 3-2).

Agricultural trade liberalisation has the strongest effects on the terms of trade for the Australia-New Zealand and Mercosur regions. With the improved terms of trade, welfare in these countries, measured by consumption or the equivalent variation, grows more than fixed-price GDP. Welfare measured by the equivalent variation increases relatively more in the Australia-New Zealand region, in middle-income and developing countries and in other industrial countries.

For Australia and New Zealand, the improvement in the terms of trade is the key factor behind the growth in welfare. Fixed-price GDP remains almost unchanged. This region has traditionally engaged in agricultural production on market terms; import protection or export subsidies have not had a significant role. With the liberalisation of trade, production is geared towards those sectors which, with the removal of trade barriers, have greatest impact in increasing world trade.



Figure 3-3: Impacts of trade liberalisation on world trade in agricultural products, decomposed by policy measure

It is noteworthy that whatever measurement is used, the overall macroeconomic effects on the United States are almost imperceptible even though the US, of the countries participating in the trade negotiations, has been one of the staunchest proponents of agricultural trade liberalisation. The country's terms of trade improve somewhat and agricultural production increases. However, as subsidies are directed at production, this leads to inefficient use of resources, which in turn explains the macroeconomic outcome. It is possible that a reform, which mechanically reduces import protection on all commodities, will not be approved and that in practice some products and sectors will need to adjust more than others. In their calculations, Hertel et al. (1999) also analyse a policy scenario lim-

ited to agricultural liberalisation which in its order of magnitude and direction yields a similar result for North America.

3.4.2 Implications for world trade

Figure 3.3 details the global implications of agricultural reform on trade for the main agricultural commodities. The effect is decomposed for export subsidies, import protection and import subsidies. In interpreting the individual elements in the diagram, one must realise that they are contingent on the other partial components being realised simultaneously. For example, the abolition of export subsidies reduces world beef trade by around seven per cent, if import protection and production subsidies are reduced as has been done in this exercise.

In the model's simulated estimate of global trade liberalisation, the volume of world trade grows, except for dairy products and wheat production. Depending on the product, the increase in trade is between 10 and 25%, and is most pronounced for beef and sugar. The most important factor boosting trade is the removal of import protection. A cut in export subsidies has the effect of reducing world trade. In practice this reflects a drop in subsidised exports from the EU. A cut in import subsidies has the effect of increasing trade in beef and feed grains and decreasing trade in other crops and wheat.



Figure3-4 : Volume of world trade –dispersion of trade, with varying demand parameters

Because the reform at issue is one that alters the price structure of foreign trade, the key point in evaluating its effects is to determine how regional demand reacts to the changes in relative prices that result from the policy. This depends on the parameters determining behaviour, but there is uncertainty with regard to these. The method described in section 3.3.2 attempts to summarise the effects of this uncertainty.

The results in figure 3.4 take account of the uncertainty relating to the parameters governing price reactions in foreign trade. The figure presents the expected value and dispersion of changes in production when the foreign trade parameters are interpreted as random variables within a certain range. The central line in the bars in the figure represents the expected value of the volume of world trade by commodity, the upper and lower parts of the bar one standard deviation and the 'whiskers' two standard deviations from the expected value in the simulations, in which the parameters of trade are allowed to vary randomly.

The uncertainty regarding the magnitude of the behavioural parameters affecting trade flows has a significant effect on the range of the results. Nonetheless, it is evident that trade in dairy products is the only item where no definite results could not determined as to the impact of the reform on the direction of the change in the volume of trade.

The dispersion of the results is greatest for beef and sugar production, but the expected values of the changes are so great that the direction of the effect is unambiguous. Relatively speaking, the uncertainty is greatest in trade in dairy products. The range of the changes in trade is fairly small because the anticipated change is minor. The uncertainty related to the expected value of the production of oilseeds and sugar is almost equally large and the second most significant. In the case of sugar this is especially significant because the change in the expected value is fairly large.

Distribution of effects by commodity and region

In the following the regional distribution of the commodity-specific changes in foreign trade is examined. The examination comprises four commodities which are especially significant for the EU's food trade: beef, sugar, feed grains and dairy products.

In the figures presenting regional changes in commodity exports, the effects of trade liberalisation are decomposed into policy measure for export subsidies, import protection and input subsidies. The magnitude of the policy effects with respect to individual policy components shows the impact of a multilateral measure when the actions of all regions are taken into account for the instrument concerned. One must also remember that the estimated effects are contingent on the simultaneous realisation of other policy measures.

The effects on exports by region are arranged by order of magnitude. In the study, the EU's trade constitutes only external trade with other regions. In the figures illustrating exports by commodity, the aggregate overall effect is represented by the line because stacking the bars that isolate the individual effects only produces the overall effect if all the effects are in the same direction.



Figure 3-5: Change in beef exports by region – million US\$ at 1997 prices

The USA, Canada and Mercosur are the main beneficiaries of exports from the growth of beef exports. For beef, market access, i.e. lower tariffs, is of central importance in increasing world trade. In fact market access is the most significant trade factor for all regions wanting to increase their exports. The EU and other industrial countries are the principal recipients of these exports (cf. annex 3a).



Figure 3-6: Change in sugar exports by region - million US\$ at 1997 prices

The abolition of export subsidies is significant for the EU only, where this factor explains the most of the reduction in exports. The model calculations show that the USA benefits mostly from the markets lost by the EU. Reduction of tariffs in other industrial countries improves the EU's competitiveness in their respective markets but this is not sufficient to compensate the adverse impact resulting from reductions in export and input subsidies.

For sugar, the number of regions where trade liberalisation has a significant effect is smaller. Sugar exports increase the most for middle-income and developing countries and the Mercosur region. Lower export subsidies are of some significance for middle-income countries and especially for the Mercosur region, where the increase in trade is most pronounced, owing to the EU's reduced competitiveness. For developing and middle-income countries, access to EU markets through lower tariffs is the most significant factor increasing trade (cf. annex 3b). The diminished export subsidies explain almost all of the reduction in trade on the part of the EU.



Figure3-7: Change in exports of feedgrains by region - million US\$ at 1997 prices

In feed grains exports, the incidence of impacts is even more polarised than in the case of sugar. Exports from the EU decrease and exports from developing countries increase. Here, reduced input subsidies have some influence on the level of exports from developing countries. The decline in EU exports is largely a reflection of the abolition of export subsidies. But it is mainly the developed countries like the USA that fill the gap left by the EU's exports (cf. annex 3c). However, the USA's exports of feed grains to the rest of the industrial world have declined so sharply that its overall exports remain almost unchanged. The developing countries' strong growth in exports is mainly directed towards middle-income countries, where the increase in trade is explained by the reduced import protection.

In dairy products, the changes in exports are not as polarised as for feed grains. Nonetheless, the EU is once again the clear loser and the Australia-New Zealand region is clearly the greatest beneficiary, unequivocally gaining market areas at the expense of the EU (cf. annex 3d). In this case the cut in EU export subsidies has a significantly positive effect on exports of Australian dairy products. Dairy products are the only group examined where exports decline significantly in an area other than the EU. In this case other industrial countries, where Switzerland occupies a central role, see a decline in exports.



Figure 3-8: Change in exports of dairy products by region - million US\$ at 1997 prices

3.4.3 Implications for EU Agriculture

This section examines the effect of the WTO reform on EU agricultural production. The production implications are evaluated both in relation to the significance of the various measures and with regard to the uncertainty in the trade parameters. Production implications for the main commodities are also evaluated in relation to the market outlook based on the FAPRI (2002).

Production, as a result of the reform under review, declines in the EU in all agricultural sectors apart from oilseeds and other crop production. The most pronounced production decline is in sugar, beef and feed grains. According to the simulation results, sugar production declines by almost 20 per cent, beef production by almost 15 per cent and feed grains by around 10 per cent. According to the calculations, production of milk that is central for overall agricultural production declines by around seven per cent. The drop in production for individual commodities, however, is attributable to a number of factors.

The significance of export subsidies in the decline of sugar and milk is relatively large. The reduction in input subsidies is most significant for cereal products. Increased competition from imports is a relatively more important reason for the decline in production of sugar than it is in the production of milk. Of the seven per cent decline in milk production, over four per cent is explained by the reduc-



Figure 3-9: Change in agricultural production in the EU – by policy components

tion in export subsidies, whereas the change in border protection explains just over two per cent.

For cereals and beef, the reduction in input subsidies is the principal factor depressing production. In the case of wheat the significance of lower input subsidies is so great that without the reduction in support, production might stay almost unchanged or even increase. Although the reduction in input subsidies also has a substantial impact on the change in beef production, competition from imports is nonetheless the key factor prompting the decline in production.

Although agricultural production in the EU region declines for almost all commodities, oilseed and other crop production increases, as a result of resources being freed up from declining agricultural sectors. Oilseed production represents only 1.5 per cent of the total value of EU agricultural production. But in terms of total agricultural production, an increase in other crops is significant because this segment represents around 40% of the value of EU agricultural production. As a result of the WTO reform, overall agricultural production declines only by just under two per cent even though the drop in production for individual products is significant.

The significance of the uncertainty of the parameters for the anticipated changes in production is less than its significance for trade flows. This is natural since trade in agricultural products represents a relatively minor share of overall production. Also, the reform under review falls short of free trade.

The dispersion around the expected values is the greatest for sugar, beef, milk and oilseeds. Even here, the size of two standard deviations is less than five per cent for all products. For beef, the change in anticipated production within two standard deviations is somewhere between 12 and 16 per cent; for milk the corre-



sponding figures production are 6 and 9. For no product does the expected value

Figure 3-10: Dispersion of changes in production, with varying foreign trade parameters

of the observations as arranged in order of magnitude come within the first standard deviation of the observation immediately preceding or immediately following it in order of magnitude. The expected value of observations, as arranged in order of magnitude, does not alter the ranking of the sectors arranged according deviation in production.

For cereal products and other crops the fluctuation in production around the expected value due to the magnitude of the parameters is very modest. In terms of



Figure 3-11: Net exports from the EU before and after the agricultural trade reform

evaluating production changes for these commodities in the trade liberalisation scenario, the uncertainty caused by trade reactions has a very moderate effect.
In foreign trade, the EU goes from being a net exporter of feed grains and sugar to being a net importer; for beef net imports double. Correspondingly, net imports of other crops are almost halved due to increased domestic supply.

3.5 The Future of EU Agricultural Production in Relation to the WTO Reform

The GTAP model used in this study is a comparative-static analytical tool for carrying out policy evaluations based on 'what if' scenarios by comparing the economic situation before and after a policy measure. The simulation results should be understood as deviations from the trend path of the economy. In this section the calculations derived are compared to the long-term trend outlook using the scenarios of the future state of agriculture in 10 years time, as projected by the FAPRI international agricultural research institute.

FAPRI, the US-based Food and Agricultural Policy Research Institute, publishes an annual 10-year scenario of international agricultural projections for world trade and individual producer segments. The basic trend path in the institute's estimates builds on the most widely used macroeconomic projections and assumptions regarding the implementation of agricultural policy.

According to the WTO negotiating timetable, a new negotiating agreement should be reached during 2005. In the previous round, industrial countries were given six years and developing countries 10 years to implement the agreement. Similarly, a new trade agreement could be implemented in 2006 and the necessary measures completed by 2011.

Because the near-term perspective is not pivotal to the present study, just some of the long-term growth assumptions in FAPRI's (2002) world economic scenario are set out here. GDP growth in the world economy is assumed to be around 3.5 per cent annually, but growth in the developed industrial countries is assumed to be slower than this, around 2.5 per cent annually. The transition economies of eastern Europe are assumed to grow by around 1.5 percentage points faster than the word average over the review period up to 2012. In the rest of the world growth is assumed to be around 4.5 per cent on average, i.e. somewhat slower than in the transition countries but two percentage points above the industrial countries. The economies of China and India are expected to grow particularly rapidly, with China continuing to grow over seven per cent and India forecasted at six per cent, on average.

The FAPRI trend path for agricultural policy assumes that international agreements currently in force will remain in place throughout the review period. The obligations of the WTO Uruguay Round are assumed to remain in place up to the end of the period. The analyses contain no forecasts of the impact of the new round. The impact of the Chinese and Taiwanese membership in the WTO has also been taken into account in the outlook for agricultural markets.

EU agricultural policy under Agenda 2000 - including the forthcoming dairy sector reform in 2005-2007 - is factored into the analysis. On the other hand, the impact of the new US agricultural budget has not been considered because it had not been adopted at the time of drawing up the scenario.



Figure 3-12: Agricultural production in the EU following trade liberalisation relative to the FARPRI scenarios

Figure 3-12 examines the results of the agricultural trade model simulations relative to the FAPRI agricultural production scenario for the EU for four commodities. The figure examines those commodities in which, according to the model simulations, production will decline most in the EU region. Production for the last production year identified in the figure, which in the FAPRI report is 2001, is set at 100. The production level in 2006 is FAPRI's forecast. For beef, for example, it is assumed to be 5 per cent above the 2001 level. Correspondingly, production of sugar in 2006 is assumed to be around 8 and of feed grains 7 per cent above the 2001 level. Milk production is assumed to remain more or less unchanged compared to the reference year level.

In 2001 domestic consumption of beef declined in the EU by 10 per cent. Exports remained at the level of the previous year, when they fell by around 30 per cent due to new outbreaks of BSE. Exports are assumed to pick up again in future, thus a small increase in overall production is anticipated by 2006. However, beef production is assumed to be only three per cent above the present level by the end of the review period.

EU sugar production in 2001 was depressed, due to adverse weather conditions. The increase in production is explained in the analysis largely as the return to normal conditions. Increased production will mainly go for exports, which are assumed to more than double in the review period.

The increased demand for feed grains in the world markets is explained mainly by China's expanding needs. FAPRI forecasts that the EU will capture the majority of the growing export markets for barley as it increases its market share at the expense of Australia and Canada. In the basic scenario, increased exports are the main factor explaining the higher production of feed grains in the EU. At the end of the review period, production is assumed to be 11 per cent higher than in 2001.

During the review period, global milk production grows by over 12 per cent. Most of this growth takes place in North and South America. Most of the production goes to satisfying domestic demand, whereas increased production in Australia and New Zealand goes for exports. The EU's production level is restrained by quota limitations.

The final bar in figure 3-11 relates the expected outcomes of the model simulations for each commodity to the 2011 production levels, assuming that the FAPRI scenario is realised. The figure also assumes that the reform is initiated from the beginning of 2006 and that its effects will be seen in full in the production figures for 2011.

When the results of the model simulations are related to the FAPRI scenarios, and production in 2011 and 2001 is compared in the case of the WTO reform, beef production falls most. Production in this sector would be 11 per cent below the 2001 production level. Sugar production would also be around ten per cent below the reference year level. Production levels of feed grains would be almost the same as in 2001. Milk production would fall by around six per cent below the present level.

Comparing the expected consequences of the WTO reform to the production outlook in the EU, in no sector are production levels assumed to be 10 per cent lower than at the moment. It can be said that the market situation for sugar and beef in the reference year was to some extent abnormal. But for feed grains the impact of the reform is mitigated by the positive market outlook.

3.6 Conclusions

The main achievement of the GATT Uruguay Round was that it brought trade in agricultural products within the GATT rules. As a result, agricultural trade restrictions were only partially abolished and agricultural subsidies have changed

in character, with a greater share of direct aid replacing the previous practice of border protection. The OECD's PSE indicator shows that, with the exception of the EU, amounts by the three largest agricultural subsidy payers in 2000 were higher the average levels in 1986-88. This year was used in the URAA agreement as the reference year for AMS subsidy cuts.

Domestic agricultural is generally protected by high external tariffs. In several industrialised countries it is subsidised from budget resources. In 1997 the aggregate global value of agricultural subsidies was US\$ 80 billion. Capital or land use-related input subsidies are the major form of support, representing over 80 % of total value of subsidies. The EU was the largest single payer of agricultural subsidies, covering almost 60 per cent of the global total of farm support. The second-largest subsidiesr was the USA, with an approximate 20 per cent share of world agricultural subsidies. Government support, paid by other industrial countries is also relatively greater than their share of world agricultural income.

Using the GTAP model, the study evaluates the effects of agricultural trade liberalisation by simulating a policy shock in which export subsidies are abolished entirely, effective import tariffs are reduced by 36 per cent and the value of domestic support paid from public funds is reduced by 20 per cent.

The overall economic effects of the liberalisation of agricultural trade have been measured by fixed-price GDP and fixed-price per capita consumption. In the model simulations, the main beneficiaries of trade liberalisation are the middle-income country group, the EU, central and eastern European countries and other industrial countries. Agricultural trade liberalisation increases GDP in these regions by 0.1-0.2%. While in the USA, Canada and the Australia-New Zealand region the GDP impact is almost non-existent. For the USA and Canada, part of the explanation is the fact that agriculture is a very small sector relative to overall production. The GDP significance of agriculture is also small in the EU and the group of other industrial countries. But in these regions large-scale agricultural aid in its present form has led to great inefficiency.

If success of reform is measured by fixed-price consumption rather than GDP, the benefits are relatively greater for all other parts of the industrial world with the exception of Canada and the USA. It should be noted that whatever measure is used, the overall economic effects in the United States are almost non-existent even though the US, of the negotiating countries, has been one of the strongest proponents of agricultural trade liberalisation. The country's terms of trade improve somewhat and agricultural production increases. Production subsidies encourage inefficiency in the use of resources, which in turn explains the overall economic outcome.

With the improved terms of trade, the Latin American countries belonging to the Mercosur customs union and the large group of middle-income countries also benefit from liberalisation. The effects are also positive for the developing countries, although the impact is relatively small. This is partly because the developing countries only have a relatively small share of the world food trade to begin with and they can hardly increase their share of this trade.

In the model simulations, the volume of world agricultural trade grows in almost all product groups. Depending on the product, trade expands by 10 - 25%, and grows most strongly for beef and sugar. The most important factor increasing trade is the abolition of import protection. Lower export subsidies decrease world trade. A prominent factor here is the lower subsidised exports from the EU, which are not fully compensated by the supply from other regions. Lower input subsidies have a less pronounced trade-reducing impact, and for several products may actually increase trade.

The study analyses the regional distribution of changes in foreign trade by commodity and in particular for four commodities: beef, sugar, feed grains and dairy products. For all these products, the EU is the region whose share of the world trade shrinks, but more typically, a number of regions profit from the EU's lost market areas. Most of the growing trade in beef goes to the USA, Australia -New Zealand and Mercosur regions. Fewer regions increase their markets for sugar. Sugar exports increase mostly in the middle-income and developing countries and in the Mercosur region. For feed grains, the incidence of change in exports is if anything, even more restricted than for sugar. In the model simulations the USA makes up for the falling exports from the EU, but exports from developing to middle-income countries also increase. The changes in the exports of dairy products are not as concentrated as for feed grains. The Australia – New Zealand region is clearly the main beneficiary, unequivocally gaining market areas lost by the EU.

As a result of the liberalisation of agricultural trade, production, apart from oilseeds and other crops, declines in the EU in all agricultural sectors. The most pronounced production decline is in sugar, beef and feed grains. Production of oilseeds and other crops increases because resources are released from declining agricultural sectors. From the point of view of EU agriculture as a whole, oilseeds are of minor importance. On the other hand, other crops account for around 40% of the value of agricultural production. Increased production in this sector is highly significant for EU's agricultural production, which declines on average by close to two per cent, even though production in the individual sectors declines by almost a fifth.

The study's model simulations are designed to be comparative-static. It is natural to interpret the results as deviations from the economy's trend path. At the end of the study the simulation results are compared to the scenario of the outlook for EU's agricultural production in produced by FAPRI. The study assumes that the WTO reform will be implemented over a six-year period starting from 2006 and

concluding to 2011. Compared to the production levels projected by FAPRI, beef production declines the most compared to production in 2001, which will be 11 per cent lower than in 2001. Sugar production would also be around 10 per cent lower than the reference year level. Feed grain production would be at almost the same level as in 2001 and milk production around six per cent below current production.

Appendix to Chapter 3

A 3.1a: Regional aggregation in the study

Abbreviation	Description				
AUZ	Australia and New Zealand				
USA	United States				
CAN	Canada				
MCR	Mercosur countries				
MED	Mediterranean countries				
MDC	Middle-income countries				
LDC	Developing countries				
EU15	European Union				
CEA	Central and eastern European				
FSU	countries CIS countries				
ROI	Other industrial countries				
'	GTAP aggregation key				
GTAP ab-	Name of region	Abbreviation of	GTAP ab-	Name of region	Abbreviation of
breviation	Australia	aggregated region	breviation	Finland	aggregated region
AUS	Australia	AUZ		Finiano	EUIS
	New Zealand	AUZ		France	EUIS
	Clilla			Gernany United Kingdom	EUIS
	Hong Kong	RUI	GBR		EUIS
JPN	Japan	RUI	GRU	Greece	EUIS
KUR	Korea	MDC		Ireland	EUIS
	I alwari	MDC		luxombourg	EUIS
	Malaveia			Luxembourg	EUIS
	Malaysia	MDC		Nethenands	EUIS
	Philippines	MDC		Portugai	EUIS
SGP	Singapore	RUI	ESP	Spain	EUIS
	Vietnem	MDC	SWE	Sweden	EUIS
	Vietilalli				ROI
BGD	Bangladesh			Rest of EFTA	RUI
	India Sri Lopko			Hungary	CEA
	SII Lalika Rest of South Asia		YCE	Rest of Central European	CEA
XOA	Rest of Could Asia	LDO	XOL	Assoc	OEA
CAN	Canada	CAN	XSU	Former Soviet Union	FSU
USA	United States	USA	TUR	Turkey	MED
MEX	Mexico	MDC	XME	Rest of Middle East	MED
XCM	Central America, Caribbean	MDC	MAR	Morocco	MED
COL	Colombia	MDC	XNF	Rest of North Africa	MED
PER	Peru	MDC	BWA	Botswana	LDC
VEN	Venezuela	MDC	XSC	Rest of SACU (Na- mibia,RSA)	LDC
XAP	Rest of Andean Pact	MDC	MWI	Malawi	LDC
ARG	Argentina	MCR	MOZ	Mozambique	LDC
BRA	Brazil	MCR	TZA	Tanzania	LDC
CHL	Chile	MCR	ZMB	Zambia	LDC
URY	Uruguay	MCR	ZWE	Zimbabwe	LDC
XSM	Rest of South America	MDC	XSF	Other Southern Africa	LDC
AUT	Austria	EU15	UGA	Uganda	LDC
BEL	Belgium	EU15	XSS	Rest of Sub-Saharan Africa	LDC
DNK	Denmark	EU15	XRW	Rest of World	LDC

Abbreviation	Description	Abbreviation	Description
Wheat	Wheat	BeefProd	Beef products
Feedgrns	Feed grains	OthMeat	Other meat
Oilseeds	Oilseeds	MilkProd	Milk products
OthCrops	Other crops	VOF_Prod	Vegetable oils and fats
SugarCB	Sugar cane, sugar beet	SugProd	Sugar products
Milk	Milk	ProcFood	Processed foods
Cattle	Cattle	MnfProd	Manufacturing production
OthAn	Other animals	Svces	Services
NatRes	Natural resources	I	

A3.1b: Commodity aggregation in the study

	GTAP aggregation key				
GTAP ab- breviation	Description	Abbreviation of aggregated commodity	GTAP ab- breviation	Description	Abbreviation of aggregated commodity
PDR	Paddy rice	ProcFood	LUM	Wood products	MnfProd
WHT	Wheat	Wheat	PPP	Paper products, publishing	MnfProd
GRO	Cereal grains nec	Feedgrns	P_C	Petroleum, coal products	MnfProd
V_F	Vegetables, fruit, nuts	OthCrops	CRP	Chemical, rubber, plastic prod	MnfProd
OSD	Oil seeds	Oilseeds	NMM	Mineral products nec	MnfProd
C_B	Sugar cane, sugar beet	SugarCB	I_S	Ferrous metals	MnfProd
PFB	Plant-based fibres	OthCrops	NFM	Metals nec	MnfProd
OCR	Crops nec	OthCrops	FMP	Metal products	MnfProd
CTL	Bovine cattle, sheep and goats	Cattle	MVH	Motor vehicles and parts	MnfProd
OAP	Animal products nec	OthAn	OTN	Transport equipment nec	MnfProd
RMK	Raw milk	Milk	ELE	Electronic equipment	MnfProd
WOL	Wool silk-worm cocoons	NtRes	OME	Machinery and equipment nec	MnfProd
FOR	Forestry	NtRes	OMF	Manufactures nec	MnfProd
FSH	Fishing	NtRes	ELY	Electricity	MnfProd
COL	Coal	NtRes	GDT	Gas manufacture, distribution	MnfProd
OIL	Oil	NtRes	WTR	Water	MnfProd
GAS	Gas	NtRes	CNS	Construction	MnfProd
OMN	Minerals nec	NtRes	TRD	Trade	Svces
CMT	Bovine cattle, sheep and goat	BeefProd	OTP	Transport nec	Svces
OMT	Meat products nec	OthMeat	WTP	Sea transport	Svces
VOL	Vegetable oils and fats	VOF_Prod	ATP	Air transport	Svces
MIL	Dairy products	MilkProd	CMN	Communication	Svces
PCR	Processed rice	ProcFood	OFI	Financial services nec	Svces
SGR	Sugar	SugProd	ISR	Insurance	Svces
OFD	Food products nec	ProcFood	OBS	Business services nec	Svces
B_T	Beverages and tobacco prod- ucts	ProcFood	ROS	Recreation and other services	Svces
TEX	Textiles	MnfProd	OSG	PubAdmin/Defence/Health/Educat	Svces
WAP	Wearing apparel	MnfProd	DWE	Dwellings	Svces
LEA	Leather products	MnfProd			

	$\sigma_{D/2}$	$\sigma_{\scriptscriptstyle D}$	$2 imes \sigma_{\scriptscriptstyle D}$	$\sigma_{_M/_2}$	$\sigma_{\scriptscriptstyle M}$	$2 \times \sigma_{M}$
Wheat	4.4	8.8	17.6	8.8	17.6	35.2
Feed grains	4.4	8.8	17.6	8.8	17.6	35.2
Oilseeds	4.4	8.8	17.6	8.8	17.6	35.2
Other crops	4.4	8.8	17.6	8.8	17.6	35.2
Beef	4.4	8.8	17.6	8.8	17.6	35.2
Other meat	4.4	8.8	17.6	8.8	17.6	35.2
Dairy products	2.2	4.4	8.8	4.4	8.8	17.6
Sugar	4.4	8.8	17.6	8.8	17.6	35.2

A3.2: Armington parameters used in foreign trade systematic sensitivity analysis

A3.3: Absolute change and percentual distribution of change by regional exports

A3.3a Beef Exports

					% s	share of r	egion of to	tal char	ige in e	xports		
Region of origin	Australia and New Zealand	United States	Can- ada	Mer- cosur coun- tries	Mediter- ranean coun- tries	Middle- income coun- tries	Develop- ing coun- tries	Euro- pean Union	CEE coun- tries	CIS coun- tries	Other industrial countries	Total abso- lute change Mill. 1997 US\$
Australia and New Zealand	0.0	-9.7	-2.2	0.0	-0.2	6.3	-12.5	92.1	0.4	0.9	25.0	1561
United States	0.0	0.0	1.2	0.7	19.9	15.3	-0.9	22.7	0.7	2.4	37.9	2566
Canada	0.1	12.8	0.0	0.3	0.4	12.0	-2.5	54.7	1.0	0.8	20.6	499
Mercosur countries Mediterra-	0.0	-0.1	0.0	7.2	1.3	0.3	3.3	82.9	0.2	0.2	4.6	2185
nean coun- tries Middle-	0.3	1.3	0.2	0.0	14.9	1.7	13.3	53.6	0.5	0.6	13.5	40
income countries	0.3	6.9	0.2	7.9	2.3	2.5	10.3	59.4	0.5	0.6	9.2	307
Developing countries	0.0	0.1	0.0	0.0	2.9	3.8	6.2	78.1	0.2	4.9	3.7	719
European Union	0.3	2.8	0.4	0.9	33.8	2.2	9.2	0.0	5.3	35.1	10.0	-1726
CEE countries	-0.1	-0.2	0.0	0.0	-0.9	-0.3	3.5	93.4	5.1	-3.5	3.0	-340
CIS countries	0.0	-0.1	0.0	0.0	0.8	0.2	0.4	7.5	4.0	86.3	1.0	222
trial coun-	1.3	11.9	1.1	2.4	4.4	18.8	29.7	15.5	3.5	-4.1	15.6	52

A3.3b: Sugar exports

					% s	share of r	egion of to	tal char	ige in e	xports		
Region of origin	Australia and New Zealand	United States	Can- ada	Mer- cosur coun- tries	Mediter- ranean coun- tries	Middle- income coun- tries	Develop- ing coun- tries	Euro- pean Union	CEE coun- tries	CIS coun- tries	Other industrial countries	Total abso- lute change Mill.1997 US\$
Australia and New Zealand	4.4	80.6	-57.6	0.0	27.1	-165.2	86.2	12.5	12.7	-1.6	101.0	23
United States	1.2	0.0	8.6	0.9	15.2	16.1	2.0	45.5	0.4	1.2	8.8	28
Canada	1.0	71.0	0.0	0.0	0.0	2.6	-0.1	18.4	0.0	0.0	7.0	46
Mercosur countries	0.0	7.6	0.1	3.1	54.9	1.5	23.4	3.5	3.1	3.1	-0.2	620
Mediterranean countries	0.9	9.2	0.4	-0.1	25.6	0.0	8.6	58.9	1.8	0.6	-5.8	25
Middle-income countries	0.0	21.6	0.7	1.4	10.6	7.8	15.0	23.6	1.6	5.8	11.8	1733
Developing countries	0.0	5.1	0.1	0.1	4.8	0.2	15.1	68.7	0.7	0.8	4.4	1017
European Union	0.1	0.6	0.1	0.1	55.1	1.2	21.3	0.0	3.1	9.0	9.5	-2425
CEE countries	0.0	2.2	0.0	-0.1	27.4	0.0	2.2	33.2	16.3	18.7	0.2	147
CIS countries	0.0	1.1	0.0	0.0	6.7	-3.1	-0.6	17.1	49.8	29.4	-0.4	38
Other industrial countries	0.2	0.8	0.2	0.1	63.9	4.2	23.6	7.2	0.1	0.8	-1.0	51

A3.3c: Feed grain exports

					% s	share of r	egion of to	tal char	nge in e	xports		
Region of origin	Australia and New Zealand	United States	Can- ada	Mer- cosur coun- tries	Mediter- ranean coun- tries	Middle- income coun- tries	Develop- ing coun- tries	Euro- pean Union	CEE coun- tries	CIS coun- tries	Other industrial countries	Total absolute change Mill.1997 US\$
Australia and New Zealand	-0.1	-0.1	0.0	-0.4	-1.5	-7.0	119.7	-2.3	0.0	0.0	-8.2	45
United States	0.1	0.0	-2.1	2.2	73.1	115.9	10.0	-14.9	-1.6	0.1	-82.7	302
Canada	0.1	41.9	0.0	-2.1	29.7	-5.3	36.5	0.0	0.0	0.0	-0.9	178
Mercosur countries	0.0	6.1	0.1	-77.8	124.0	17.6	21.8	-11.3	-4.8	0.2	24.3	110
Mediterra- nean coun- tries	0.7	5.0	0.7	-0.6	88.9	-2.2	-1.1	11.8	0.1	0.7	-3.8	40
income	-2.1	-40.3	-3.0	-4.0	-5.7	281.2	-38.4	-65.2	-0.9	-2.3	-19.3	-16
Developing countries	0.0	0.1	0.0	-0.1	0.2	107.9	-7.5	-0.1	0.0	0.1	-0.5	1706
European Union	0.0	5.4	0.0	2.1	58.6	1.7	14.5	0.0	14.1	2.5	1.1	-1019
CEE coun- tries	0.1	4.1	0.1	0.1	67.4	-7.2	-33.1	2.9	-99.2	16.7	148.3	19
CIS coun- tries	0.4	0.4	0.0	0.0	87.1	-13.5	2.8	-2.9	-12.3	37.1	0.9	26
Other indus- trial coun- tries	0.6	5.1	0.6	0.1	27.5	-0.6	4.1	17.2	5.1	33.9	6.4	7

A3.3d: Dairy exports

					%	share of	region o	f total ch	ange in i	exports		
Region of origin	Austra- lia and New Zea- land	United States	Can- ada	Merco- sur coun- tries	Medi- terra- nean coun- tries	Middle- income coun- tries	Devel- oping coun- tries	Euro- pean Union	CEE coun- tries	CIS coun- tries	Other indus- trial coun- tries	Total abso- lute change Mill.1997 US\$
Australia and New Zealand	0.8	7.5	2.2	1.0	16.2	13.0	8.9	23.9	0.2	4.2	22.0	3204
United States	0.5	0.0	15.3	0.5	6.7	23.2	5.1	11.0	0.2	1.9	35.8	1180
Canada	0.3	21.4	0.0	-0.2	31.3	5.7	1.9	27.2	0.7	0.8	10.9	398
Mercosur countries	-0.1	-42.1	-6.3	281.0	-4.7	-85.7	-2.5	-28.3	-0.1	-12.7	1.6	-47
Mediterranean countries	0.2	5.6	1.2	-0.2	71.5	1.4	2.1	17.5	0.4	1.2	-1.1	207
Middle-income countries	0.6	13.2	2.9	-0.2	3.9	37.8	12.3	40.8	0.6	2.2	-14.1	178
Developing countries	0.3	10.7	1.3	-0.1	13.5	6.1	33.0	45.3	3.6	1.6	-15.2	119
European Union	0.9	7.9	1.5	3.1	28.8	16.4	14.6	0.0	2.7	14.4	9.9	-4943
CEE countries	-0.7	3.8	0.5	0.4	29.8	-3.2	-0.8	70.3	-2.4	6.0	-3.6	249
CIS countries	0.0	5.9	0.9	0.2	1.2	0.3	0.5	55.8	6.6	15.8	12.7	953
Other industrial countries	1.0	11.1	4.3	0.9	1.6	9.0	0.2	61.8	0.8	1.7	7.6	-902

4. Economic Transition in the Central and Eastern Europe

Since the break up of Soviet economic bloc, countries of Former Soviet Union and its East European associates headed towards market oriented societies. The centrally-planned resource allocation mechanisms, which were based on quantitative output targets, have been replaced by de-centralized market-based mechanisms where price system has the main role in determining resource allocation. This has entailed both liberalisation of internal and external market transactions.

This chapter is divided into two parts. In the first part we characterize transition as a systemic change. At the beginning we summarize the macroeconomic developments of the Central and Eastern European Economies (CEECs). We then outline the reforms that have taken place in CEECs. One of the surprises was the transitory recession that followed the introduction of reforms to set up market economy. The causes of this decline are discussed and empirical studies of the interaction of reform policies and output development reviewed.

Integration and trade re-orientation have greatly facilitated the transition process. Trade redirection has helped these countries to better exploit their comparative advantage. Opening up has also curtailed the market power of the large companies that used to dominate the market structure of former socialist countries. Trade redirection has been only one part of the Central European transition economies integration towards the west. All CEEC countries have signed a bilateral 'Europe Agreement' with the EU, which constitutes a comprehensive framework for economic and political integration. At the European Council meeting in Copenhagen 1993, a long term political strategy was agreed for the EU's enlargement with the associated Central and East European countries. Enlargement as a part of transition process is discussed in the second part of the chapter.

4.1 Systemic Change: Market Liberalization and its Consequences

The process of systemic transition from planned economies to market-based democracies has consisted of groups of sequentially introduced complementary policy measures in different areas of society. Fischer and Gelb (1991) have characterized these according to the length of time the reforms will take and the intensity required at the start of the transition process. They divide the domain of the reforms into four areas: Macro-stabilization, price and market reform, restructuring and privatization and redefinition of the role of state. Intensive measures are needed at an early phase of the process for macro-stabilization, price reform in goods and services production and external trade, as well as small-scale privatization. Areas which need longer-term preparations before intensive action can take place are labour markets, banking sector and large scale restructuring and privatization.

4.1.1 Macroeconomic Development Since Reforms

Table 4-1 presents some key indicators of macroeconomic development in the CEECs during the transition. At the beginning of the transition inflation peaked in double or even triple digits numbers in all of the CEECs. Inflation in Hungary and Poland peaked even before they introduced their stabilization and reform programs. In fact, Poland initiated its program in the midst of hyperinflation and prices were rising 640 percent annually. Since the peak years, the divided republics of Czech and Slovakia have succeeded in moderating their inflation, to a relatively low level. Inflation is also declining also in Hungary and Poland.

In the case of Romania and Bulgaria, inflation has remained high after the initial price shock. On average prices, have been growing at annual rate over 50 percent in 1990's. In Bulgaria, the high inflation seems to be moderating but is still close 50 percent in Romania; although this is lower than average of decades. The problem with Bulgaria and Romania has been the fiscal deficit, which has not been at sustainable level with given income and expenditure parameters in any plausible growth scenario (see Budina and Wijnbergen, 1997). The unsustainable fiscal stance can be seen as the primary source of the present monetary instability in these economies.

	Lowest level of production 1989=100 ^a	Average growth rate since recov- ery	Growth in 2000	Level of GDP in 2000 1989 = 100	Inflation peak ^b	Average inflation in 1991- 2000	Inflation at 1998
Bulgaria	63 (1997)	3.6	5.0	70	1082 (1997)	55	9.9
Czech Re- public.	86 (1992)	1.5	3.1	95	57 (1991)	10	3.9
Hungary	82(1993)	3.5	5.2	105	35 (1990)	19	9.8
Poland	82 (1991)	4.8	4.1	126	640 (1989)	22	10.1
Romania	75 (1992)	0.3	1.6	77	256 (1993)	88	45.7
Slovak Re- public	75 (1993)	4.5	2.2	102	61 (1991)	12	12
Slovenia	82(1992)	4.3	4.7	114	207(1992)	20	8.9

Table 4-1: Macroeconomic development of the CEECs in Transition

^a Number in parenthesis indicates the year of lowest production.

^bNumber in the parenthesis indicates the year of highest inflation.

Source: EBRD (2001).

Looking at the reported figures, the initial collapse in output was particularly severe. Output declines have been in a range of 18 percent in Poland to 37 percent in Bulgaria. These magnitudes are of similar size as the consequences of Great Depression to European countries in the 1930's or the civil war in Spain²⁵. If the previous systems were inefficient in allocating the resources, what are the reasons for so large an output loss during the transition? There seems to be a broad consensus that the output decline in the beginning of transition was significant and real (Williamson, 1995) but the deepness of the recession has been questioned by various authors and for various reasons.

4.1.2 Market Reforms and Stabilization Programs

All the Central East European countries liberalized their commodity and services markets at the beginning of the 1990's and introduced macroeconomic stabilization plans concurrently. The first country to implement such a program was Poland, which introduced a comprehensive stabilization and market reform program, the so-called Balcerowicz plan, in January 1990. Poland was followed by all main CEECs within approximately a year. The main characteristics of these reforms have been outlined in table 4-2. These can be summed it up in the following elements:

- 1. Instantaneous liberalization of almost all prices concurrently with substantial reductions in state subsidies.
- 2. Balanced state budget accompanied by restrictive monetary policy aimed at restoring positive real interest rates.
- 3. Wage policy: money wages were set on the expected monthly rate of inflation and taxes were levied on wage increases above the guideline for state enterprises.
- 4. Currency convertibility for residents and current account transactions followed by substantial devaluations.
- 5. Trade liberalization with tariff reductions and introduction of fairly uniform tariff structure, elimination of export quotas and automatic authorization for international trade to all registered firms, whether state or private owned.
- 6. Implementation of further institutional reforms including the development of banking and credit institutions, competition legislation and privatization accompanied by capacity restructuring in medium term.

Although the programs adopted in the individual countries resemble each others there are also differences in the individual programs. Bulgaria and Romania adopted a more gradual approach to price liberalization, while Hungary had partly liberalized its pricing system before reform and stabilization. The choice of exchange regimes differed. Poland and Czechoslovakia adopted fixed exchange rate systems, while Bulgaria and Romania, which lacked exchange reserves, chose floating inter-bank systems to determine the initially depreciated exchange rates (Bruno, 1994). The size of initial devaluations varied also considerably. The

²⁵ For comparisons see Boone et al. (1997)

realignment was the largest by far in Poland, large in Romania, sizable in Czechoslovakia and Bulgaria but not large compared to Poland and Romania and moderate in Hungary.

	Czechoslovakia	Hungary	Poland	Bulgaria	Romania
Start	1.1.1991	20.2.1991	1.1.1990	15.3.1991	1.9.1990
Price liberalization	Instant 85 %	62-90 %	Instant 90 %	Gradual	3-stages
Subsidy reduction 89/91	16.1-4.6 % of GDP	13.0-7.0 % of GDP	17.4-4.0 % of GDP	16.7-3.0 % of GDP	Partial
Fiscal squeeze	Yes	Yes	Yes	Limited	No
Monetary restraint	Yes	Yes	Yes	Limited	No
Exchange rate system	October 1990 35 % devaluation 15 % devaluation in December 1990, the fixed	15 % devalua- tion in January, then managed	Initial sizable devaluations, then fixed	Floating Inter- bank	Floating Inter- bank
Foreign trade liber- alization	Extensive	Extensive	Extensive	Limited	Limited
Wage policy	Tax based in- comes policies	Tax based incomes poli- cies	Tax based in- comes policies	Real wage cut by 35 % imple- mented by ceilings in wage bills	Tax based incomes poli- cies
Interest rates	Increase before program and flexible thereafter	With abolition of interest rate ceilings will be market based	Establish posi- tive real interest rates	Very large increase before program; flexi- ble thereafter	Complete liberalization
Small-scale privatiza- tion	Yes	Yes	Yes	Yes	Yes
Sale of state enterprises	Slow	Some	Some	Slow	Mostly land
Property destitution	Yes	Yes	Yes	Yes	Yes
Mass privatization	Delayed	Delayed	Delayed	Delayed	Delayed

Table 4-2: Stabilization and reform programs in Central-Eastern Europe

Sources: Bruno (1994), Gros and Steinherr (1995), Kemal and Condon (1994).

Market liberalization

In the socialist economies, the allocation of resources was coordinated by a central plan, which was based on quantitative output targets specified in physical units. Macroeconomic balance was a consequence of direct control by central authorities. The financing of enterprises was set through a credit plan, which also included investment targets, and was implemented through the mono-bank sector (de Melo, Denizer and Gelb, 1996). The major source of government income was enterprise profits taxes (see Bruno, 1994), which were used in transfers and direct expenditures that consisted of 46 to 56 percent of GDP. Under administered prices, wage control formed the key instrument to for keeping supply and demand in balance.

In the central planning system, prices played only an accounting role and these were set by the central authorities. Prices did not necessarily reflect cost of production or scarcity of factors. According to Hughes and Hare (1992), who have used quality adjusted international prices to evaluate the competitiveness of industries in transition economies, the value-added measured at international prices was negative in 10 to 50 percent of industrial activities depending on the country in question²⁶.

Initially, when the reforms were introduced, prices were completely determined by administrative process except in Hungary and to some extent in Romania. State ownership dominated the organization of production with some private activity in Hungary and Poland where a large part of agriculture was carried out by small-scale private farms.

Market liberalization in transition economies has entailed both internal and external liberalization of transactions. Internal liberalization has denoted the deregulation of the price system and replacement of government central plan by markets as the coordinating mechanism of resource allocation. It has also facilitated private sector entry in economic activities, and the privatization of the state owned production. One instrument in the reform programs was the elimination of the subsidies to producers, which served the aim of reducing distortions in the economy along with the stabilizing of fiscal balances.

External liberalization has consisted of the removal of quantitative restrictions and administrative controls in foreign trade. Significant tariff barriers have been eliminated and uniform and flat tariff structures have been taken in use. Adoptions of norms of conduct in international trade that are accepted by WTO, and current account convertibility with transparent foreign exchange regime have taken place.

The market structure that prevailed at the start of the reforms created an additional element to the initial price response to liberalization. The production of industry had been traditionally organized into large units²⁷. The potential market power of state-owned companies gave firms the possibility to pass through the cost effects of subsidy cuts if firms were allowed to behave monopolistically. In

²⁶ One of the main reasons for this was the cheap energy supply from the Soviet Union. The energy intensity of production at the beginning of the transition was twice as high as in comparable middle income countries (World Bank, 1996 p. 2).

²⁷ The average size measured by employees per firm was in Czechoslovakia 16 times, in Poland 3.5 times and in Hungary 2 times higher than in Germany in 1989. This pattern is uniformly true for individual sectors. These figures have come down considerably after the first years of transition (see Fingleton et. al. , 1996)

this respect foreign trade reform was essential in introducing external competition to eliminate the potential of a few domestic firms exercising market power. Liberalization in this respect was most comprehensive at the initial stage of the reform in Hungary, Poland and Czechoslovakia and substantially more limited in Bulgaria and Romania.

Price stabilization

In the pre-transition period, the purchasing power exceeded the ability of the planned economies to supply consumer goods, which caused an involuntary accumulation of nominal assets. Together with the fact that prices of many essential goods were kept low, the transition economies introduced the systemic change in an environment of repressed inflation. The liberalization of prices induced an initial price hike.

Excessive cash balances of the public, i.e. monetary overhang, were a wellknown problem of price liberalization. When markets are left to balance supply and demand, the supply-constrained shortage disappears. Consumers are then able to spend their accumulated savings in a desired manner. When the amount of nominal assets is disproportionate to production possibilities, a general price level increase would balance nominal demand and supply. The reason for the excessive nominal assets in socialist countries was the mismatch between wages and the amount of available goods, so that the total of wages exceeded the supply of goods at the price level fixed by government (Gros and Steinherr, 1995, p. 157). In last years before transition, this phenomenon was aggravated because of lack of discipline and growing economic disorder. (see Gros and Steinherr, 1995 p. 126). The initial price shocks were substantially larger in all of the reforming countries than anticipated. Similarly, to stabilize inflation, this was the case a in terms of output decline (see Bruno, 1994).

Berg and Blanchard (1994) have studied econometrically the inflation process in Poland by a simple aggregate monopolistic wage and price setting model²⁸. It is one of the few econometric studies of the stabilization process in transition economies. Poland is an interesting case also because it started the stabilization and economic reform program before the break-up of CMEA²⁹. It is possible, at least partly, to separate the effects of stabilization from the consequences of trade collapse among trade partners in CMEA.

Berg and Blanchard note, that neither the increase in wages nor mark-ups were responsible for the initial price hikes. The main sources of the immediate price

²⁸ Blanchard (1987) has shown that depending on the sizes of parameters this type of model can be consistent with various stories at the background.

²⁹ The Council for Mutual Economic Assistance (CMEA) was the organization that co-ordinated trade relations within the socialist trade block. As a governing institution of bilateral trade relations it ceased to exist in January 1991.

rise were the growth in non-labour costs and reduction in the labour productivity. Thereafter, the process was driven by two factors, namely relative increases of consumer prices versus producer prices and decline in the mark-ups.

Consumer price development was mainly affected by increases in electricity, gas and housing prices, as well as the widening of retail price margins. The prices of household essentials were kept at low nominal level and increased when government subsidies were cut. The removal of rationing brought prices closer in line with their economic costs³⁰. Changes in the retailing sector were caused by the fact that in the former system the distribution network for consumer commodities had been a neglected and underdeveloped. Also, the previous administrative pricing system did not take into account the true costs of distributing commodities³¹.

Berg and Blanchard see two reasons for the decline in mark-ups. The first one is increased foreign competition, which limited the possibilities of domestic firms to exert monopoly power. But as the dominant reason for reductions in mark-ups the authors, however, consider the wage increases. In the stabilization program tax-based incomes policies were introduced to restrain wage development. Initially the taxation covered all the firms, but private sector was excluded from 1991 on. At the beginning of the program, wages were partially indexed to inflation with a coefficient of 0.3. High marginal taxes were imposed to enterprises on wage increases exceeding the norm. Originally wages did stay below the norm, reflecting uncertainty about the consequences of stabilization to profitability. At a later phase, this shortfall could be compensated by wage increases above the norm. Because the original wage norm was defined in terms of wage bill, the reduction in employment gave additional leeway for unit wage increases. Thus, the catching-up in wages characterized the persisting inflation.

Fiscal policies

The role of fiscal policy in the transition process has not only entailed control of budget deficits but also reduction of the role of state in the economy. As figure 4.1 demonstrates, the share of income intermediated by the state was significantly larger than typically in market economies. Over time the relative size of government declined in Czech and Slovak Republics, Bulgaria, and Romania but not in Hungary and Poland. Reforms have been associated with worsening fiscal balances, but there seems to be very weak correlation between output behaviour

³⁰ In Poland 80 percent price increase was needed for heat gas and electricity to roughly cover their economic costs. This would cost for, the average household, 8 percent of their budget. A similar situation was estimated in other transition economies (see World Bank, 1996 ch. 2).

³¹ At the beginning of the transition a major expansion in private sector activities took place in sectors neglected in the socialist area, namely services and trade (see World Bank, 1996 ch. 2). For example in Poland at the end of 1991, 75 percent of trade was in hands of private sector compared to 10 percent in 1989 (Berg and Blanchard, 1994).

and budget balance (Coricelli 1998 and Pirttilä, 2000). Other structural factors seem to explain this phenomenon.



Figure 4-1: Governmet expediture in CEECs in 1989 and 1999

In the pre-transition era, countries did not need market economy type tax-systems to raise public revenue because the government could simply appropriate the funds for its own needs. There was no budget office, budget law, or treasury in these economies. In the pre-transition era tax revenue was collected mainly from three - firm-related - sources: turnover tax, profit taxes and payroll taxes. Also many activities, typically associated with the public sector in market economies, were carried out by state-owned enterprises providing for their workers housing, schooling, vocational training, medical care and pensions (Tanzi and Tsibouris, 2000). In this system the collection of taxes was a simple task. Central authorities had knowledge of the quantities produced, which reflected the central plan. Firms had only one bank account in mono-bank system and production was concentrated on few production units. Taxes were not collected on basis of detailed and codified tax laws that defined tax bases and taxed them with parametric rates. Taxes especially for enterprises were largely collected on the basis of negotiations between firms and government officials. The government was free to change the tax-rates and often did so (Tanzi, 1994). On the other hand, tax liabilities tended to be flexible, rather than well-defined and rigid, obligations.

Systemic transition destroyed the old informational and functional basis of tax system. An immediate institutional task in this respect was the establishment of a

modern budgetary system with tax administration and regulatory body to link the different budgetary appropriations to anticipated government revenues. The new system, in order to be capable of working in a changed environment, required new tax laws and previously non-existent institutions to collect taxes. This had to be created from scratch. Reforming the fiscal system required not only setting up the administration but also implementing a tax system, which would treat different agents in a neutral way and establish a stable tax base³².

Well-functioning administrative procedures were needed to avoid tax evasion in growing private sector and diminishing government control over public-owned enterprises. The problem of premature fiscal institutions was at least partially reflected in the fact that fiscal deficits were larger than anticipated in all of the reform programs (see Bruno, 1994).

Firm-related transfers diminished sharply during the early phase of transition (see Table 1-2). Similarly the importance of profit taxes declined (IMF, 1994). Coricelli (1998) has noted that in Hungary the revenue structure was similar to that in Western Europe already before transition and converging even further afterwards. VAT was introduced in Hungary as early as in 1988 in conjunction with personal income tax. VAT was introduced in Bulgaria, Czech and Slovak Republics and Poland in 1993. The anticipated problem concern from the heavy reliance on revenues from state enterprises was rapidly overcome.

The increased budget deficits seem to be related to additional social security expenditures in the fast reforming countries, whereas it deficits in slowly reforming countries were related to eroding tax base. The evidence seems to indicate that main pressure within social expenditures arose from pensions and other social payments rather than unemployment benefits. An important factor in the increase in pensions has been the rise in the number of pensioners due to labour shedding that took the form of early retirement (Coricelli 1998, ch. 5). Transfers to the unemployed who had exhausted their entitlements largely accounted for the growth in for social benefit expenditures.

4.1.3 Output Decline

As already noted, a decline in the output followed the introduction of economic and political reforms in Eastern Europe and former Soviet Union. Several authors (Berg, 1995, Rose, 1995 and Earle, 1995 among others) have questioned the severity of the transitional recession. There are both conceptual and measurement issues behind the scepticism whether the reported figures of GDP decline accurately reflect the severity of the economic slump that has followed the transition

³² The problem of evading tax-base as a source of unsustainable fiscal stance in the case of Romania is well documented in Budina and Wijnbergen (1997). General discussions on the importance of fiscal reform see Gros and Steinherr (1995) and references therein.

process. Although the depth of the transitional recession can be debatable, the fact that the transition process initially triggered an output decline is self evident. In this section we first discuss measurement issues and then look for some potential explanations for the evident decline.

Measuring the output decline

The conventional reference year in most of the statistics on macro-economic transition is the year 1989. The initial year has had to be constructed from data on system of Net Material Product (NMP) that was inherited from the socialist accounting practices. One problem in this respect is that NMP excludes in its definition most of the services, which constitute a significant portion of value added included in GDP. The availability and quality of data, thus, sets limits on the reliability of the constructed GDP for the reference year.

Earle (1995) has questioned the capacity of the statistical authorities in recording the growing activity that emerged in the private sector. He gives several reasons for this. Statistical offices of the former socialist economies that were accustomed to the material product system (MPS) accounting practises had to change, with few resources to new very different system of national accounts (SNA). This happened during a period of structural change when the relative importance of services was increased at the expense of agriculture and industrial production. Economic activity was expanding disproportionately as small-scale private firms, while operations in large-scale state-owned enterprises and producer cooperatives were contracting. The decline hit those activities that the statistical authorities were accustomed to monitor and the growth of activities with thousands of new legal entities was contracted in sectors that had been deemphasized, ignored or absent in the old accounting practices.

Besides the institutional capacity of recording accurately the magnitudes of entries and exits of firms there are at least two conceptual issues concerned in measuring the change in real GDP. The first is related to the entry and exit of firms. This reflects the emergence of new previously non-existing goods and disappearance of earlier goods without sufficient demand to make their production profitable. This can cause measurement problems if the introduction of new products involves large improvements in the quality of commodities. Importance of the quality issue is demonstrated by Baily and Gordon (1988) who show that large part of the 'observed' productivity slowdown would be eliminated when improvements in computer technology were taken into account.

Dis-organization as a supply shock

Together with the initial macroeconomic imbalances and distorted relative prices, the sudden disruption of the planning system as a coordinating mechanism exacerbated the initial liberalization shock. Coricelli (1998) has characterized the

functioning of the planning system similar to a vertically integrated sector. Monetary exchange and inter-firm credit contracts were irrelevant for the operation of the system. After reforms were instituted, inter-firm exchanges took to take place through monetary transfers. In a developed industrial structure, firms are typically both suppliers of some firms and customers for others. The higher the degree of circularity of the system the more exposed it is to local shocks.

Old delivery and credit institutions were discarded before new institutions were firmly established. The absent transactions and distribution institutions were the cause for the coordination failure that resulted in limited information about the delivery sources of delivery and uncertainty about material availability. The initial shock of the resulting dis-organization has been emphasized e.g. by Blanchard (1997). The higher the degree of central intervention to the production processes the larger the supply-shock. In those cases where decentralization preceded liberalization reforms, as in Hungary and Poland, supply bottlenecks seem to have played a minor role. This view implies joint decline in productivity and output (Blanchard, 1997).

The growing lack of coordination can be thought of as a negative supply shock with increasing transaction costs, which are related to both internal and external market transactions and should have been higher in countries with higher specialization. This is particularly true for the former Soviet states, which the intraunion trade comprised typically over 80 per cent of the total and a much higher share of GDP than in Central Europe (Kaminski et. al., 1994). As a consequence, the discontinuation of previous trade links did drive some of the former Soviet states almost to autarky.

Demand shift

In central plans of the socialist era, priority in production was given to heavy industry over consumption goods. On the other hand, prices of many essential consumer goods, like housing, utilities and food products were kept at a low level. Berg (1995) has characterized the transition process as a resource shift from 'surplus' sector to 'shortage good' sector. Initially central authority controlled the relative size of the output between sectors by allocation of factors of production. Unless this distribution paralleled market allocation, the output of one of the sectors at given prices was in short supply. Under these conditions, if there is no saving, the income left over after the purchase of scarce good will be spent on the other commodity. Berg calls this forced substitution.

Price liberalization in this kind of environment would lead to relative increase in effective demand in the sector in short-supply and decline in the demand in the surplus sector without any change in the input costs or subsidies. The subsequent decline in the surplus sector is likely to be larger than the expansion in shortage sector if there are rigidities in allocation of factors. This causes a transitory out-

put decline. If factor allocation had been smooth and immediate, no output fall would have occurred. In this respect Berg points out that with full utilization of given resources, the measured output change using initial and distorted prices would have been zero, even though the new resource allocation reflects market demand and is a welfare improvement relative to the initial situation.

In addition to a relative shift in consumer demand, Berg emphasizes two other demand components that were of importance in the output decline. These are the changes in inventory investments and the collapse in the CMEA regime that initially generated the fall in export demand. In the beginning of the transition, inventory investments declined dramatically. Berg claims that in Poland in 1990 the reduction in inventories was the main source of output decline and that in 1991 still accounted for one-third of the output decline when the CMEA trade shock was felt. Berg gives several reasons for this phenomenon. In Soviet-style economies, firms were eager to accumulate as much inventories as possible. In these economies the principle obstacle to increased production was pervasive shortage of inputs. This encouraged hoarding when interest rates were low or negative.

Trade re-orientation and terms of trade shock

Rosati (1995) has estimated the impact of the demise of CMEA on output decline, where the collapse of Soviet trade was the dominant factor for all Central European countries. Rosati estimates that the trade collapse was the sole cause of the output decline in Bulgaria in 1991. For the rest of the Central European countries, the trade collapse was not as important but still contributed about half of the fall of GDP in Czechoslovakia, Hungary and Poland. It had no importance for the decline in Romania, because the country had very loose trade contacts with the former Soviet Union. The trade collapse turned out to be partly transitory in nature, since in very short time it was compensated by trade with Western Europe, particularly with European Union. This seems to be only a part of the story. The shift to world market prices in Soviet trade seems to have caused a permanent deterioration in the terms of trade for the CEEC–countries.

The energy intensity of production, at the beginning of the transition, was twice as high as in comparable middle income countries (World Bank, 1996 p. 2) reflecting the cheap energy supply from the Soviet Union. It has been estimated that Russia's support to Central East European countries in terms of subsidised energy prices was \$ 18 billion and the terms of trade losses after trade liberalisation for CEEC's were about 10 percent of their GDP (World Bank, 1996 p. 27).

The role of reforms in output decline

One of the most recent attempts to econometrically isolate the factors behind the U-shaped profile of output during the transition process is that of Berg et al.

(1999), Havrylysyn et al. (1998), de Melo et al. (2001). According to their conclusions, the main force behind initial output decline were adverse initial conditions, particularly trade dependency and over-industrialization. The main force behind recovery has overwhelmingly been the structural reforms³³. Macroeconomic stabilization has helped, but its quantitative impact appears to have been small.

The role of initial conditions in explaining the cross-sectional variation in output growth appears to be small in Berg et al. (1999) study. The difference in performance between the CEECs and FSU countries is explained mostly by differences in structural reforms. Unlike, Havrylysyn et al. (1998) or de Melo et al. (2001), Berg et al. did not find the 'J-curve' -effect of structural reforms, which indicates initial costs but longer-run benefits. On the contrary, they find that countries, which have liberalized their economies not only grow faster, but that choosing a faster path has provided an additional growth impulse.

Although all of the studies use the same data for the initial conditions, their approaches are not compatible in a sense that one could say whether one model outperforms the other. In their study Berg with his colleagues, focuses to identify those aspects of the liberalization, which have been the most influential for post-transition growth. They use the initial conditions to explain the growth performance but they do not analyze the impact of these on policies i.e. the determination of liberalization. On the other hand, both Havrylysyn et al. (1998) and de Melo et al. (2001) use simple averages of the various sub-indexes of progress in transition. In both of these studies initial conditions have been factorized into two broad groups³⁴. The difference between these two studies is the one by de Melo et al (2001) estimates liberalization, growth, and macro imbalances - measured by inflation - as a system of equations while Havrylysyn et al. (1998) estimate only growth regression. Of these three studies, the one by de Melo et al (2001) and of Havrylysyn et al (1998) are fairly similar. In its methodology the study by de Melo et al. is more careful and ambitious.

³³ Structural reforms are measured in all of these studies by qualitative transition indicators produced by World Bank and EBRD. EBRD has developed summary indicators of the progress of transition that have been published since 1994. The main aspects on which the transition is monitored by these indicators are enterprises, markets and financial institutions. On the enterprise aspect, the elements that are taken into account in assessing the progress of reforms are small and large-scale enterprise privatization and corporate governance. In markets the monitored aspects are price liberalization, foreign trade and exchange system and competition policy. In financial institutions the progress is looked in banking reform and interest rate liberalization, and in securities markets and non-bank financial institutions. The score from 1 to 4+ is given in each of these aspects, where 1 indicates no progress, 2 indicates some progress, 3 indicates substantial progress, 4 indicates level close to standards in advanced industrial economies and matches 4+ standards and performance norms in advanced industrialized economies.

³⁴ The first group can be interpreted as the degree of macroeconomic distortions and unfamiliarity with market processes. This captures factors like repressed inflation, black market premium, trade dependency, and market memory. The second group characterizes socialist development and its associated distortions: GDP per capita, level of urbanization over-industrialization, prior economic growth and richness of natural resources. These are discussed in more detail in de Melo et al. (2001).

When the simultaneous determination of growth liberalisation and macroimbalances are taken into account de Melo et al. (2001) unlike Havrylysyn et al. (1998), do not find any association with growth and inflation. However there is a negative association between inflation and liberalization and positive association between inflation and initial conditions. These results are in line with those of Berg et al. (1999). One can say that inflation is symptomatic and reflects (un)ability to solve existing structural problems. Initial conditions have, however, had major impact on determining the degree of liberalisation in transition economies. Economies with larger macroeconomic distortions tended to liberalise more slowly and countries with higher incomes and a resource-poor production basis selected a faster track.

According to de Melo et al. (2001), liberalization included an initial cost so that in-depth liberalization is associated with output contraction. This is a temporary phenomenon, which is offset by positive cumulative effects from past liberalisation measures. Difficult initial conditions are associated with slow reforms, but the hypothesis that unfavourable conditions diminish the effectiveness of reforms is not supported. The regression result indicates that initial conditions do not reduce the effectiveness of reforms once they are implemented. This result parallels those reached by Berg et al. (1999). Both of these studies also agree on the fact that main factor to explain the divergence across countries in growth is economic liberalisation.

4.1.4 From Plan to Market: Structural Change and Progress in Transition

The transition of the former socialist economies has been the systemic change of societies from centrally planned economies towards market-oriented systems. In different countries, this has taken place in varying degrees. Some of the Central European countries and Baltic states of the former Soviet Union have substantial steps in organizing their economies according to the standards and performance that is typical for advanced industrial countries. Initial macro-economic imbalances and distorted resource allocation have conditioned the transition. Basically, countries, which have liberalized their economy fast, have adhered to fiscal discipline and consequently sound monetary policy, have succeeded to stabilize their macroeconomic environment (de Melo et. al., 1996, de Melo and Gelb, 1997 and Fisher, Sahay, Végh, 1997).

Even though the stabilization has been a precondition to post-transitional recovery, the recent evidence seems indicate that progress in the institutional reforms is the key factor in explaining the cross-country variation in growth. It appears that radical reforms have paid off although with delayed effects, and according to most studies, at the expense of an initial decline in output. In general, the output decline in the radical reformers has been less sharp and signs of recovery were evident sooner (de Melo and Gelb, 1997 and Fisher, Sahay, Végh, 1997).



Figure 4-2 Progress of Transition and Growth

A whole different issue is the extent to which the initial output contraction has affected the welfare of the citizens in these economies. Given the fact that central planner's priority was heavy industries; the liberalisation of markets has directed the production to consumer goods. Increased availability of consumer goods, together with increased quality and greater variety, has improved consumers' welfare, an event that has at least partly compensated the reduced income. In fact, some authors (e.g. Sachs, 1995) have argued that welfare has increased despite the output loss, at least in some of these countries for above mentioned reasons. One indication of this might be the increase in expected lifetime of one to two years over the period 1989-97 in five of the CEECs. Only in Bulgaria and Romania, which has experienced severe difficulties in transition, it has life expectancy declined (EBRD, 1999 p. 14).

Figure 4-2 presents correlation between structural reforms, as measured by transition score and cumulative growth since 1991. The transition score is calculated as a simple average of transition indicators produced at the European Bank for Reconstruction and Development (EBRD, 1999). Countries with an overall score of substantial progress in transition have succeeded in achieving their 1991 level of output, except, for the Baltic States. Poland is about 50 % over that level and the next, in order of success are Slovenia and Slovak Republic. The countries performing under the expectations are Hungary and Czech Republic. The expectation of growth performance in the figure is plotted as a polynomial regression of cumulative growth on transition score. This regression explains 40 % of the cross-country variation of the growth performance of transition economies.

Figure 4-2 suggests that countries at an advanced stage of structural reforms have been able to recover from the transitional recession and to hook up to the growth path, whereas countries adopting modest steps in transition have, in fact, experienced some negative impact on output performance. Together with these structural changes, these economies have transformed their economic structure, as can be seen in the figures in table 4.3. This table compares the relative shares of agriculture, industry and services as well as exports relative to GDP in 1991 and 1998.

As was discussed earlier in this chapter, there was a strong priority to industrial production in former socialist economies. Moreover the emphasis was on heavy industry, and the production of consumer goods had secondary role. Also consumer related services like retail trade, hotels and restaurant services were neglected. The resource allocation during the transition process has been characterized by flow of resources towards services while agriculture and industries have been declining branches of economic activity. The relative share of services is from 3.7 to 13.2 percentage points larger in 1998 than in 1991. The change has been the smallest in Hungary and Bulgaria, because in Hungary the share of services was already at a rather high level in 1991. In fact, in three of the eight countries, services still in 1998 have a lower share of GDP than Hungary in 1991.

The share of services as of 1998 has remained below 60 percent in Bulgaria, Czech Republic and Romania. The lower-than-average share of services in Bulgaria and Romania can be explained by their living standards; on per capita basis they are the poorest countries of the region. Since the demand for services grows more than proportionally to income growth, the lower than average share can be explained by the level of development of these economies. In this respect, the relatively low share of services in Czech Republic is somewhat surprising, since it is, after Slovenia, the second richest nation in the region in terms of per capita income. This is probably a reflection of the structural adjustment problems in Czech Republic that have recently been mirrored as weak growth performance. On the other hand, the share of services in Czech Republic corresponds, on average, to upper middle-income countries (World Bank, 1999). A service sector share of approximately two-third of the GDP, like in Hungary, is more typical for high income industrialized countries.

	Agricul- ture ^a		Industry ^a		Services ^a		Exports ^a	
	1991	1998	1991	1998	1991	1998	1991	1998
Bulgaria	14.3	18.7	37.4	25.5	48.3	55.8	36.5	39.3
Czech Rep. ¹	6	5	40.2	36.6	53.8	58.4	37.8	46.8
Hungary	7.8	5.8	26.7	25	65.5	69.2	28.0	43.3
Poland	6.8	5.7	40.2	28.1	53	66.2	16.4	20.1
Romania	18.9	16	37.9	31.7	43.2	52.3	12.2	21.8
Slovak Rep. ¹	6.2	4.4	37.9	26.7	55.9	68.9	45.6	52.1
Slovenia	5.2	3.8	36	27.5	58.8	68.7	30.5	46.5

Table 4-3: Structural Change in CEECs

Source: EBRD, Transition Report 1999.

¹Export shares are for year 1993.

During the transition the CEEC–countries have become significantly more open than they were at the beginning of the systemic change, although they were not especially closed before transition. Poland and Romania are countries where exports have the least importance; their export shares are comparable to the world average that is 20 percent (McDougall et al., 1998). Exports as a component of GDP in these countries are of the same magnitude of importance as in Germany. Openness measured by export share in Czech Republic, Hungary and Slovak Republic, is similar to that of Taiwan, which ranks the highest export share (47 %) of new industrialized economies of South-East Asia. Export shares above 40 percent are higher than for example in South Korea. Thus, these economies are more open in terms of exports share than the EU on average in where in 1995 exports accounted for 28 % of GDP (McDougall et al., 1998).

4.2 Trade and Integration: Enlargement as a Part of Transition Process

The European Union has concluded membership negotiations with 10 candidates who will become new members of the community at the beginning of May in 2004. Enlargement has been conducted at an Intergovernmental Conference (IGC) at Nice, where the current EU Member States agreed to reform the Community's institutions so as to make enlargement possible. Conclusion of the IGC provided a roadmap for the timetable and enlargement process.

At present relations between the EU and the applicant countries are based on bilateral 'Europe Agreements', which set out the framework for the political and economic integration of the CEE countries with the EU.

At the Copenhagen European Council in June 1993 a decision was reached on the long-term political strategy for European Union enlargement under which the associated countries of Central and Eastern Europe could apply for EU membership. At the same time the general criteria for accession of the associated countries were adopted. Known as the Copenhagen criteria, these stipulate that applicant countries must have:

- 1) stable social institutions to guarantee democracy, the rule of law, human rights and respect for minorities and their status;
- 2) a functioning market economy and the ability to cope with the pressures of competition and market forces in the Union, and
- 3) the ability to assume the responsibilities of membership, including the creation of a political union and the objectives of Economic and Monetary Union.

Poland and Hungary were the first to submit their applications for membership in 1994 and the other transition countries of Central and Eastern Europe soon followed suit. In June 1997 the Commission submitted its Agenda 2000 communication, drawing up a detailed plan of action for strengthening and enlarging the Union and the financial framework for 2000-2006. Agenda 2000 also contains the first assessments of the candidate countries' suitability for membership based on the Copenhagen criteria.

In December 1997 the EU began negotiations with the countries subsequently known as the Luxembourg group – Estonia, Poland, Hungary, the Czech Republic, Slovenia and Cyprus. At the Helsinki summit in 1999 it was decided to begin negotiations with Latvia, Lithuania, Slovakia, Romania, Bulgaria and Malta – the so-called Helsinki group. Potential membership has also been promised to the countries of the western Balkans, with which the initial intention is to conclude Stability and Association Agreements.

4.2.1 The Liberalization of Trade

The reorientation of trade has been an important factor in the transition process. First of all, it has facilitated these countries in exploiting their comparative advantage and reallocating their resources. Second, the opening up of domestic markets has increased import competition, thus reducing the market power of the large domestic companies that have dominated the market structure in the former socialist countries (Fingleton et al., 1995).

Since the break up of CMEA there has been a fast redirection of trade among Central East European countries. The main re-orientation has been in the markets of the European Union, and in a few years time since the beginning of the transition, EU's share on exports from these countries has almost doubled. Brenton and Gros (1997) have estimated that in the early years of transition the growth of trade with constant market shares would have been only 10-30 per cent of the actual development. Trade to the EU has expanded as a result of increased market shares. The growth of market shares continued immediately after transition in 1989-1992, but their importance to the expanding trade diminished somewhat during the late transitory phase.

	1020	1004	1004	
	1929	1984	1994	
CEEC	17.4	12.2	6	
FSU	0.9	37.3	9.3	
EU15	63.8	18.7	63.7	
Germany	23.9	5.7	30	
Austria	15.6	2.4	6	
US	2.3	2.2	4.2	
Others	15.6	29.6	16.8	

Table 4-4: Destination of CEEC's Exports

Source: Piazolo, 1997.

Table 4-4 describes the geographic pattern of CEEC's exports for three different eras. The first year 1929 represents the period before socialist systems; the second year 1984 represents CMEA era, and the last year 1994 time after the dismantling of CMEA and trade reorientation. During the socialist era, on average half of the CEEC's trade was between CMEA. Trade with the former Soviet Union was dominant. After the break-down of CMEA in 1991, the re-orientation of trade toward geographical patterns prevailing in 1929 was amazingly fast. The main differences in 1994 compared to the situation in 1929 are noticeable in the trade within CEEC's, which has not gained the same importance as in 1929, and country composition of the trade with the current EU members. The intra regional trade within CEEC has not gained the same importance that it used to have in 1929. The main change in the trade with the EU has been Germany's growing importance as a destination of trade while Austria's role has diminished in this respect.

Table 4-5 describes the development of exports in CEECs. Exports started to decline already in 1988 and reached the bottom line in 1991, when CMEA broke up. Trade started to decline before the dismantling of CMEA because of USSR's difficulties to meet its obligations in bilateral trade (Gács, 1995). From 1991 exports have recovered, reached the pre-transition levels on aggregate in 1993 and have more than doubled in the five years after the lowest dip.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Bulgaria	7.55	6.65	5.23	3.44	3.99	3.77	3.94	5.35	4.89	4.91	4.30
Czech	8.87	8.59	7.69	8.11	8.77	14.46	15.88	21.27	22.18	22.78	26.36
Republic											
Slovak	3.51	3.40	3.04	3.21	3.50	5.46	6.71	8.59	8.82	9.64	10.67
Republic											
Hungary	10.00	9.67	9.73	10.23	10.68	8.92	10.70	12.87	15.70	19.10	23.01
Poland	14.57	14.67	18.29	14.91	13.19	14.20	17.24	22.89	24.44	25.75	26.31
Romania	8.97	8.08	4.57	4.27	4.36	4.90	6.15	7.91	8.09	8.43	8.30
Total	55.47	53.04	50.54	46.16	46.48	53.70	62.62	80.86	86.12	92.61	100.94
a = =			0.5	101.40	00			•	•		

Table 4-5: Exports of CEECs in billions of US\$

Source: Economic Survey of Europe, UN, 1999.

There are, however, considerable differences in performance across countries. In Bulgaria and Romania exports declined almost by half and they have recovered slowly since 1991. The decline was much more moderate in Czech and Slovak Republics and Poland. Since the broke up of CMEA, export growth has been fast in these countries. In Hungary in fact export growth was already evident in 1991. The high export growth is indicative of fast reorientation and opening up of the CEEC–countries.

Probably the main adverse effect of CMEA's dissolution was the terms-of-trade shock that resulted from the increased prices of energy imports to CEEC– economies as emphasized e.g. by Rosati (1995), Gács, (1995) and World Bank (1996). Only in the case of Bulgaria, it does seems that the country has not been able to gain as a large share of the West European markets as it lost in the trade with former Soviet Union. The reason for Romania's weaker-than-average trade performance is most likely the fact that resources were excessively devoted to open sector in to support Ceaucescu's earlier policy to repay Romania's foreign debt. Thus decline in exports can at least partly be seen as a resource shift towards domestic needs.

Several trade policy measures have facilitated the integration of former socialist countries to the rest of Europe in the 1990s. The European Agreements, signed bilaterally by EU and all Central European countries, are the most significant elements. The first agreement was signed in 1991 with Hungary, Poland and Czechoslovakia, and subsequently with Bulgaria, Romania and the three Baltic states.

CEECs have also established free trade agreements with EFTA countries. The significance of these agreements, however, has been diminished by the fact that in 1995 three of the EFTA countries, namely Austria, Finland and Sweden, became members of EU. Concurrently with the liberalisation to Western Europe trade the Central European countries liberalised their bilateral trade.

The Visegrad countries (Poland, Hungary, Czech and Slovak Republics) have established a free trade area (CEFTA) in 1992, which Slovenia and Romania have joined in 1996 and 1997, respectively. The principal objective of CEFTA was to gradually establish a free trade area in accordance with Article XXIV of GATT within a period ending on January 2001. Industrial and agricultural commodities in this agreement are dealt separately. The original timing of liberalization of several commodity categories has been speeded-up and in 1997 approximately 90 percent of trade in industrial products were free of restrictions (Richter, 1997).

The Europe Agreements form a comprehensive framework for bilateral relations between the EU and each of the CEECs. From an overall economic perspective, the most important areas covered are the establishment of a free trade for industrial goods, liberalization of capital movements, and approximation of laws relevant for the EU's internal market and competition policy, and financial cooperation, notably under the Phare Programme³⁵. The European Agreements also recognize the ultimate wish of associate countries to be full members of EU. In fact, the full implementation of the requirements of the Agreement would be one of the prerequisites of accession.

However, the Europe Agreements fall short of full membership of the EU in certain important areas. While they include provisions for dismantling quantitative restrictions on agricultural products and improved market access in both directions, they do not yet give the CEECs free trade in the agricultural sector. Another economically important area where the CEEC 10 does not have full access to EU markets is labour mobility: migration from the CEEC 10 is still strictly regulated.

The Europe Agreements did not fully liberalize trade among associate partners. Agricultural trade is included in very limited sense in these treaties. The Europe agreements also follow a principle of asymmetry. For eastern industrial exports free trade has practically applied since 1997, while for EU exports to the associated countries the last barriers will be removed at the end of 2001, although the slow phasing of tariffs covers only a narrow range of products.

4.2.2 Comparative Economic Development and Population in the Applicant countries

Sizeable differences exist between the new Member States. They include small, medium-sized and one large country – Poland. *Table 4-6* presents the population figures of the Central and Eastern Europe applicant countries and their income level relative to the average of EU's current Member States. The candidate members clearly deviate from the relatively homogeneous group of the current Member States.

In terms of population, most of the applicant countries are small or mediumsized. Correspondingly the economies of these countries are small a fact, which is further accentuated in the price levels differences in the countries relative to the EU. Since the applicant countries are small states at least economically, the economic effects of their accession are small from the EU's perspective.

The economic and social differences between the applicant countries are significant. The income level in the most advanced applicant countries (the Czech Republic and Slovenia) is close to that of some current Member States. The weakest countries, on the other hand, are still well behind the EU level. On average, the

³⁵ Mayhew (1998) has a detailed presentation of the contents of these agreements.

income level of the applicant countries is around 40 per cent of that in the EU as measured by PPP value. Thus the differences in income between the current EU countries and the countries aiming for membership are larger than when Portugal and Greece acceded to the Union. Their income level was 60-70 per cent of the average of the then EEC. Now the income level of Slovenia and the Czech Republic is similar to that of Greece, the member of the current Union with the lowest income level –the other applicant countries being well below this level.

•							
	Czech Rep.	Estonia	Hungary	Poland	Slovenia	Cyprus	Relative to EU
		GROSS D	OMESTIC P	RODUCT, 1	998		
GDP at current prices							
- 1000 Mio ECU	49.5	4.7	41.9	140.2	17.2	8.1	3.4%
- per capita in ECU	4869	3181	4201	3639	8797	12217	20.5%
- per capita in % of EU	24	16	21	18	44	60	20.5%
- per capita in % of EU at PPP	60	37	47	37	69	79	43.8%
Share of gross value added by sector (%)	r						
- agriculture	4.6	6.3	5.5	4.8	4.1	4.4	2.1
- industry and construction	43.4	27.6	32.8	36.2	37.6	21.9	1.2
-services	52	66.1	61.7	59	58.3	73.7	0.9
	POPULATION AND LABOUR FORCE, 1998						
Total population (in 1000s)	10294	1446	10092	38667	1969	663	16.8%
Labor force (in 1000s)	5173	710	4008	17172	983		18.1%
Economic activity rate (%)	73	73.2	58.7	68	71	61.5	0.97
Unemployment rate (%)	6.5	9.9	7.8	10.6	7.9	3.3	0.93
Agriculture: % of total employment	5.5	9.5	7.5	19.1	11.5	9.6	3.2
Industry: % of total employment	41.3	33.2	34.2	32.1	39.2	n.a.	1.2
Services: % of total employment	53.2	57.3	58.3	48.8	49.3	n.a.	0.8
	Bulgaria	Latvia	Lithuania	Malta	Romania	Slovakia	Relative to EU
		GROSS D	OMESTIC P	RODUCT, 1	998		
GDP at current prices							
- 1000 Mio ECU	11	54	9.6	3.1	36.9	18 1	1 1%
- per capita in ECU	1337	2337	2567	8201	1507	3356	9.7%
- per capita in % of FU	7	12	13	41	8	17	9.7%
- per capita in % of EU at PPP	23	27	31	40	27	46	29.1%
Share of gross value added by sector	r		0.				20/0
-agriculture	21.1	4.7	10.1	2.8	17.6	4.6	5.7
- industry and construction	28.7	29.5	31.5	27.5	40.7	33.3	1.1
-services	50.2	65.8	58.4	69.7	41.7	62.1	0.8
		POPULAT	TION AND LA	BOUR FOR	RCE, 1998		
Total population (in 1000s)	8230	2439	3701	378	22489	5393	11.4%
Labor force (in 1000s)	3601	1168	1598		11577	2573	11.6%
Economic activity rate (%)	63.1	71.5	74.8	n.a.	75.6	69.9	0.99
Unemployment rate (%)	14.1	13.8	13.3	5.1	6.3	12.5	1.19
Agriculture: % of total employment	26.2	18.8	21	1.8	40	8.2	6.2
Industry: % of total employment	30.6	26.2	27.6	n.a	29.4	39.5	0.9
Services: % of total employment	43.2	55	51.4	n.a	53.7	52.3	0.7

Table 4-6: Pop	ulation and Income	Statistics of the	CEECs Applican	t Countries

Source: Eurostat (1999 a, b), Eurostat (2000) and own calculations

The applicant countries differ in their economic structure. Compared to the current EU Member States, in applicant countries the share of agriculture of aggregate GDP is relatively large. The share of agriculture is at least twice as large as in the EU on average, but in some countries the share of agriculture is 5 times as large as the average in the EU. The relative share of labour force is even higher than the corresponding relative figure of value added implying that the labour productivity compared to other sectors is weaker in applicant countries than in the EU.

4.2.3 Trade and Factor mobility

The CEE countries' trade is already very much directed towards the EU. Imports of industrial products from the CEECs to the EU have been liberalised since the start of 1997. The end of 2001 will conclude liberalisation of exports of industrial products from the EU to the applicant countries. The overall trade implications will be much more pronounced in the applicant countries because CEECs exports represents less than one per cent of the GDP of the current EU, whereas exports to the EU represent 15 per cent of the CEECs' GDP. Growth in CEECs trade may continue to be rapid because of overall economic growth and the differences in growth rates, even if the EU membership itself does not produce any further significant boost to growth.

The free trade provisions do not cover agricultural products, which are important to the CEECs. The concessions made by the EU to agricultural products under the Europe Agreements are negligible. The applicant countries give considerably less support to their agricultural sectors than the EU, both in terms of customs and quotas. Under the Europe Agreements, certain agricultural products from the EU are given preferential treatment in the applicant countries and most quantity restrictions have also been abolished. Thus the EU's agricultural trade surplus with the CEECs is largely attributable to asymmetrical trade liberalization. EU membership will alter this situation to the benefit of the new Member States unless the change is hampered by long transition periods.

Apart from some sensitive sectors, EU enlargement ought not to cause major changes to trade flows. On the other hand it is generally assumed that membership will have a major influence on investments even though most of the CEECs have a relatively open investment climate already. The biggest change with full membership is likely to be the reduction in investment-related risks and greater stability and credibility. Legislative harmonization and a reduction in institutional uncertainty may have a significant effect on investment growth both in the short and long term. In practice this means that investments will partly be redirected from the old to the new Member States. The experience of Spain's accession to the EEC supports the view that membership will lead to a spike in investment flows (see Baldwin et al., 1997).

So far foreign direct investment has been concentrated only on certain CEECs, i.e. the most advanced countries. Those countries, which have been most proficient in implementing reforms, which have the gone furthest in privatization and have succeeded in combating inflation, have also succeeded in attracting foreign investment. Privatization has already advanced well, especially in Hungary and

Poland and in recent years also in the Baltic States. This means that most of the companies that interest foreign investors have already been sold through privatization programs. Therefore the most advanced applicant countries are increasingly dependent not on companies being purchased but on true direct investments. Any reduction in direct investments would slow the catch-up process with the EU. Direct investments have also been the most important means of funding balance-of-payments deficits.

The movement of capital via direct investments is generally easier and quicker than the movement of labour from one country to another. As capital is more mobile than labour, EU membership is likely to increase the credibility and attractiveness of the transition economies joining the Union as investment destinations. The prospect of EU membership and efforts undertaken by some of the transition economies themselves have already led to significant direct investments (particularly in Poland, the Czech Republic, Hungary and Estonia). When capital moves into the new Member States, labour does not need to move away. The movement of capital into the new Member States will slightly dampen the demand for labour and the growth in real wages in the old Member States, and thus marginally weaken their attractiveness as destinations for migration. Direct investments will correspondingly increase the demand for labour, productivity and real wages in the new Member States, reducing in turn migration. If this favorable trend continues for long enough, the final outcome will be that the economies become more similar and the differences in living standards are bridged.

The population of the current EU is around 385 million and the labour force 175 million. The total population of the candidate countries is around 104 million and the labour force 53 million. There are currently around 12 million foreigners living in the EU, with around 5.3 million foreign employees in the workforce (EU-ROSTAT, 2000). Of this population, around 800,000 persons are from the present candidate countries. Of these, around 300,000 are legally employed in the EU area.

According to the Commission's (2001) report, total annual immigration to the EU area in recent years has been around 800,000 and there have been around 300,000 asylum-seekers. Boeri and Brücker (2000) have estimated that during the first years following the enlargement, the migration can reach around 350 thousand people. This figure will decline within 10 years to less than half and become negligible in twenty years. Compared to this population flow, the immigration caused by the EU enlargement cannot be considered dramatic.

4.2.4 Effects of EU membership

The enlargement implies two kinds of changes for the economic environment of the new entrant economies. New members are affected by changes in traditional trade policy as well as institutional factors that will follow from the adoption of common market rules and institutions. In the sense of traditional trade policy, enlargement is a formation of a custom union. This implies removal of all bilateral border measures between the EU and CEECs and adoption of common trade policy measures against third parties. Since tariffs in industrial trade are to be removed on enlargement, the most important aspect in the bilateral trade relations are the removal of trade barriers in agricultural and food production and the introduction of Common Agricultural Policy (CAP) to new entrant economies. The customs union implies also harmonization of new entrants' tariffs against third parties to correspond those applied in EU.

Trade policy is only one aspect of the integration. EU is a single common market area with harmonized commercial legislation and industrial standards. Unified regulations cover common competition and state-aids policy as well as administrative procedures to implement these regulations. The internal trade is also free of border formalities. Despite the duty free character of trade in manufactures, this trade is subject to rules of origin regulations that impede completely unparalleled access to EU's internal markets. The membership in Union removes these frictions in trade. Balwin et al. (1997) have emphasized the importance of these aspects for the improved business confidence in new member countries. Harmonized market rules constrain possibilities of new entrants to conduct arbitrary commercial and industrial policy. In addition to the goodwill effects, regional integration reduces transaction costs of bilateral trade with new partners in common market area.



Figure 4-3: Expenditures in EU the Budget 1999

If membership takes place without the transition period, this will lead to the free movement of labour, significant income transfers to agriculture in the applicant
countries from the EU's Common Agricultural Policy and subsidized investments in infrastructure through structural funds. The new members will also be involved in the EU's decision-making mechanisms. The most difficult areas in the membership negotiations are agricultural policy, structural funds, and free movement of labour.

Figure 4.3 presents EU's budget expenditure summarized according to three main categories for the year 1999. Total expenditure in 1999 was 92 billion euros, of which almost 40 billion was allocated to agriculture. The second largest category with 30 billion euros expenditures is structural operations which covers various aspects of regional policies. All the remaining items total less than 15 billion euros (European Communities, 2000). Because agriculture and structural funds are overwhelmingly the most important categories in budgetary terms, and they will also be of major importance for new members states, we next characterize these policies shortly.

Common Agricultural Policy

The Common Agricultural Policy is based on principles that are market unity, community preference and common financial responsibility. Market unity guarantees that no internal barriers in trade are applied. Community preference is EUjargon for common border protection against external suppliers. Common financial responsibility means that CAP outlays are funded jointly. They are partly covered by CAP revenues (such as tariff receipts) and by budgetary transfers from the member states. These principles will be applied to the new members also.

Agricultural production is supported in EU through different *market organization schemes* that are in force for different agricultural products. There are:

- a) Price guarantees that are supported either externally by import tariffs or export refunds, or internally by buffer stock agencies
- b) Price guarantees supported at the external border only, and
- c) Direct producer subsidies.

The market support system has gone through reforms that are important when the impacts of eastern enlargement are considered. The 1992 MacSharry reform significantly lowered guaranteed price. This was compensated to European farmers through direct payments per hectare (for cereals, oilseeds and protein crops) or per head (for bulls and suckler cows). The amount of the total direct payments is upper-bounded nominally; they are guaranteed in nominal terms only and up to a maximum eligible reference area or reference herd.

The latest CAP reform, the agricultural part of Agenda 2000, was partly motivated by EU's preparation for eastern enlargement. Essentially, the Agenda 2000 CAP reform is repeating the 1992 CAP reform. Guaranteed prices are lowered and direct payments to farmers increased to compensate in part the income losses. The Agenda 2000 reform package was agreed at the European Summit in 1999. This reform continues the redirection of the Common Agriculture Policy from market price support towards income support. Shifting policies toward income support implies reductions in the level of tariffs and export subsidies, which are necessary to maintain domestic price levels.



Figure 4-4: Agricultural expenditures in the EU budget, 1999

Figure 4.4 describes the allocation of agricultural support for plant products, animal products and miscellaneous purposes. There is also distinction whether expenditures are caused by market support measures or direct support. Most of the subsidies are directed to plant products, and largest proportion goes to arable crops (see, e.g. European Communities, 2001 Agriculture in the European Union, 2000). This support is mainly in form of direct subsidies, such as hectare premiums. Most of the market support in plant products is used for sugar production. The amount of animal subsidies is less than half of that for plant production, mostly going to milk and beef production. The breakdown of subsidies is such that most of the market support is targeted towards milk production and direct support goes to the production of beef.

The Structural Funds are transfers to poorer member states and regions in the EU. Funds are targeted to increase 'social cohesion', which is generally taken to mean convergence of per capita incomes. EU's structural policy has a strong regional emphasis but there are also non-regional objectives. Since the Single European Act onward, the Structural funds have been allocated within operational periods. In period the 1994-1999 regional policies were addressed under four objectives and non-regional cohesion policies under three objectives. These

polices were financed from four different funds. In Agenda 2000 the number of objectives was restricted into three:

- Objective 1: Regions that are lagging behind,
- Objective 2: Economic and social conversion of areas facing structural difficulties,
- Objective 3: Adaptation and modernization of policies and systems of education training and employment.

In addition to these, there is a special Cohesion Fund for less developed member states to support the development for meeting the criteria of the monetary union. There is also a separate Community initiative program to support transnational, cross-boarder and inter-regional actions.

The first two objectives are regional while the third one uses horizontal measures not region specific, but which are however directed towards regions with high unemployment. Only regions that do not qualify for support on the basis of objectives 1 and 2 are eligible for support on the basis of objective three. Previously subsidies under objective one were based solely on the level of regional GDP per capita. Regions with GDP per capita of less than 75 per cent of the EU average, measured by PPP-standards, were eligible for this support. Unemployment has been added to as supplementary criteria in allocating the funds. According to estimates by Wiese et al (1999) two-thirds of the support of this objective goes to Greece, Portugal and Spain. The expenses under objective one cover 60 per cent of all Structural subsidies. Germany, France and UK, but also Spain, are main recipients of funds according to objective 2 and 3.



Figure 4-5: EU Structural Fund Expenses: Agenda 2000 scenario

Objective-one support has been sizable for the regions lagging behind. On average they have been 2.1 per cent of the GDP of recipients and 4.7 per cent of their gross fixed capital formation (Mayhew, 1998). For the regions in EU countries that have received most of the subsidies (Greece, Ireland, Portugal and Spain) the respective figures have been 2.9 and 7.8 per cent.

4.3 Eastern Enlargement as a Complementary Factor in Transition

EU membership means free movement of both labour and capital. The earlier the new Member States are admitted or the shorter the transition periods, the greater the pressures on the factors of production to move from one country to another. Capital will endeavour to move to low-income countries and labour to high-income countries.

What changes will EU membership mean for the applicant countries versus their present situation? Full membership abolishes trade barriers. This is important, even though the Europe Agreements already guarantee relatively free trade between the CEECs and the EU countries. Full membership also liberalizes trade in sensitive areas such as agriculture where the EU currently protects its own production. With membership, the applicant countries' political and economic risks decrease, this boosts investor confidence.

Agricultural and structural policy is the central issues that have to be resolved in terms of the budgetary effects of EU enlargement. Income transfers from the EU and the Common Agricultural Policy will also have a significant macroeconomic impact in the applicant countries. Because of these new subsidies and the change in relative prices, support for agriculture in the applicant countries, which already has bloated agricultural sectors, will distort incentives to the benefit of agriculture and will steer structural change in the wrong direction.

The main economic effects of EU enlargement have to do with movements in the factors of production and convergence of economies. Experience from previous enlargements, when countries poorer than the average acceded (Ireland, Greece, Spain, Portugal), shows that membership leads to growth in foreign trade and investments and to accelerated technical progress in the new Member States (Baldwin et al, 1997). Closer participation in the international division of labour raises the economic welfare of nations participating in integration. Free movement of the factors of production and freedom of trade, will lead to gradual convergence. Integration does not only bolster trade but also creates incentives for increased investment in low-income countries and for labour to move to high-income countries.

The very prospect of membership and the measures required for accession precipitate structural changes in the applicant countries and increases the economic weight of these. This change speeds up the process of economic convergence, during which the new Member States catch up to the lead of the present members in production and productivity.

The result of these changes is economic convergence. This will mean that income and production differentials between the countries of an enlarged EU will narrow, and structural change, especially in the new Member States, will accelerate. The greatest benefit from membership accrues to low-income applicant countries. Although the old Member States have to foot the bill for income transfers to the new Member States, they are also likely to benefit in this process; trade increases, the division of labor intensifies, and markets expand. It is also likely that in the old high-income Member States low-wage sectors will be exposed to greater competition and wage differences will grow as a result of movements in the factors of production. For the old Member States, however, the changes will be slight.

In the next chapter we would like to analyze quantitatively the importance of these different aspects of the enlargement process. It is important to put the different aspects in perspective by assessing their relative importance. We do this by using a dynamic computable general equilibrium model to simulate the impacts of the eastern enlargement of the EU.

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5 Eastern Enlargement of the EU: Factor Mobility and Transfers - Which Factors Dominate?

The European Union is expanding with 10 new members in 2004. The new Member States include small, medium-sized and one large country. In terms of their population, most of the applicant countries are small or medium-sized. The total population of the new member candidates is around a quarter of the population of the current EU. Correspondingly the economies of these countries are also small. The economic and social differences between the applicant countries are significant. The income level in the most advanced applicant countries (the Czech Republic and Slovenia) parallels that of some of the current Member States. The weakest countries, on the other hand, are still well behind the EU level. On average, the income level of the applicant countries is around 40 per cent of that in the EU. Thus the differences in income between the current EU countries and the countries aiming for membership are larger than when Portugal and Greece acceded to the Union.

This chapter examines the effects of the EU's eastern enlargement on migration of labour, investments, consumption and production. These are evaluated using simulation results of a dynamic numerical general equilibrium model. The analysis is based on six different scenarios. The macroeconomic effects are evaluated in terms of fixed-price GDP, national income and per capita private consumption. GDP measures the change in the level of economic activity that results from the eastern enlargement. However, GDP is not a valid measure for regional income trends, if international capital movements change local ownership patterns and thereby regional capital income claims. Unlike GDP, national income describes the change in production factor incomes paid in the region. It also describes the growth in national economic potential better than GDP.

Fixed-price consumption per capita has been used in the study to measure the change in welfare. Changes in consumption best describe the narrowing of the gap in living standards between new and existing Member States. In many ways EU membership will affect not only the GDP outlook but also changes in national income and consumption. Direct investments will accelerate growth in the capital stock in the new Member States, migration will affect both the production potential and the number of consumers and direct EU income transfers to the new Member States will affect disposable incomes and the level of investments.

The effects of eastern enlargement are analysed as cumulative deviations from the base-line growth path. A certain basic development path is assumed both for the old and new Member States, against which the effects of eastern enlargement are then analysed. For the existing Member States the effects are so small that the trend of the basic path totally dominates the trend going forward. In the new Member States EU membership has a more pronounced influence. This chapter is structured as follows. Section two contains a brief overview of the model. Section three describes the reference baseline and characterizes the enlargement scenarios. Section four presents the simulation results and the final section contains a concluding discussion.

5.1 Model Used

This chapter assesses the economic effects of the eastern enlargement of the EU using simulations generated by a numerical equilibrium model. The model used is a dynamic extension of the comparative static GTAP model. In its production technology, the standard GTAP model (see Hertel and Tsigas, 1997) is a constant returns to scale multi-region computable general equilibrium model. The model regions are linked by bilateral trade flows. Industries are linked by input-output flows. Although product pricing is characterised by perfect competition, commodities produced in different regions are differentiated, which makes it possible to take inter-industry -trade between sectors into account, as in Armington (1969). From the viewpoint of a dynamic analysis, the central feature of the GTAP model is the modelling of saving and investment behaviour.

In the GTAP model, regional investments and saving are separate decisions. Regional savings depend on the spending decisions of households and regional investments depend on investment decisions based on expected returns. Thus in equilibrium regional saving and investments can diverge in magnitude. The payments balance need not be balanced. The average return on capital varies whilst saving and investments are globally equal.

In dynamising the GTAP model, three inter-temporal links were added to connect the model's individual simulation periods: (1) accumulation of fixed capital, (2) accumulation of financial claims and (3) lagged adjustment mechanisms.

In designing the accumulation of physical capital in the model, the solutions of the Australian single-area MONASH model for dynamising the numerical equilibrium model were used (Dixon and Rimmer, 2002). The model assumes that capital in each period is sector-specific. The sector-specific capital stock changes depending on the investments targeted to it.

The approach of McDougall and Ianchovichina (2001) was used in designing the accumulation of capital claims. In modelling financial claims the central motivation is to make macro accounting reflect the income distribution effects of the cross-ownership of wealth caused by capital movements. If investments and savings can on a regional basis permanently diverge from each other, this will affect the areas' financial position over time. Changes in the financial position affect amount of payments to the factors of production made abroad and received from abroad. GDP and gross national income (GNI) diverge from one another over

time as the domestic and foreign financial positions change. In terms of local decisions on expenditure and welfare, national income is a relevant variable because it describes changes in available income, unlike GDP which describes economic activity in the region.

The model contains two types of lagged adjustments. Investment expectations may differ from the actual level of return on capital. Expectations adjust towards equilibrium by means of error-correction mechanisms. Similarly in labour markets where unemployment is at a level at which the price trend is stable, wage demands may diverge from equilibrium wages. The movement of wages towards NAIRU equilibrium is described by means of error-correction mechanisms as set out by Solow (1990).

Accumulation of fixed capital

The model assumes the capital stock, $K_t^r(i)$, to be both sector- (*i*) and region- (*r*) specific. The model calculations assume that it takes one period for investments, $I_t^r(i)$, to turn into productive capital. Thus investments made in period *t* become productive capital in period t+1. Productive capital grows as per the equation:

$$K_{t+1}^{r}(i) = (1 - \delta^{r}(i)) \cdot K_{t}^{r}(i) + I_{t}^{r}(i)$$
(5.1)

in which the parameter $\delta^{r}(i)$ describes the depreciation of the capital stock. In the model investments are defined as a positive function of the expected return on capital:

$$\frac{K_{t+1}^{r}(i)}{K_{t}^{r}(i)} - 1 = F_{i,t}^{r} \Big[EROR_{t}^{r}(i) \Big] \qquad \frac{\partial F_{i,t}^{r} \Big|}{\partial EROR_{t}^{r}(i)} > 0$$
(5.2)

According to equation (2), an acceleration in the rate of growth of the capital stock requires an increase in the expected rate of return on capital, $EROR_t(i)$. The fact that investments are an increasing function of the expected return on capital is based on the view that investors are cautious and shun risks. The investment allocation mechanism used in the MONASH model prevents unrealistically high short-term investment reactions relative to small changes in expected returns entering the model simulations.

Expected returns can be defined in two ways in the MONASH model, either as static retrospective expectations or as forward-looking expectations that are model consistent. In the case of static expectations, investors only weigh the current return on capital and evaluate past performance in terms of expected returns. In the case of model consistent expectations investors, use the model's calculations of future returns as the basis for investments. The advantage of static expectations is that the model can be solved recursively as a sequence of successive solutions. In the case of rational expectations, the entire equilibrium path of the

model has to be solved iteratively (Dixon and Rimmer, 2002, chapter 5). In the dynamisation of the GTAP model only static expectations have been used, where the expected return on capital converges in a lagged fashion via an error-correction mechanism towards equilibrium.

Accumulation of financial claims

The financial markets are not actually modelled in the dynamic model. In this respect the model is stylised and is constructed in such a way that it can be operationalised with minor data requirements. The main motivation for modelling financial claims is to reflect the dynamic consequences of the difference between domestic investments and savings in balance-of-payments accounting. In the model households do not own productive capital: this is owned by companies. The only savings vehicle of households is company shares, which represent an indirect claim on productive capital.

For the sake of simplicity the model assumes that companies' investments are financed from equity capital. In the model, the shares of a company in a particular region can be owned either by households in the region, i.e. domestic owners, or an international investment fund. The wealth of households in a region is invested either in domestic shares or in an international investment fund. There is no inter-regional bilateral ownership in the model; only domestic ownership abroad and foreign ownership domestically. The aforementioned are the basis of the determination of payments to the factors of production made abroad and received from abroad. The return on domestic productive capital is shared between domestic and foreign owners on the basis of their ownership. The return on the international investment fund is distributed to the regions on the basis of the shares owned regionally. Vaittinen (2000, chapter 4.3) documents how cross-ownership of capital is reflected in the model's data. The pool of regional financial claims develops over time as follows:

$$WF_{t+1}^r = WF_t^{r,f} + SF_t^r + GF_t^r$$
(5.3)

where WF_{t+1}^r is the wealth invested in companies in region *r* in period t+1, WF_t^r is the wealth invested in companies in region *r* in period *t*, SF_t^r is the savings in region *r* allocated to domestic wealth, GF_t^r is the investments by the international investment fund in region *r*.

The pool of regional financial claims grows on the basis of domestic savings and investments in the international investment fund allocated to it. Domestic savings S_t^r are divided into investments in domestic shares SF_t^r or shares in the international investment fund SG_t^r :

$$S_t^r = SF_t^r + SG_t^r \tag{5.4}$$

The resources of the international investment bank, which it can diversify between different regions, are determined by the allocation of regional savings into the international investment fund:

$$\sum_{r} SG_{t}^{r} = \sum_{r} GF_{t}^{r}$$
(5.5)

The allocation of domestic savings between the foreign investment fund and shares in domestic companies is based on the principle according to which the aim is to keep the division of wealth between foreign and domestic wealth constant. Although this rule as such is ad hoc in nature, it is nonetheless in keeping with the empirical observation that savings strive to converge on domestic assets. The background to this is described more fully in McDougall and Ianchovichina (2001).

Labour market slow to adjust

In reality, the labour market does not generally adapt all that quickly to changes for instance in the production structure. The result is often frictional or structural unemployment. The model attempts to replicate this observation by having the labour market adjust slowly to equilibrium. The model describes this adjustment as follows:

$$\Delta^2 w_t = -b \cdot (u_t - \overline{u})$$
where $\Delta^2 w_t = (w_t - w_{t-1}) - (w_{t-1} - w_{t-2}),$
(5.6)

 w_t is the logarithm of the unit wage,

- u_t is the actual rate of unemployment at moment t and
- \overline{u} is the rate of unemployment that is appropriate at any given stable rate of inflation (NAIRU).

According to equation (6), the rate of increase in wages accelerates when the unemployment rate falls below the equilibrium rate of unemployment and slows down when the unemployment rate exceeds it. Using OECD cross-sectional material, Solow (1990) has estimated the reaction parameter of wages to be 0.5. The above model is in line with a number of micro theory models describing the labour markets (cf. Layard, Nickell and Jackman, 1994).³⁶

5.2 Model Baseline and Enlargement Scenarios

For our simulation purposes the 45-region 50-commodity version of GTAP-4 database is aggregated to be more suitable. In the commodity aggregation, activi-

³⁶ Kiander & Viren (2001) present empirical evidence of the duration taken by the labour markets to adjust to supply shocks, which in western European countries is typically over 5 years.

ties closely related to CAP and sectors likely to be influenced by enlargement are better presented in the industry breakdown. In the modelling exercise we assume that enlargement will take place by 2005. The model baseline and data is described in next section and the simulation scenarios that characterize enlargement in section 3.2

5.2.1 Baseline Scenario of the Simulation

For the model simulation the GTAP database³⁷ was aggregated into three regions and 15 sectors. The model's areas are the present EU, central eastern Europe (CEA) and the rest of the world (ROW). Central eastern Europe is an aggregate area comprising Bulgaria, the Czech Republic, Poland, Romania, Slovakia, Slovenia and Hungary³⁸. The model contains 15 aggregated sectors. The main sectors from the point of view of the EU's agricultural policy have an important ranking³⁹.

In our simulation analysis the EU's eastern enlargement is assumed to take place in 2005. The model's parameters assume that prior to enlargement agriculture in the present EU has been reformed to align with the AGENDA 2000 reform as adopted by the Council of Ministers in Berlin in April 1999.

From now on, EU's eastern enlargement is evaluated so that the integration scenario is compared to the baseline scenario, which is calculated up to the year 2025, i.e. the effects of integration are assessed over a 20-year period. The simulation results are reported as deviations from the basic path. The base year of the GTAP database is 1995, when many customs duties on industrial goods from the EU and eastern Europe were still in force. Also in that year, the commitments made in the GATT Uruguay round to remove trade barriers began to be implemented. Implementation of the AGENDA 2000 programme's reforms is also a precondition for the EU's eastern enlargement because agricultural reform will significantly reduce the costs of integration to the EU budget.

³⁷ The main contribution of the GTAP project to research of the international economy is its database, which describes the input and output of 45 countries or regions in 50 sectors and the bilateral trade flows between these. The database also contains information on border controls and transport costs (McDougall et. al., 1998).

³⁸ The GTAP database does not describe the economy of the individual candidates, only the region consisting of the countries listed above, so that our analysis of EU enlargement relies on a partly unsatisfactory regional aggregation. Bulgaria and Romania are unlikely to be among the first countries acceding to an enlarged EU. These countries' share of the composite region's GDP is around one fifth.

³⁹ The aggregated GTAP sectors are: cereals, beef, dairy, other agriculture, beef products, dairy products, other processed foods, natural resources, textiles, wood processing, chemical industry, metal products, transport equipment, other machinery and equipment, and services. The sector aggregation is the same as in the study by Vaittinen (2000), which describes how they have been aggregated from the GTAP database.

These factors have been included in the baseline path. Allowance has been made for the reduction in bilateral trade barriers under the Association Agreements, the GATT commitments and the changes to border controls required by AGENDA 2000 in the basic path for 1995-2005. The factors have been gradually built into the basic path, with reduced bilateral customs duties on industrial products between the EU and the association partners of 1995, the GATT reform implemented in stages in 1996-2001 and the reforms required by AGENDA 2000 reforms phased in 2001-2005. The aforementioned factors have been taken into account in the basic path of the model, with trade policy shocks representing the reforms built into the trend growth path. Otherwise the economies are assumed to evolve in line with trend growth determinants.

	Percentage changes in growth					
	GDP	Capital stock	Labour force	Population		
European Union	2.4	2.7	0.5	0.2		
Central and eastern Europe	3.2	3.5	0.2	-0.2		
Rest of the world	2.6	2.8	0.6	1.7		
		Sector-specific total factor productivity				
	Overall produc- tivity growth %	Agriculture	Industry	Services		
European Union	1.0	2.4	1.8	0.8		
Central and eastern	1.8	3.6	2.3	1.2		
Europe						
Rest of the world	1.0	2.5	1.7	0.7		

Table 5-1: Regional trend growth paths and their components

Table 5.1 describes the factors of trend growth. In the model, growth in GDP and capital stock is determined endogenously. Sector-specific total factor productivity and growth in the labour force are exogenous factors. Population growth in itself is not of significance for the behaviour of the model, but the welfare measures it produces are calculated in per capita terms. Aggregate productivity for the EU and the rest of the world is calculated on the basis of the data on GDP in the study by Coyle et al. (1998), as residuals of the income weights of the trend growth in the labour force and capital stock. The rate of growth in the labour force is taken to be the average rate of growth for 1980-1990. For eastern Europe it would be pointless to use historical reference material; the figures are calculated based on the study by Jensen, Frandsen and Bach (1998, p. 16), which uses medium-term growth scenarios calculated by the World Bank.

Productivity growth in the whole economy has been divided into sectoral components by interpreting sectoral productivity figures, which correspond to Bernard and Jones' (1996) relevant material using least-squares regression (Vaittinen, 1999). The method as such is ad hoc, but can accommodate the general feature of growth in overall productivity in that agricultural and industrial productivity regularly grows faster than productivity in services (Bernard and Jones, 1996).

5.2.2 Simulation shocks accompanying EU eastern enlargement

The significance of EU membership for the new Member States can be divided into two types of factors. Besides traditional trade policy, EU membership means the harmonisation of economic legislation, industrial standards and norms, common competition and business support policies and the approximation of administrative standards governing business life. Trade in the single market is not hampered by the customs formalities of ordinary foreign trade, which cause trading costs on top of the customs tariffs themselves. Institutional harmonisation lowers the risk premium on investments and channels new investments into the region. For example, Baldwin et al. (1997) have emphasised this aspect in the economic development of the countries of central eastern Europe.

EU's eastern enlargement is characterised by means of six alternative simulation scenarios, which are set out in *box 1*. The first and second scenarios attempt to sketch out the consequences of the policy measures without any changes in the factor mobility. The first scenario analyses the effects of the traditional trade policy. The second scenario also factors in income transfers from the EU's structural funds. The third scenario analyses the option under which foreign investments in the new member states grow with the increased economic policy credibility brought by EU membership.

Capital has traditionally been more internationally mobile than other factors of production. However, with EU enlargement it is to be expected that labour will migrate from the new low-income member states to the areas of the present Union. Scenarios 4-6 evaluate the significance of migration for economic development given different assumptions about the propensity to labour force movements.

Scenario 1:Trade policy

From the point of view of traditional trade policy, enlargement of the EU means the establishment of a customs union between the current EU and the new Member States and the harmonisation of the instruments of trade policy. In practice this means the dismantling of mutual border controls and the installation of a similar level of border controls towards third parties. The most significant individual element in this regard is the extension of the EU's Common Agricultural Policy to the new member states.

With the common market, barriers to mutual trade between the current EU and the new members will be removed. For the current EU, import tariffs and export subsidies will fall significantly in agricultural trade with Eastern and Central Eu-

rope. For Eastern and Central Europe, integration will mean moderate reductions in customs both in intraregional trade and with the EU's outlying regions. On the other hand, EU membership will significantly increase export subsidies and import duties vis-à-vis third parties. Export subsidies are funded directly from the EU's general budget. The model makes provision for this in the EU budget, which is a new element to the GTAP model. The budget income comprises common customs income and a GDP contribution, which keep income and expenditure in equilibrium in the model's budget. In the model, the budget expenditure consists solely of agricultural subsidies. Apart from changes to the actual instruments of trade policy, the simulation assumes that trade transaction costs for the EU's new and old member states will drop by 10%. This is a standard estimate of the reduction in transaction costs found in literature on the formation of the single market (e.g. Harrison and Rutherford, 1996).

Scenario 2: Structural funds

The EU has largely attempted to use the structural funds to balance regional development within countries, but another aim of these funds has been to promote social cohesion. Often this has meant that Community funding has been used to solve problems in regions with high unemployment. Low GDP relative to the EU average has been the main factor in the allocation of structural funds expenditure. Regions whose GDP has been below 75 per cent of the EU average have received the bulk of structural funding. Of individual countries, the majority of structural funds expenditure has been directed at four current Member States: Greece, Ireland, Portugal and Spain. All the new Member States are poor in the sense that most of their regions are entitled to structural subsidies. At the same time, the entry of the new Member States will lower the EU's average GDP so that many of the current recipient regions will lose the structural support they enjoy at present.

Structural subsidies have been factored into this study in a simple, straight-line way, being modelled simply as regional investment subsidies in Central and Eastern Europe. The magnitude of the subsidies is taken from the five-year estimate of the EU's budget guidelines (Official Journal of the European Communities, 1999). The provision for structural funds expenditure on the new member states in the period 2002-2006 is estimated to be 3750 million euros for the first year expenditure, rising to 12 billion euros by 2006. In the estimate, 2002 is the first possible year of membership for the six new Member States. In the study's scenario, the start of the planned budget expenditure is deferred until 2005. The increased expenditure has been covered by corresponding deductions from the current Member States.

The methodology for the inclusion of the subsidies is very elementary. Investment subsidies, for example, have not been targeted by sector. Nor does the model distinguish between public and private investments, i.e. it is not possible to analyse the various ways in which public investments crowd-out private investments. In the model, the structural funds are simply considered public support for the purchase of commodities, which promotes the accumulation of capital and economic growth. The model's calculations totally lack dynamic

BOX 1: EU's enlargement simulation scenarios

Scenario 1

Changes in trade policy

- Formation of customs union between the EU and its new members and removal of remaining barriers to trade,
- 10% reduction in bilateral trade transaction costs,
- Extension of Common Agricultural Policy and related subsidy mechanisms to the new Member States.

Scenario 2

Trade policy and structural funds

• Structural Fund expenditure measured as defined in the appropriations in the EU's budget framework for Community enlargement. In the simulations, the appropriations are deferred until 2005, being initially 3750 million euros and rising to 12,080 million euros over a five-year period.

Scenario 3

Trade policy, structural funds and growth in investments into eastern Europe

• and in addition to (2) it is assumed that with the institutional credibility brought by EU membership the expected capital yield requirement in eastern Europe will fall 15 per cent from the pre-membership level.

Scenario 4

Same as scenario (3) but including a moderate estimate of labour force mobility (employment 1).

• Mobility declines in stages; initially 70,000 persons annually and later 60,000. Effect on the work force over 10 years around 0.7 million and over 20 years around 1.3 million.

Scenario 5

Same as scenario (3) but including 'consensus estimate' of labour force mobility (employment 2).

• Mobility initially 140,000 persons annually and later 115,000 persons. Effect on the work force over 10 years around 1.4 million and over 20 years around 2.6 million.

Scenario 6

Same as scenario (3) but labour force mobility assumed to be double to the 'consensus estimate' (employment 3).

• Mobility initially 280,000 persons annually and later 215,000. Effect on the work force over 10 years around 2.7 million and over 20 years around 5 million

efficiency analyses, for example from the point of view of optimal saving. Therefore, regard with any appraisal of the impact of the structural funds the results should be seen as being indicative only.

Scenario 3: Capital movements

European Union membership will integrate the new members, more than to customs union, closely into the Common Market institutions and the legislation governing business life within the Community framework as a whole. EU legislation forms a harmonised operating environment – familiar especially to EU investors – but also removes the possibility of individual countries making unforeseen trade or industrial policy changes. Membership also accords companies in the new Member States full access to the Common Market. For reasons of various rules of origin, amongst other trade partners, this is not the case with free trade or the customs union.

In this study the effect of the increased credibility brought about by institutional factors is estimated in the form of a reduced capital return requirement. The magnitude of the effect is taken from Baldwin et al. (1997), according to which the added credibility would reduce the required return on capital by 15 per cent. Even allowing for this the required return on capital, remains permanently above the EU average in the model. In other words capital return rates do not need to converge in the model's calculations even in the long term, so in that sense the estimate used can be considered conservative.

Scenarios 4-6: Labour force mobility

It is believed that the freedom of movement of the labour force made possible by the EU's eastern enlargement will increase migration from the new entrants to the area of the current EU⁴⁰. A number of studies have attempted to estimate the scale of this migration, and the findings of these are summarised in a Commission (2001) report. In assessing the labour market effects of this migration, research findings typically range from 70-150,000 workers per annum. Higher estimates have also been put forward, but these include dependants brought by workers and migration for other reasons. These estimates put total migration at 120-380,000 immigrants. According to the Commission's (2001) report, total annual immigration to the EU area in recent years has been around 800,000 and there have been around 300,000 asylum-seekers. Compared to this population flow, the immigration caused by EU enlargement cannot be considered dramatic.

The population of the current EU is around 384 million and the labour force 176 million. The total population of the candidate countries is around 104 million and the labour force 53 million. There are currently around 12 million foreigners living in the EU, with around 5.3 million foreign employees in the workforce (EU-ROSTAT, 2000). Of this population, around 800,000 persons are from the present candidate countries. Of these, around 300,000 are legally employed in the EU area.

⁴⁰ For labour movement, see Faini (1995), Borjas (1999), Boeri and Brücker's (2000), and Bauer and Zimmermann (1999).



Figure 5-1: Projected changes in employment in the current member countries in alternative migration scenarios

Figure 5.1 presents three different scenarios of the effect of labour force mobility on the supply of labour in the current EU area. Of these, scenarios 1 and 2 are very close to relevant estimates in Boeri and Brücker (2000) of labour force mobility⁴¹. In the third scenario the propensity to migration is doubled.

In the model used in the study, migration is explained by income differences. The propensity to labour force mobility is calibrated so parallel Boeri and Brücker's (2000) estimate of migration. The estimates of changes in the cumulative pool diverge because income differences in the model in this study decline somewhat slower than in those used by Boeri and Brücker (2000). However, they are of a similar order of magnitude.

In scenario 1, cumulative migration increases labour supply in the EU over a tenyear period by 0.35%, in scenario 2 by 0.75% and in scenario 3 by 1.4%. The corresponding figures after 15 years are 0.5%, 1.0% and 2%, and after 20 years 0.65%, 1.3% and 2.5%. The calculations assume that each employee is accompanied by one dependant. Since the share of the labour force of the total EU popula-

⁴¹ The study by Boeri and Brücker's (2000) bases its estimate of migration on a model in which the main factor explaining migration is income differences adjusted for purchasing power. The material for the model is migration to Germany from countries which have had 'free' movement of the labour force.

tion is around half, the impact of migration on the population is, relatively speaking, the same as that on the labour force.

The relative impact of incoming migration on the labour supply or the population total on present EU members remains comparatively small even if the flow is assumed to be fairly substantial. But for Central and Eastern Europe the impact of migration is significantly higher. In scenario 1, cumulative migration over 10 years reduces the labour supply and the population in Eastern Europe by 1.3%, in scenario 2 by 2.7% and in scenario 3 by 5.2%. The corresponding figures over 15 years are 1.9%, 3.8% and 7.3%, and over 20 years 2.4%, 4.8% and 9.2%. Relatively speaking these figures constitute four times the effect on the current Member States. For comparison, in the 10-year period since the border was opened, 7.3% of the population of the former East Germany has moved to the western parts of the country (Commission, 2001). Of these migrants, one third – 2.8% of the total population – moved to the west in the first six months, i.e. before German unification.

5.3 Results of the Model Simulations Evaluating EU Eastern Enlargement

In this section the macroeconomic effects of the six model scenarios estimating the EU's eastern enlargement are presented. The macroeconomic effects are assessed in terms of fixed-price GDP, national income and per capita private consumption. GDP measures the change in the level of economic activity following the eastern enlargement. However, this is not a valid measure of the regional incomes if international capital movements alter regional ownership and thus claims for regional capital income. The change in national income describes the change in incomes of the factors of production paid in the area. It describes the national potential for economic growth better than GDP. Fixed-price per capita consumption has been used here to measure the change in welfare because measures relevant in commonly used comparative and static models such as equivalent variation cannot be computed directly in models that develop over time (see Ianchovichina and McDougall, 2001).

The effects of the EU's eastern enlargement are analysed as cumulative deviations from the basic growth path, which was described in section 3.1. In the model's calculations eastern enlargement is assumed to take place at the beginning of the year 2005. The economic effects of enlargement are simulated for 20 years from that date. The effects are analysed for six scenarios (sim1-sim6). The shocks characterising the scenarios are described in *box 1*.

5.3.1 Impacts of Enlargement on Central Eastern Europe

Impact of trade policy and structural funds on Central and Eastern Europe

Figure 5.2 presents the simulated GDP effects of eastern enlargement on the eastern European region. The cumulative effects of scenarios 1-3 are rendered as stacked bars. The results of the scenarios estimating labour force mobility are represented by lines. Scenario 1 is an estimate of the effects of traditional trade policy. The impact of this on GDP growth is remarkably small; cumulatively around 0.5 per cent of GDP. The effect is somewhat greater in the first years of membership as a result of the more efficient use of resources. The effect on private consumption is bigger, however. This is because with the EU's Common Agricultural Policy the costs of agricultural policy are paid from the Community budget, and the resulting incomes are greater than the candidate countries' contributions to the common expenditures. Another important aspect in this respect is the improvement in the terms of trade for the Central and Eastern Europe region as a result of trade liberalisation. This increases disposable incomes but not fixed-price GDP.



Figure 5-2: Deviation from baseline in CEECs GDP

Scenario 2, which takes account of structural fund transfers, increases GDP only slightly at first, but more so over time. This is partly because of the assumed growth profile of structural fund income transfers, but partly because the cumulation of investments leads to expanding production capital capacity. This increases

disposable incomes: when some of the increased additional income is saved and invested, this has multiplier effects in promoting economic growth. This can also be seen in figure 3, which compares the changes in GDP (GDP 2) and national income (GNI 2) in scenario 2. Initially, structural fund income transfers boost disposable incomes more than GDP, but the cumulation of investments means that GDP growth accelerates more than the growth in incomes.



Figure 5-3: GDP and GNI deviations from baseline in CEECs

As can be seen from figure 5.2, the immediate effect of EU enlargement is that economic growth accelerates in the new member states so that the cumulative divergence from the trend is initially around 2 per cent compared to the basic path. This is largely due to the increased income transfers accruing to the new Member States. The simulations assume that at the time of enlargement unemployment in the candidate countries is at an appropriate level for stable inflation, i.e. it is at the NAIRU level. Growing income transfers promote overall demand and accelerate the rate of price increases. This adds to unemployment, which dampen wage demands, so that the price trend stabilises over time on a path that is in keeping with stable growth. The growth in production immediately after integration slows for a period to below trend. After an adjustment phase, however, growth picks up again and in the model's calculations, is above previous trend growth for the entire period of the analysis.

The slowing of the initial growth stimulus should not be interpreted as a 'prediction' of the future trend, because the countries' economic development at the time in question will be affected by factors other than those in the analysis. Also, the growth profile in figure 2 is dependent on the assumptions made in the model, for example that unemployment at the outset is in equilibrium and that integration does not affect this. It is to be expected, however, that after the initial growth impulse, increasing income transfers will lead to a temporary acceleration in price rises and a slowdown in growth.

Impact of foreign investments on Central and Eastern Europe

Scenarios 1 and 2 analyse the effects of EU income transfers on the changed operating environment in the new Member States. Scenario 3 attempts to assess the significance of the possibly increased mobility of the factors of production as far as capital movements are concerned. Increased investor confidence will potentially be of major significance for growth in overall production in the region. In the simulated model analysis in this study, the cumulative GDP divergence is twice as large at the end of the analysis period as the effects of the policy shocks induced purely by membership. In scenario 3, the cumulative GDP trend divergence is 15% above the basic scenario at the end of the period, whilst in the calculation reflecting the joint effect of scenarios 1 and 2 it is around 7% higher than the basic scenario.



Figure 5-4: Consumption per capita - Deviations from baseline in CEA's

The expansion in foreign investments is seen in inducing strong growth in overall production, but the effect on the incomes of the factors of production in the region is very slight. This can be seen in the comparison between GDP (GDP 3) and GNI in figure 3. Disposable incomes grow only fractionally more than in scenario 2, where no assumption is made regarding the reduced anticipated rate of return on capital. At the end of the analysis period, per capita private con-

sumption is around one per cent higher than in the scenarios that ignore the growth in capital movements.

As regards scenario 3, it should be noted that in the GTAP model capital income taxes are not included for any of the regions in the model. If, for example, a 20% effective capital income tax in eastern Europe were to be a 'competitive' rate of tax that would not alter investor behaviour, disposable incomes in the region would grow by around two per cent compared to the basic path.

Impact of labour force mobility on Eastern Europe

Labour force mobility from the new member states to the area of the current EU decreases economic growth as measured by GDP in the new entrants. At the end of the analysis period cumulative GDP in the low-migration scenario is around two per cent lower than in scenario 3. The corresponding variations for scenarios 5 and 6 are four and seven per cent. In the maximum migration case, the GDP-depressing effect of the labour outflow is approximately equivalent to the boost to GDP induced by increasing investments.

However, the outflow of labour raises the wage level and per capita incomes, which are evident as significant growth in private consumption in all the migration scenarios vis-à-vis a situation with no labour outflow. In the maximum migration scenario, per capita private consumption grows almost twice as much compared to a no labour outflow situation.

5.3.2 Effect of Eastern Enlargement on the EU's Current Member States

The economic effects of the EU's eastern enlargement are an order of magnitude smaller on the current Member States. Figure 5 shows that initially the GDP effects of scenarios 1-3 are almost non-existent and even at the end of the analysis period are only around 0.25 compared to the basic growth path. In all the scenarios labour force mobility turns GDP growth positive. In the case of maximum migration, overall production is 1.5 per cent above the trend growth path.



Figure 5-5: Deviation from baseline in the current EU GDP

In comparing national product and national income it is noticeable that in scenario 2, national income initially declines more than GDP. This is because the current EU countries are the net payers of the income transfers to the new member states. In terms of national income, however, the costs are only around 0.2 per cent compared to incomes in the basic growth path. This ratio remains reasonably stable throughout the analysis period. Taking into account the possible growth in capital movements, the GDP effects are greater than the national income effects. This is because some of the investments directed at the current EU area are targeted to the new member states. Increasing capital incomes from these countries compensate the effects resulting from a slower GDP growth. As a result of the growth in capital incomes, the costs of enlargement in the calculations presented here are in fact somewhat smaller than without increased capital mobility.

Migration has a distinct effect on changes in per capita consumption. In the lowest migration scenario, per capita consumption falls around twice as much as without migration. However, the decline is only 0.3 per cent compared to the basic growth path. In the maximum migration scenario the change in consumption is just short of one per cent, whilst the growth in population is 2.5 per cent.



Figure 5-6: GDP and GNI - deviations from baseline in the current EU



Figure 5-7: Consumption per capita - Deviations from baseline in the current EU

5.4Conclusions

EU enlargement will have a significant impact on the economic development in the new Member States. The countries of Central and Eastern Europe will gain substantially from EU membership. For the EU's current member states, the nations financing the resulting increased transfers, the economic costs will be small. This asymmetry naturally results from the difference in size between the current and the new Member States. The total population of the new Member States is only around a quarter of that of the current EU, and their economies are very small compared to the economy of the old Member States. The actual effects of the EU's eastern augmentation will depend on when and in what order enlargement takes place and what transition periods are applied. The present study assumes that the new member states will gain immediate access to the EU's Common Agricultural Policy and structural policy. If this happens, the principal effects of eastern enlargement will be the liberalisation of trade - extending also to agriculture: large agricultural and structural policy income transfers to the new Member States, growth in direct investments directed at the new member states, and as a result of the free movement of labour migration from new to old member states.

The effect of enlargement on private consumption in the new member states is greater than the change in the rate of growth in GDP. This is because the calculations are based on the assumption that, within the EU's agricultural policy, the expenses of agricultural policy will also be paid to the new member states from the Community budget. The resulting income to the applying countries is greater than their contribution to common expenditure. In other words, the new member states become net beneficiaries and the old member states, on average net payers, adding to the disposable incomes in the new entrants. Another aspect that is important in this connection is the improvement in Central and Eastern Europe's terms of trade as a result of the liberalisation of trade, a fact increasing disposable incomes but not fixed-price GDP.

It turns out that the conventional trade policy effects of enlargement – the formation of custom union and implementation of common agricultural policies to new member states - are of minor importance compared to the effects of factor mobility. Factor mobility is induced by institutional changes that boost business confidence on the one hand and remove obstacles to labour mobility on the other.

The calculation that takes account of structural fund income transfers to the new Member States increases GDP only slightly at first, but increasingly so over time. This is partly because of the assumed growth profile in structural fund income transfers, but also partly because the cumulative effect of investments increases the capacity of productive capital. The model calculations are based on assumptions that structural subsidies increase the investment rate in the new Member States. Initially, structural fund income transfers increase disposable incomes more than GDP, but the cumulation of investments means that GDP growth accelerates more than the growth in incomes.

Increased investor confidence resulting from the EU membership is of major significance for overall production growth in the new member states. The growth in foreign investments is seen in the form of strong growth in overall production, but the effect on the incomes of the factors of production in the region is substantially smaller, reflecting the fact that part of the profits are ploughed back to the foreign investors. The free movement of labour is the issue that has raised the most discussion and concern in connection with the eastern enlargement. Big differences in wages and incomes will encourage people to move, and the gap in living standards between eastern Europe and the current EU countries is large. Measured by exchange rates, the income differences between Poland, for instance, and the current EU countries are significant – around eightfold. However, income differences adjusted for purchasing power are considerably smaller, a fact which will also reduce the willingness to move.

EU membership for the transition economies entails integration and convergence. It is believed that EU membership will boost economic development in the new Member States so that they eventually will close the gap in production and productivity with the existing Member States. If convergence takes place - as has already happened in Poland and Hungary for five years - the income level in the new Member States will gradually approach that of the current member states. The progressively narrowing income difference between countries will also gradually reduce migration pressures.

The model's calculations quantify the economic effects of different scales of migration. The migration of labour from the new Member States to the current EU area reduces economic growth as measured by GDP in the new Member States. A contracting labour force reduces their growth potential. However, the effects of labour outflow are not only negative; they increase the salary level and per capita income in the new member states. This is evident as significant growth in private consumption under all the migration scenarios compared to a situation with no migration takes place.

The economic effects of the EU eastern enlargement on the existing Member States are smaller by an order of magnitude. A comparison of the trends in national product and national income shows that initially national income declines more than GDP as compared to the basic trend path because the current EU countries are the source of the income transfers to the new member states. In terms of national income, however, the costs are very small - only around 0.2 per cent compared to incomes in the basic growth path.

Following enlargement, the increasing capital income from the new Member States through direct investments compensates for the effects arising from the slower GDP growth. As a result of the growth in capital incomes, the calculations presented in this study actually show the costs of enlargement to be somewhat smaller than they would be without increasing capital movements.

In the current Member States, too, inward migration affects changes in per capita consumption. Even in the lowest migration scenario, per capita consumption declines around twice as much as without migration. However, the decline is only 0.3 per cent compared to the basic growth path. In the maximum migration sce-

nario the change in consumption is just short of one per cent, whilst the growth in population and GDP is 2.5 per cent.

Theoretical analyses of labour force mobility show that improved migration opportunities generally improve total incomes in the target country. However, the benefits of immigration are not distributed equally, and the incomes and welfare of certain groups can even deteriorate. The distribution of benefits depends on the configuration of skills of the newcomers compared to the original population. But the configuration of newcomers' skills is not coincidental, but rather depends on the economic incentives both in the country of departure and the target country and in particular on the distribution of incomes and salaries. Although EU enlargement may cause welfare losses to certain groups in the current Member States, the overall benefit of enlargement is sufficient to make up for these losses.

Appendix to Chapter 5

This appendix describes how capital accumulation dynamics, used in single region Australian CGE model MONASH (Dixon and Rimmer, 2002), has been incorporated into multi-regional GTAP model. The standard GTAP as described by Hertel and Tsigas (1997) is used as a reference model, to which modifications have been made. GTAP is comparative static model. When the model is shocked, fixed amount of primary factors, move across sectors to balance demand and supply to equalise prices of mobile factors over industries. Since GTAP is a static model, it does not take into account the effects of policy or other shocks into the accumulation of capital. Investments are taken into account in the model but only as a component of demand.

In core GTAP, investments are defined as a single region specific non-tradable good. Investment demand responds to the expected future rate of return in a region. But since there is only one period in the model, neither the accumulation effects of these investment decisions nor the realization of expectations are studied in the model simulations. The impact of investments on model results comes from their difference in the incidence of industry specific demand from the other demand components.

In MONASH -model capital is assumed to be sector specific. Capital stock increases or decreases in one sector when investments exceed or fall short of physical depreciation, which in the model is determined by constant rate of decay. Investments depend on investors' willingness to supply funds to an industry. This willingness is responsive to expected rates of return. To incorporate sector specific accumulation of capital, we have to introduce sector specific investments. Instead of having regional scalar variable, aggregate investments, we have regional vector variable, investments for each sector in the economy. This means that we have to add a new dimension into the variables that determine investment formation in the model.

To make the model genuinely a dynamic one, we specify a stock-flow relation between existing capital stock and investments in the model. We incorporate new formulation of investment theory into the GTAP model. In this specification, investments are truly inter-temporal variables linking stocks of capital in different time periods to each other. Our formulation follows closely that adopted in MONASH model presented by Dixon and Rimmer (2002). Thus we remove the original investment allocation module altogether and introduce a new one.

The postulation of sector specific capital as well as new investment formulation requires data that is not present at the GTAP database. We have also had to redefine partly the database. The additional new data is generated using a steady state simulation. The data issues are discussed in a separate section of this appendix.

A5.1 Stock Flow Dynamics

The expansion of capital stock is determined on the basis of an existing reference year data within the model formulation in MONASH model. In standard GTAP closure capital stock is assumed to be an exogenous endowment and capital stock expansion is modelled as a shock to the model. The MONASH method to endogenize the capital stock growth using information of reference year data is to assume that gestation time of investment is one period. This means that investment flows recorded in the reference year's database add to the capital stock in the simulation period that is in the period the model is shocked. For a given flow of investment (I) capital stock (K) evolves as:

(a)
$$K_t = (1 - \delta) \cdot K_{t-1} + I_{t-1}$$

(b) $K_t - K_{t-1} = (I_{t-1} - \delta \cdot K_{t-1}) \cdot UNITY$
(A5.1)

where *t* refers to current period for model simulations. Period *t-1* refers to time that has already passed and on which we have collected the initial data for our simulations. K_{t-1} and I_{t-1} are data on capital stock and investments on our database. Parameter δ is the rate of depreciation of the capital stock. In MONASH model implementation K_{t-1} and I_{t-1} are treated as given coefficients and K_t and *UNITY* are variables. Originally at period *t-1 UNITY* is zero. When period *t* is opened it is shocked to one (*del_UNITY* = 1). Shocking *UNITY* kicks off the accumulation dynamics.

The changes in the simulation period capital stocks are thus predetermined. The simulation shocks generate induced changes in investments that add to the next period's capital stock. In order to study investment behaviour, we also have to endogenise that variable even though it has effects that do not materialize in our current period simulation. The growth of next period capital stock is the variable that connects the sequence of one period simulations. Extending the expression in (1a) one period ahead and differentiating it we get

$$K_{t+1} \cdot k_{t+1} = (1 - \delta) \cdot K_t \cdot k_t + I_t \cdot i_t.$$
(A5.1')

Equation defines the change of capital stock at period (t+1) that is outside the simulation period. It follows from an accounting relation. In the model k_t is predetermined but i_t is induced by model shocks and is determined by the behaviour of investors' specified in the model.

Figure A.1 gives a summary on how stock flow dynamics is characterized in MONASH -model. The database information on the existing capital stock and investments in pre-simulation period determines the growth of productive capital stock, since it takes one period of time for investments to become productive. Simulation shocks induce changes in investments according to the theory specified in the model. The growth rate of capital stock at the post simulation year is then calculated using the induced level of investments and predetermined capital

stock. Thus the growth rate of capital stock for next period in a sequence of solutions can be calculated from the updated database.

	Base pe Investme at databa	eriod nts se	Simulation p Investment indu by one period simulation show	eriod uced cks	Period n the shoc model	ext to k in the
Capital stock in database Capital stock availab beginn		stock le at the ing of simulation	Capita availa simul	al stock ble next to ation period	Time	

Figure A5.1: Timing of capital accumulation in MONASH model

If expectations are defined in a backward looking fashion, the model can be solved as a sequence of one period sollutions. In this case all information needed is either in the database or generated by the current simulation period. However, in this case we cannot guarantee that the investments induced by the one period solution generate realized rates of returns that are consistent with expected returns. When expectations are backward looking, investors are not fully aware of the consequences of their action. We have adopted this approach when introducing the dynamics into GTAP -model. In next section we look at the investment specification in MONASH -model and the disequilibrium dynamics in response to errors in expectations.

A5.3 Investment Behaviour and Disequilibrium Dynamics

MONASH -approach to investment determination is the same as in ORANI model. It is assumed that investors are cautious. They finance investments in an industry above some reference level only when the rate of return is expected to increase. In the core GTAP -model the same approach is followed although the functional form is different. Also, the investment allocation is applied to a regional level in GTAP, while in MONASH it is specified for industry level.

The investment behaviour in MONASH is defined as an inverse logistic relationship between expected equilibrium rates of return (*EEQROR*) and growth rate in capital stock:

$$EEQROR_{i} = RORN_{i} + \frac{1}{C_{i}} \left[\ln \left(\frac{\hat{k}_{i} - \hat{k}_{i}^{\min}}{\hat{k}_{i}^{trend} - \hat{k}_{i}^{\min}} \right) - \ln \left(\frac{\hat{k}_{i}^{\max} - \hat{k}_{i}}{\hat{k}_{i}^{\max} - \hat{k}_{i}^{trend}} \right) \right],$$
(A5.2)

where, $\hat{k}_i = \left(\frac{K_{i+1}}{K_i} - 1\right)$ is the proportionate growth rate between the beginning and end of a period at the sector i,

- \hat{k}_i^{\min} is minimum possible rate of growth, which is set in MONASH to negative of the depreciation rate at the sector *i*,
- \hat{k}_i^{irend} is historically normal capital growth in a given industry, which is an observed growth rate in a given (long) historical period at the sector *i*,
- \hat{k}_i^{\max} is maximum feasible growth rate of capital defined by modeller at the sector *i*,
- C_i is sensitivity parameter in investment function at the sector i, defined by modeller and RORN_i is the historically normal rate of return in the sector *i*, which is the average rate of return in historical period where rate of growth in capital stock has been \hat{k}_i^{trend} .

In equation (2) the logarithmic terms in the square brackets are both zero when actual growth of capital is at its historical trend level. *EEQROR* at historical trend growth of capital equals then *RORN*. Equation (A5.2) states that with 'historically' normal rates of return (*RORN*) investors are willing to supply capital to that sector at a rate observed to be the long-term average. If capital growth is going to be higher than at the historical level, *EEQROR* has to be higher than *RORN* and vice versa.

The advantage of the present functional form is that excessive volatility with respect to changes in the rates of return can be controlled for and the growth of capital does not go out of bounds. When growth rate approaches minimum rates the first term of equation (2) in brackets approaches minus infinity while the second term approaches some constant. In the opposite case the first term approaches constant and the second term infinity. The shape of investment function is illustrated in *figure A.2*, where historically normal rate of return is set to 9%, rate of growth of capital stock to 3% and minimum and maximum bounds to -6%and 9%, respectively.

The advantage of inverse logistic specification relative to that GTAP specification is that it puts definitive upper and lower bounds for investments into one sector. The problem encountered in dynamic CGE analysis is that with constant returns to scale, the induced investment behaviour is very volatile and growth of capital stock can easily become an unreasonably large positive or negative number (see Malakellis, 1992). When the equilibrium of these models is disturbed by some shock, there is a strong tendency to specialization. This is ruled out in the investment schedule of (3) and capital responses induced by model shocks are expected to remain within the bounds of historically observed variation.



Figure A.2: Inverse Logistic Investment Function

By defining k^{trend} and *RORN* we fix the position of investment schedule in EROR $-\hat{k}$ -space. The slope of this curve depends on the sensitivity parameter *C* and the distances $k^{trend} - k^{min}$ and $k^{max} - k^{trend}$.

When *C* is evaluated at the neighborhood of trend growth:

$$C_{i} = \left[\frac{\partial EEQROR}{\partial \hat{k}}\Big|_{\hat{k}=\hat{k}^{trend}}\right]^{-1} \cdot \left[\frac{\hat{k}^{\max} - \hat{k}^{\min}}{\left(\hat{k}^{\max} - \hat{k}^{trend} - \hat{k}^{\min}\right)}\right]$$
(A5.3)

If we have an idea of the sensitivity of capital stock growth rate to changes in the expected rate of return at the neighbourhood of trend we can define C_i .

Equation (1) determines all rates of returns that maintain a given growth rate of capital stock in an industry. With backward looking expectations, any shock pushes investors out of this schedule. They are unable to calculate the equilibrium level of rate of return in next period. They use the following rule to anticipate the *EEQROR* as a basis for their investment decision:

(i)
$$EEQROR_{t} = EROR_{t} - (1 - \lambda)(EROR_{t-1} - EEQROR_{t-1})$$
 $0 \le \lambda \le 1$
 \Leftrightarrow (A5.4)
(ii) $\Delta EEQROR_{t} = \Delta EROR_{t} + \lambda (EROR_{t-1} - EEQROR_{t-1})$

Thus, the expectation of equilibrium rate of return is simulation period expected rate less some fraction of initial disequilibrium. Equation 4 (*ii*) is just restatement of 4 (*i*) in difference terms. The initial discrepancy between expected and equilib-

rium rates of returns is $(EROR_{t-1}-EEQROR_{t-1})$. Investors use the correction rule above to make their estimate regarding what the equilibrium of rate of return would be.

Expected rate of return in MONASH model is specified as the present value of investment divided by the asset price:

$$EROR_{i,t} = \frac{\frac{w_{i,t+1} + (1-\delta)P_{i,t+1}^{I}}{1+r} - P_{i,t}^{I}}{P_{i,t}^{I}} = -1 + \left(\frac{w_{i,t+1}}{P_{i,t}^{I}} + (1-\delta)\frac{P_{i,t+1}^{I}}{P_{i,t}^{I}}\right)\frac{1}{(1+r)}, \quad (A5.5)$$

where

 $w_{i,t+1}$ is expected rental price of capital in next period, $P_{i,t+1}^I$ is expected price of investment,ris the current period interest rate, and δ is rate of depreciation.

With backward looking expectations for any variable:

$$\frac{x_{t+1} - x_t}{x_t} = \frac{x_t - x_{t-1}}{x_{t-1}} \Longrightarrow x_{t+1} = x_t \left(1 + \frac{x_t - x_{t-1}}{x_{t-1}}\right) \equiv x_t \left(1 + g_x\right)$$
(A5.6)

Inserting this definition into (6) we get

$$EROR_{i,t} = -1 + \left(\frac{w_{i,t}(1+g_{w_i})}{P_{i,t}^I} + (1-\delta)(1+g_{P_i^I})\right) \frac{1}{(1+r)}$$
(A5.5')

The differential of (5') is the change in expected rate of profit that is used in our model formulation:

$$dEROR_{i,t} = \frac{w_{i,t}}{P_{i,t}^{I}} \frac{\left(1+g_{w_{i}}\right)}{\left(1+r\right)} \frac{dw_{i,t}}{w_{i,t}} - \frac{w_{i,t}}{P_{i,t}^{I}} \frac{\left(1+g_{w_{i}}\right)}{\left(1+r\right)} \frac{dP_{i,t}^{I}}{P_{i,t}^{I}} - \frac{w_{i,t}}{P_{i,t}^{I}} \frac{\left(1+g_{w_{i}}\right)}{\left(1+r\right)} \frac{dr}{\left(1+r\right)} + -\frac{\left(1-\delta\right)\left(1+g_{P_{i}^{I}}\right)}{\left(1+r\right)} \frac{dr}{\left(1+r\right)}$$
(A5.7)

To make the above equation operational, the rental asset price ratio has been measured by net operational surplus relative to the value of capital stock $\frac{w_{i,k}K_{i,k}}{P_{i,k}^{l}K_{i,k}}$.

From equation (7) we can see that changes in the expected rate of return are determined only by simulation period variables. Current rental price changes to balance demand and supply of capital. Asset price adjusts to balance demand and supply investment goods markets. In our model specification we have used a global discount rate that has the same role as variable *rorg* in the GTAP model. When the global-savings-equal-investments condition holds in the model, we are lacking one degree of freedom in identifying sector specific investments. With sector specific rental and asset prices already determined in the model as well as global level of investments, we let discount rate to vary in order to meet the global equilibrium condition in the determination of sector specific investments.

With the steps described above the new investment module is well determined given the neoclassical closure of the model. All components determining the rate of return are determined in the simulation period. The new formulation of investment determination and industry specificity of capital impose data requirements that cannot be met by relying on GTAP database. In the next section we describe how this additional data is possible to create by interpreting the reference year as a steady state.

A5.4 Generation of New Data and Modification of the Database

The new formulation of the investment behaviour imposes data requirements with respect to both variables and parameters that are not available from GTAP database. New data needs are related to the equation (2). All other components in the right hand side of this equation are parameters except \hat{k}_i , which by its definition requires sector specific investments on base year data. This is not available from GTAP database and it is possibly the kind of data that is non-existing for most part of the world. If one wants to utilise the sector specific capital approach, the data has to be generated somehow.

The same is true for the parameters of equation (A5.2). Most problematic it is for \hat{k}_i^{trend} and RORN_i. If we can say something about these parameters, it is easier to specify k^{min} and k^{max}, which introduce limits to industry specific capital growth. The choice made here to create the missing data is to generate it by a simulation. The first step is to collect information on growth determining (exogenous) variables from available sources, look at their trend or growth rates. The next step is to shock the model using data on these exogenous variables. In this manner we are able to generate growth patterns, which are in line with long-term development.

GTAP database includes estimates of regional aggregate capital stocks and aggregate investments. The way we can determine industry specific investments is that we interpret (or assume) that the data we observe in our reference year reflects 'steady state' or historically normal state when capital growth rate is \hat{k}_i^{trend} and rate of return on investments is $RORN_i$. When we are at steady state or historically tranquil growth path, rates of return across sectors are constant. By this fact we can motivate the use of standard GTAP model with perfectly mobile capital across industries. If we already are in a state, which does not contain any forces to change the current state of affairs, the sectoral growth rates of capital stocks reflect their steady state values that will maintain the growth patterns we already observe.

The only modification to the original GTAP model that we do in order to conduct our 'steady state' simulation, is that we determine the growth of capital stock, its availability in our simulation period, within the model. Thus we implement regional specification of equation (A5.1) to standard GTAP model. This equation tells us how much the aggregate endowment of capital changes in our simulation period. That is the period to which we introduce the long-term trend changes of exogenous variables on labour force and technological progress variables.

In order to generate a steady state that replicates itself we fix the current rate of return in return in the investment allocation equation of the original GTAP model and introduce a shift variable that adjusts the capital stock to meet this requirement. The results of our simulation work as check whether we have succeeded to replicate steady state or not. In the steady state, change in the expected rate of return should be zero and current and future period growth of capital stocks should be the same.

After we have scaled our initial capital stock to be consistent with the steady state, we distribute the aggregate capital across industries according to their share of factor rewards. What we are assuming here is that rates of return are equal across industries within regions but not across regions. Since the model simulation calculates the sectoral growth rates for capital stocks which under mobile capital assumption maintain the current rate of return, we can calculate sector specific investment levels that are consistent with that growth pattern from equation (A5.1'). This is the method we used to generate the sector specific investments, which are not available in the GTAP data.

We now have the values of sector specific investments but in order to make them as a part of GTAP database, we also have to determine their composition. This means that we have to calculate the use of intermediate inputs for every particular type of investment commodity. At the moment this has been done on the assumption that commodity composition defined by source (domestic or foreign input use) is the same in all industries⁴².

The steady state history simulation with standard GTAP model helps us to generate data we need while adopting an alternative modelling approach. In addition to getting new data, in our modified model we need some parameters while implementing the MONASH investment theory into an operative model form. From

⁴² This is not entirely satisfactory. The main problem here is that housing wealth is a major share of regional capital stocks. The assumption of uniform composition makes intermediate demand in most of the investment goods biased towards construction sector.

GTAP simulation we can get \hat{k}_i^{trend} and $RORN_i$, which are used as parameters while fixing the position of investment function.

GTAP history simulation is helpful also in another respect. Namely, in steady state the modified model and standard GTAP should produce the same results. The alternative models behave differently only when they are pushed out of equilibrium. The results obtained from standard GTAP model simulation can thus be used as control to ascertain that the modifications to the original model have been done properly.
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