

VATT-TUTKIMUKSIA
64
VATT-RESEARCH REPORTS

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**EASTERN ENLARGEMENT OF
THE EUROPEAN UNION**
Transition in applicant countries
and evaluation of the economic
prospects with a dynamic
CGE-model*

Valtion taloudellinen tutkimuskeskus
Government Institute for Economic Research
Helsinki 2000

* This study has been made as a part of the Academy of Finland's research project Opening Up of Russia and Central-East European Economies at the Helsinki School of Economics and Management Sciences. Financial support from Ministry of Industry and Trade is gratefully acknowledged. Special thanks are due to Leena Kerkelä and Pertti Haaparanta for comments and suggestions.

ISBN 951-561-313-2

ISSN 0788-5008

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Helsinki, May 2000

RISTO VAITTINEN: EASTERN ENLARGEMENT OF THE EUROPEAN UNION - Transition in applicant countries and evaluation of the economic prospects with a dynamic CGE-model. Helsinki, VATT, Valtion taloudellinen tutkimuskeskus, Government Institute for Economic Research, 2000, (B, ISSN 0788-5008, No 64). ISBN 951-561-313-2.

Abstract: In this study the economic implications of eastward enlargement are analyzed using a multi-regional, dynamic general equilibrium model. EU's eastern enlargement is, in one respect, conventional regional integration where new entrants joins a customs union. In the common trade policy an important aspect is the specific features of the common agricultural policies of the EU.

Enlargements also entails the adoption of common market institutions and legislation for the new entrants. This aspect of integration consolidates the reforms that has been taken place in the former planned economies in Central and Eastern Europe. Membership in EU provides also unconditional access to European common markets. These facts are expected to increase the business confidence in the area and lower the required rate of return on investments, which will stimulate growth in the new members.

Key words: *Integration, Common Markets, Trade policy, Eastern Enlargement, CGE modeling.*

JEL classification: D58, F02, F13, F15.

Tiivistelmä: Tässä tutkimuksessa analysoidaan Euroopan Unionin itälaajentumista monen alueen yleisen tasapainomallin avulla. Uusien jäsenmaiden näkökulmasta laajentuminen on alueellista integraatiota, jossa niistä tulee jäseniä tulliliitossa. Keskeinen asema yhteisessä kauppapolitiikassa on EU:n maatalouspolitiikan erityispiirteillä.

Laajentuminen merkitsee uusille jäsenmaille myös yhteismarkkinoiden instituutioiden ja lainsäädännön omaksumisen. Tässä suhteessa EU-jäsenyys vakauttaa talouspoliittisia uudistuksia, jotka ovat olleet meneillään Keski- ja Itä-Euroopan entisissä suunnitelmatalouksissa. Jäsenyys EU:ssa takaa myös uusille jäsenmaille täysimääräinen pääsyn sisämarkkinoille. Kummatkin tekijät ovat omiaan lisäämään luottamusta uusien jäsenmaiden talouskehitykseen ja alentamaan sijoitetulle pääomalle vaadittua tuottoa, millä on myönteinen vaikutus talouskasvuun.

Asiasanat: *Integraatio, Yhteismarkkinat, Kauppapolitiikka, Itä-laajentuminen, YTP -mallintaminen.*

JEL luokitus: D58, F02, F13, F15.

Prologue

All through the 1990ies the research programmes of the Government Institute for Economic Research have included studies concerning the economic effects of the European integration. This time the focus is on the eastern enlargement of the EU.

The study reports the results of the enlargement based on the macroeconomic general equilibrium model. This type of model allows taking into account various interactions between trade and factor movements to the participating countries. In addition to the usual static effects on resource allocation the model takes into account also the effects of enlargement on capital formation, and therefore is able to analyse the plausible dynamic paths of the adjustment process.

Enlargement means that the applicant countries will form in the future common trade policy and internal market together with the current EU. In principle the customs union and single market will increase the internal trade in the region and may to some extent divert the former trade with non-member countries towards the member countries. One of the major adjustments will occur in the agricultural sector. It seems that the effect will be negligible or slightly negative to the incumbent EU countries, mainly due to the increase in the agricultural subsidies. New member countries, however, experience a clear positive gain, amounting approximately to two percent of their gross domestic product. All together the effects, even though significant, do not seem dramatic at the macro-level. The real microeconomic adjustments and implementation of the new rules in the enlarged union is another matter and requires another type of study.

International economic implications of the enlargement will mainly remain inside Europe since the applicant countries because their modest size in the world economy. The share of applicant countries on the world trade is only two percent.

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Director-General

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1. Introduction

The eastern enlargement of the European Union (EU) has become an important part of the political and economic process for the further development of the European Union. The process of enlarging the EU eastward has begun to take form. On 31 March 1998, accession negotiations were started with six applicant countries: Hungary, Poland, Estonia, the Czech Republic, Slovenia and Cyprus. On 13 October 1999, the Commission recommended Member States to open negotiations with Romania, the Slovak Republic, Latvia, Lithuania, Bulgaria and Malta. Member States endorsed this at the Helsinki Summit on 12 December 1999.

In this study we evaluate economic implications of the enlargement of the European Union to include the Central and Eastern European countries (CEECs) as new members to the Union. The enlargement implies two kinds of changes to the economic environment of the acceding countries. In one respect it's a conventional regional integration where new entrants join a customs union. In the common trade policy important aspect are the special features of the common agricultural policies (CAP) of the EU. The EU is far more protectionist in its trade policy in agricultural commodities than the potential new members. On the other hand industrial tariffs on average are higher in the CEECs.

On the other hand new members will gain unconditional access to European common markets. Harmonized legislation and regulations govern common markets. This aspect of integration consolidates the reforms that has been taken place in the former planned economies and it's expected to increase the business confidence in the area and lower required rate of return on investments and stimulate growth through this effect. We analyze the economic implications of eastward enlargement using a multi-regional, dynamic general equilibrium model.

In the intended enlargement, new member countries are at vastly different stage of economic development compared to the present members of the EU. Most of the acceding countries have experienced historical transformation from central planning to market oriented economies. The transition has been largely a process of market creation with significant institutional changes embodying large-scale privatization and imposition clearly defined property rights and other institutions that enhance market exchange.

The outcomes of the transition process in the former centrally planned economies have been extremely diverse in different countries. Mainly the economies of Former Soviet Union have not been able to pick up the growth path after the initial disruption in the production that characterized the systemic change in the beginning of transition. In chapter two of this study we give a brief description of the transition process in Central and Eastern European countries to give a

perspective for our analysis of economic integration in Europe. We argue that the development in last decade has been different in CEECs compared to most of the other transition economies.

In chapter two we characterize the stabilization and subsequent transition, together with institutional changes that has been taken place in the countries applying membership to the European Union. Most of these countries have succeeded to create relatively stable institutional environment for their economies and catch the growth path. In comparative terms these economies has become closest in institutions and functioning to the developed market economies.

The progress the CEEC-countries has experienced, makes it a sensible exercise to analyze the enlargement using a computable general equilibrium model (CGE) that is based on Walrasian theory of general equilibrium. In chapter three we present our model that is a dynamic extension to a standard comparative static multi-regional CGE-model. We first outline the main building blocks of the comparative static GTAP-model as presented by Hertel and Tsigas (1997) and then the key elements needed to incorporate recursive dynamics in to the model along the lines it has been introduced to an Australian MONASH-model (Dixon and Rimmer, 1997).

In chapter four we first describe the country and industry specification that we are using in our model. In implementation of our enlargement exercise to a multi-regional model we use database characterizing production, trade and resource allocation in the world economy. This data has been compiled by Global Trade Analysis Project (GTAP) at the University of Purdue. The database is publicly available and McDougall et al. (1998) documents it.

Since, the model we use is a dynamic one we, need additional information to implement our baseline scenario. The factors characterizing growth paths of regional economies and some modifications needed to incorporate accumulation dynamics and specific features of the EU's common agricultural policies (CAP) are discussed in sections two and three of chapter four. In section four we set out our enlargement scenario and in section five we present the simulation results and discuss the expected outcomes of the enlargement. In section six we do some sensitivity analysis with an alternative scenario for world market development. In chapter five we do concluding remarks.

2. Economic Transition in the Central and Eastern Europe

The break up of Soviet economic bloc and the consequent transition of its associates to market oriented economic system has involved both internal and external liberalization of transactions in these economies. Internal liberalization has meant liberalization of price system and replacement of central plan by markets as a coordinating mechanism of resource allocation. It has also facilitated private sector entry in economic activities and privatization of the state owned production. External liberalization has consisted of 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. Adoption of norms of conduct in international trade that are accepted by WTO and current account convertibility with transparent foreign exchange regime has taken place.

The extent of liberalization varies among different countries. Transition has been most comprehensive in some of the Central European economies, whereas it has been most incomplete in certain Republics of the Former Soviet Union¹. In this chapter our main focus is in the transition taken place in Central and East European countries. In order to get impression of their progress in this process; we compare their development with less successful countries.

2.1 Transition as a Systemic Change

In the socialist economies, the allocation of resources was coordinated by central plan, which was based on quantitative output targets specified in physical units. Priority was given to heavy industry over consumption goods. Macroeconomic balance was a consequence of direct control by central authorities. Financing of enterprises was set by credit plan, taking into account investment targets, and implemented through the mono-bank sector (de Melo et. al., 1996). The major source of government income were enterprise profits taxes (see Bruno, 1994 p.40), which were used in transfers and direct expenditures that consisted 46 to 56 percent of GDP. Under the conditions of administered prices, the wage control formed the key instrument to keep the balance between supply and demand.

In the pre-transition period, the purchasing power exceeded the ability of planned economies to supply consumer goods, which caused an involuntary accumulation

¹ On the relative success of this process see de Melo, Denizer and Gelb (1996), where Asian part of the Soviet Union as well as China and Viet Nam is studied. An extensive survey on various aspects of transition in mainly European countries is in *Economics of transition in Eastern and Central Europe* (Oxford Review of Economic Policy no.2, 1997).

of nominal assets. Together with the fact that prices of many essential goods were kept at a low level, the transition economies entered the systemic change in a situation of repressed inflation. The liberalization of prices induced an initial price hike. The initial conditions and macro-economic stabilization are studied in section two of this chapter.

In the central planning system, prices played only an accounting role and central authorities set them. Prices did not necessarily reflect cost of production or scarcity of factors. One gets an impression of the magnitude of resource misallocation from the study of Hughes and Hare (1992), who have used quality adjusted international prices to evaluate the competitiveness of industries in transition economies based on input-output data.

Table 2.1. Shares of output in industries with negative value-added at quality adjusted world prices

	Share of output
Bulgaria	50.8 %
Czechoslovakia	34.8 %
Hungary	34.6 %
Poland	8.4 %
USSR	22.3 %

Source: Hughes and Hare (1992).

Table 2.1 presents shares of output of those industries where value-added measured at international prices was negative i.e. the value of intermediate input use was larger than the value of output evaluated at international prices. These figures indicate that at given input use 10-50 percent of industrial activities was in fact only wasting resources. 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). It has been estimated that Russia's subsidies to Central East European countries in terms of subsidized energy prices was \$ 18 billion and the terms of trade losses after trade liberalization for CEEC's was about 10 percent of GDP (World Bank, 1996 p. 27). Foreign trade and external liberalization are studied in a separate section of this chapter.

Together with the initial macroeconomic imbalances and distorted relative prices, the sudden disruption of the planning system as a coordinating mechanism was exacerbating the initial liberalization shock. Old delivery and credit institutions were discarded before new institutions were firmly established. The absent institutions of transactions and distribution were a source of coordination failure that was related to limited information about the sources of delivery and uncertainty about availability of materials.

The growth in the lack of coordination can be thought of as a negative supply shock with increasing transaction costs. These costs are related to both internal and external market transactions and should have been higher in countries with higher specialization. Particularly, this is true for the former Soviet states, for which the intra-union trade comprised typically over 80 per cent of total trade and a much higher share of GDP than in Central Europe (Kaminski et. al., 1996). As a consequence, the disconnection of previous trade links did drive some of the former Soviet states almost to autarky, when trade collapsed to one tenth of its previous level.

The process of systemic transition from planning economies to market based democracies have consisted of groups of sequentially introduced complementary policy reforms in different areas of society. Fischer and Gelb (1991) have characterized these by the length of the time the reforms will take and the order of intensity that is required at the beginning of the process. They divide domains of the reform in four areas: Macro-stabilization, price and market reform, restructuring and privatization as well as redefinition of the role of state. Those areas where intensive action is needed at an early phase of the reform are macro-stabilization, price reform in goods and services production and external trade, as well as small-scale privatization. Those areas, which need longer preparations before intensive action can take place are labor markets, banking sector and large scale restructuring and privatization.

In the next section we will take a short look at price liberalization and immediate macroeconomic stabilization. In the following section the external liberalization is characterized and in the final section of this chapter some structural development and implications of the transition are summarized.

2.2 Macroeconomic Stabilization

All the Central East European countries liberalized their commodity and services markets at the beginning of 1990's and introduced macroeconomic stabilization plans at the same time. The first country, which implemented such a program, was Poland who introduced a comprehensive stabilization and market reform program, the so-called Balcerowicz plan, in January 1990. Poland was followed by all main CEEC's approximately within a year. The main characteristics of these reforms have been summarized in table 2.2. The Polish plan provided a prototype for the followers and Gros and Steinherr (1995) have summed it up to the following elements:

1. Instantaneous liberalization of almost all prices simultaneously 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 expected monthly rate of inflation and taxes were levied on wage increases above the guideline in state enterprises.
4. Unilateral suspension of debt service, followed by rescheduling of foreign debt with postponed interest and debt amortization; large scale debt relief followed by official creditors in 1991.
5. Currency convertibility for residents and current account transactions followed by substantial devaluations.
6. Trade liberalization with tariff reductions and introduction of fairly uniform tariff structure, elimination of export quotas and automatic authorization to international trade for all registered firms whether state or private owned.
7. Implementation of further institutional reforms including development of banking and credit institutions, competition legislation and privatization accompanied by capacity restructuring in medium term.

Although the programs adopted by other countries resembled that of Poland there were also differences in the individual plans. Bulgaria and Romania adopted more gradual approach to price liberalization, while Hungary had partly liberalized its pricing system before the reform and stabilization program. The choice of exchange regime differed. Poland and Czechoslovakia adopted fixed exchange rate system while Bulgaria and Romania, who were lacking exchange reserves, chose floating inter-bank system to determine the initially depreciated exchange rates (Bruno, 1994). The size of initial devaluations varied also considerably. The realignment was far largest in Poland, very large in Romania, sizable in Czechoslovakia and Bulgaria but not large compared to Poland and Romania and moderate in Hungary.

2.2.1 Initial Conditions of the Transition

The initial conditions, which prevailed when the reforms were entered, are described in table 2.3. Prices were completely determined by administrative practices except in Hungary and to some extent in Romania. State ownership dominated organization of production with some private activities in Hungary and Poland where large part of agriculture was carried out by small-scale private farms. The comparatively fast growth of 1970's had almost stagnated in 1980's and had already started to decline somewhat before the reforms were launched.

The CEEC-countries were fairly open economies already at the beginning the transition². Some of them, namely Hungary, Poland and Bulgaria, had accumulated large external debts. All of these countries were heavily dependent

² The figures of trade share on GDP are taken from previously constructed GDP statistics. There is uncertainty about the extent of because of administrative nature of trade within CMEA. These figures are at least consistent with SNA accounting system.

on foreign trade within the socialist bloc,³ but most dependent of Soviet trade were Czechoslovakia and Bulgaria.

Table 2.2. Stabilization and reform programs in Central-Eastern Europe

	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 %	13-7 %	17.4-4.0 %	16.7-3.0 %	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 % devaluation in January, then managed	Initial sizable devaluations, then fixed	Floating Inter- bank	Floating Inter- bank
Foreign trade liberalization	Extensive	Extensive	Extensive	Limited	Limited
Wage policy	Tax based incomes policies	Tax based incomes policies	Tax based incomes policies	Real wage cut by 35 % implemented by ceilings in wage bills	Tax based incomes policies
Interest rates	Increase before program and flexible thereafter	With abolition of interest rate ceilings will be market based	Establish positive real interest rates	Very large increase before program; flexible thereafter	Complete liberalization
Small-scale privatization	Yes	Yes	Yes	Yes	Yes
Sale of state enterprises	Slow	Some	Some	Slow	Mostly land
Property destitution	Yes	Yes	Yes	Yes	Yes
Mass privatization through vouchers	Delayed	Delayed	Delayed	Delayed	Delayed

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

Excessive cash balances of public, i.e. monetary overhang, was a well-known problem of the price liberalization. When markets were 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 are disproportionate to production possibilities general price level increase would balance nominal demand and supply. The reason for excessive nominal assets in socialist countries was the mismatch between wages and the amount of available goods, so that the sum of wages exceeded the supply of

³ The trade share within East Europe includes trade with Soviet Union.

goods at the price level fixed by government (Gros and Steinherr, 1995, p. 157). In last years before the transition this phenomenon was aggravated because of lack of discipline and growing economic disorder in these societies (see Gros and Steinherr, 1995 p. 126).

The ratio of money to gross domestic product can be taken as a proximate measure of monetary overhang. Bruno (1994) considers ratio of 0.4 as a norm, to which the initial situation in CEEC's should be compared. In this respect there was no monetary overhang in Hungary, it was large in Poland and Bulgaria and half-smaller in Czechoslovakia and Romania.

In this comparison it seems that Bulgaria and Poland had the most unfavorable inheritance of the previous system at the beginning of the reform process. They had large internal imbalance and were deeply indebted externally and Poland was also running a large public sector deficit. Bulgaria was heavily dependent in its trade with the Soviet Union and the East European associates. Hungary had already liberalized some of its markets and decentralized the planning mechanism before the systemic reform. Measured by monetary overhang it seemed to be in internal balance, but also Hungary was heavily indebted externally.

Table 2.3. Initial Conditions of the Transition

	Hungary	Poland	Czecho- slovakia	Bulgaria	Romania
Population (mil.)	10.9	37.9	15.6	9.0	23.2
GNP per capita (in 1989 US\$)	2590.0	1790.0	3450.0	2320.0	2290.0
GNP Growth in %					
1970	4.5	5.5	4.6	7.0	9.3
1980	0.5	-0.7	1.4	2.0	1.8
Investments % of GDP	21.6	38.5	26.8	32.3	26.8
Administered prices 1990	15.0	100.0	100.0	100.0	80.0
State ownership	90.0	70.0	100.0	100.0	100.0
Money(M2)/GDP (1990)	0.4	0.9	0.7	1.3	0.6
Fiscal balance % of GDP (1989)	-0.8	-7.4	-2.4	-1.5	8.4
External debt/GDP (1990, %)	65.0	80.0	19.0	50.0	3.0
External debt-service ratio (1990)	57.0	56.0	23.0	116.0	...
Exports in 1989					
% to Eastern Europe	42.7	39.1	59.6	75.5	39.6
% to Soviet Union	28.3	25.0	43.1	58.1	30.4
% of GDP	36.0	28.6	33.3	34.5	20.9

Sources: Bruno (1994) except for fiscal deficits Budina and Wijnberg (1997), regional breakdown of exports Rodrick (1994) and share of GDP own calculations from OECD (1995).

Somewhat ironically the countries with most authoritarian regimes namely Czechoslovakia and Romania had rather favorable initial conditions for liberalization in terms of internal and external balance. They had modest monetary overhang and modest or nonexistent foreign debt. Czechoslovakia had moderate fiscal deficit and Romania had a large fiscal surplus⁴.

2.2.2 The Price Shocks

Table 2.4 presents some key indicators of macroeconomic development during the transition. As was expected the inflation peaked in double or even triple digit numbers in all of the CEEC's in the beginning of the transition. In the cases of Hungary and Poland the peak year of inflation was even before they started their stabilization and reform programs. In fact, Poland initiated its program in the midst of hyperinflation when prices were rising 640 percent annually. Since the peak years the separated republics of Czech and Slovakia have succeeded to moderate their inflation at fairly low and stable level with prices increasing at 10.7 and 6.7 percent. The inflation rate is relatively low and declining also in Hungary and Poland, where price level is growing at a rate that is comparable to recent successful stabilizers in Latin America and Israel (see Bruno, 1993).

Romania and Bulgaria are cases where inflation has remained high after the initial price shock. On average prices have been growing at annual rate above 100 percent in 1990's. In Bulgaria the high inflation seems to be moderating but in Romania the inflation, although lower than decades' average, is still above 50 percent. 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 present monetary instability in these economies.

The initial price shocks were substantially larger in all of the reforming countries to that what was anticipated. This has been the case also in the corresponding costs, to stabilize inflation, in terms of output decline (see Bruno, 1994, table 1.3). The possible reasons for higher than expected costs are manifold and we review shortly some of these here.

Wage indexation is one of the possible sources of persistence in inflation. Gros and Steinherr (1995 ch. 5) shows in a simple wage indexation mark-up pricing model that 50 percent indexation doubles the initial price hike caused by monetary overhang and 80 percent indexation will amplify the price shock by factor of 5.

⁴ Although there is evidence that part of fiscal deficit was hidden on central bank's profit and loss accounts (see Budina and Wijnbergen, 1997).

Table 2.4. Macroeconomic development of CEEC's in Transition

	Lowest level of production 1989=100 ^a	Average growth rate since recovery	Growth in 1998	Level of GDP in 1998 1989 = 100	Inflation peak ^b	Average inflation since 1991-98	Inflation at 1998
Bulgaria	63 (1997)	2.5	2.5	65	1082 (1997)	117	22
Czech Republic.	86 (1992)	2.4	-2.7	96	57 (1991)	13	10.7
Hungary	82(1993)	3.0	5.1	95	35 (1990)	22	14.3
Poland	82 (1991)	5.1	4.8	117	640 (1989)	28	11.8
Romania	75 (1992)	0.3	-7.3	76	256 (1993)	104	59.2
Slovak Republic	75 (1993)	5.7	4.4	99	61 (1991)	12	6.7
Slovenia	82(1992)	4.2	3.9	104	207(1992)	25	8

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

^b Number in the parenthesis indicates the year of highest inflation.

Source: EBRD (1999).

As was already seen in the case of Bulgaria and Romania, the consolidation of fiscal balances is an elementary part of stabilization, because it's impossible to sustain monetary stability with loose fiscal policies. An immediate institutional task in this respect was the establishment of modern budgetary system for government with tax administration and regulatory body to link different budgetary appropriations with the expected government revenues. Well functioning administrative procedures were needed to avoid tax evasion because of growing private sector and loosening of the government control over public owned enterprises.

Reforming of the fiscal system was not only a problem of setting up the administration but implementing a tax-system, which treats different agents in a neutral way and establishes a stable tax-base⁵. The problems of premature fiscal institutions are at least partially reflected in the fact that fiscal deficits were larger than anticipated in all of the reform programs (see Bruno, 1994 table 1.3)⁶.

One instrument in the reform programs was the elimination of the subsidies to producers, which served the aim to reduce distortions in the economy along with

⁵ 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.

⁶ A contrary example of unsettled practices was unanticipated fiscal surplus in a later phase of stabilization in Poland. The reason for this was profit taxation which was defined in a way that did not take into account the speed of inflation, which in conditions of hyperinflation grew disproportionately (Berg and Blanchard, 1994).

the stabilization of fiscal balances. The market structure that prevailed at the start of the reforms created an additional ingredient to initial price response of the liberalization. The production of industry was traditionally organized into large units⁷. The potential market power of state owned companies gave firms the possibility to pass through the cost effects of subsidy cuts if they were allowed to behave monopolistically. In this respect the foreign trade reform was essential in introducing external competition to eliminate the potential of few domestic firms to exercise 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.

Berg and Blanchard (1994) have studied econometrically the inflation process in Poland by a simple aggregate monopolistic wage and price setting model, which has a close resemblance to that of Gros and Steinherr⁸. We review it here shortly, because it's one of the few econometric studies of the stabilization process in transition economies. Poland is interesting case also because it started the stabilization and economic reform program before the break-up of CMEA⁹. 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 find out, that neither the increase in wages or mark-ups was responsible for the initial price increases. The main sources of the immediate price rise were the growth in non-labor costs and reduction in the labor productivity. Thereafter, the process was driven by two factors, namely relative increases of consumer prices over producer prices and decline in the mark-ups.

Consumer price development was caused by increases in electricity, gas and housing prices, as well as widening of retail price margins. The prices of household essentials were kept at low nominal level in the socialist area and prices increased when government subsidies were cut and the removal of rationing brought prices closer to their economic costs¹⁰. Changes in the retailing sector were due to the fact that in the former system the distribution network for consumer commodities was a neglected activity and was backward. Also, the

⁷ 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)

⁸ Blanchard (1989) has shown that depending on the sizes of parameters this type of model can be consistent with various stories at the background.

⁹ 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.

¹⁰ In Poland 80 percent increase for heat gas and electricity were needed to roughly cover their economic costs. This would cost for average household 8 percent of their budget. A similar situation was estimated in other transition economies (see World Bank, 1996 ch. 2).

administrative pricing system did not take into account the true costs of distributing commodities¹¹.

Berg and Blanchard see two reasons for the decline in mark-ups. The first one is increased foreign competition, which restrained the possibilities of domestic firms to exert monopoly power. As the dominant reason for reductions in mark-ups they, however, see the wage increases.

In the stabilization program tax based incomes policies were introduced to restrain wage development. Initially it 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 coefficient of 0.3. High marginal tax to enterprises was imposed on increases over the norm in wages. Wages did originally develop below the norm, due to uncertainty in firms, about the consequences of stabilization to the profitability. At a later phase of development this lagging behind could be compensated by above norm wage increases. Because the original wage norm was defined in terms of wage bill, the reduction in employment gave additional room for unit wage increases. So the persistence of inflation was characterized by catch-up in wages.

Berg and Blanchard interpret their results as not giving support to pre-stabilization fears that excessive devaluation together with monopoly power and sharp supply bottlenecks could cause price increases far in excess of costs. Monopoly power and supply bottlenecks would have been reflected in increased mark-ups. In the case of devaluation policy they refer to Bruno's (1994) argument to the possibility that domestic firms, in lack of any other reliable measure, might have used exchange rate as a yardstick to their own pricing policy even though their own activities were unrelated to foreign trade. This kind of conduct could have been seen in the increases in the mark-ups.

Although it seems to be the case that devaluations did not have undesirable effects on the market structure, one cannot right ahead argue that they were not excessive in order to correct the external imbalance. Bruno points out that it took one and a half-year of high inflation before appreciation in real exchange rate started to erode any of the competitiveness effect of the initial devaluations¹².

The devaluations have certainly contributed to the inflation through import price development. They coincided with the terms of trade shock due to collapse of

¹¹ At the beginning of the transition the major expansion in private sector activities took place in those sectors which were 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 sectors compared to 10 percent in 1989 (Berg and Blanchard, 1994).

¹² In discussion on Berg - Blanchard article it was pointed out by Winiecki that since Poland adopted pegged exchange rate regime in 1990 the prices rose by 330 percent before any realignment did take place (Blanchard et. al. p. 90).

CMEA¹³. As a consequence of this the member countries shifted to trade with world market prices and replaced transfer ruble system with convertible currencies. One implication of trade regime change was the rise in oil price, which was mainly imported from Soviet Union.

Although, for Poland, the terms of trade shock might not have been as notable as for some other Central European countries, because it had own energy resources as well, the oil price development has been important. In Berg - Blanchard study this is reflected as a new non-labor cost shock in the first quarter of 1991 at the time when Gulf war broke out and caused a new oil price shock to the world economy.

2.2.3 The Output Decline

Output development during the transition is summarized in Table 2.4. Looking at the plain figures, the initial collapse in output has been really 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 1930's or the civil war in Spain¹⁴. If the previous systems were inefficient in allocating the resources what are the reasons for so large 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 variety of authors and for several reasons. In this section we first discuss about practical and conceptual issues of measuring the output decline and then discuss the reasons behind it.

Several authors (Berg, 1993, Rose, 1995 and Earle, 1995 among others) have questioned the severity of transitional recession. There are both conceptual and measurement issues behind the doubts whether reported figures of decline in GDP reflects correctly the deepness of economic decline that has followed since the start of the transition process.

Measuring the output decline

The conventional reference year in most of the statistics that describe macro-economic transition has been 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 account for a significant amount of

¹³ Shift to world market prices and at least partial convertibility happened before the complete dissolution of CMEA and the consequent collapse of trade between CMEA partners.

¹⁴ For comparisons see Boone et. al. (1997)

value added included in GDP. The availability and quality of data, thus sets limits to the reliability for constructed GDP of the reference year.

Earle (1995) questions the capacity of statistical authorities to record the growing activity of the emerging private sector. He gives several reasons for this. Statistical offices of the former socialist economies that were accustomed to accounting practices of material product system (MPS), have had to change with few resources to new, very different, system of national accounts (SNA). This happened in a time of structural change where relative importance of services increased at the cost of agriculture and industrial production. The expansion of economic activity was taking place disproportionately in small-scale private firms. The contraction of activity was taking place in large-scale state owned enterprises and producer co-operatives. The decline in activities appeared in those activities that statistical authorities were accustomed to monitor and the growth of activities, with entry of thousands of new legal entities, in sectors that were de-emphasized, ignored or absent in the old accounting practices.

Besides the institutional capacity of recording correctly the magnitudes of declining and expanding economic activities there are at least two conceptual issues in measuring the quantity change of 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 old ones that do not have sufficient demand that would make their production as profitable economic activity. This might cause measurement problems if the introduction of new products involves large improvements in the quality of products. The importance of 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.

Demand shift

Berg (1995) has characterized the transition process as a resource shift from 'surplus' sector to 'shortage good' sector. Central authority controls the relative size of the output between sectors by allocation of factors of production. Unless this allocation mimics market allocation, the output of one of the sectors is in short supply at given prices. If there is no saving, the income left over after the purchase of scarce good will be spent on the other good. Berg calls this forced substitution. Price liberalization in this kind of situation would lead to relative increase in effective demand in the shortage sector and decline in the demand the surplus sector without any change in the input costs or subsidies. The consequent decline in surplus sector is likely to be larger than the expansion in shortage sector if there are rigidities in allocation of factors. This will cause transitory output 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 the market demand and is a welfare improvement relative to initial situation.

In addition to 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 collapse in the CMEA regime that initially generated fall in export demand. In the beginning of the transition, inventory investments declined dramatically. Berg claims that in Poland in 1990 decline in inventories was the main source of output decline and in 1991 still contributed one third to the output decline at time when the CMEA trade shock took place. Berg gives several reasons to this phenomenon. In Soviet-style economies, firms were eager to accumulate as much inventories as they could. In those economies the principle obstacle to increase production was pervasive shortage of inputs. This encouraged hoarding when interest rates were low or negative.

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 source of output decline in Bulgaria in 1991. For the rest of the Central European countries the trade collapse was not that important but still contributed about half of the fall of GDP in Czechoslovakia, Hungary and Poland. It did not have any importance for the decline in Romania because it had so loose trade contacts with the former Soviet Union. The trade collapse turned out to be partly of transitory in its nature since it was in very short time compensated by trade with Western Europe particularly with European Union. This seems to be only partly the story. The shift to the world market prices, in Soviet trade, seems to have caused deterioration in the terms of trade for the CEEC-countries, that is about half of the trade loss (Rosati, 1995). The development of trade is discussed in separate section together with trade liberalization.

2.3 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 to exploit their comparative advantage and reallocate their resources. Secondly, the opening up of domestic markets has increased import competition, which has reduced the market power of large domestic companies that have dominated the market structure in the former socialist countries¹⁵.

¹⁵ The production in industry was traditionally organized into large units. 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 (see Fingleton et. al., 1995). This pattern is uniformly true for individual sectors. These figures have come down considerably after the first years of transition.

Table 2.5. Destination of CEEC's Exports

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

Source: Piazzolo, 1997.

Since the break up of CMEA there has been a fast redirection of trade among Central East European countries. The main incidence of this re-orientation has been in the markets of European Community. In few years EC's share on exports from these countries 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 that actually realized. Trade to EC has expanded by gaining market shares. The growth of market shares has continued after the immediate years of transition in 1989-1992 but their importance to expansion of trade has somewhat diminished at the late phase of transition.

Table 2.5 describes the geographic pattern of CEEC's exports in three different eras. The first year 1929 is representative of time before socialist systems were introduced into Central Europe. The second year 1984 represents time during CMEA and the last year 1994 time after the dissolution of CMEA and trade reorientation. At the socialist era half of the CEEC's trade was between CMEA partners on average. The trade with former Soviet Union was in dominant role. After the break-up of CMEA in 1991 the re-orientation of trade toward geographical patterns that prevailed in 1929 has been amazingly fast. The main differences in 1994 with the situation in 1929 are in the trade within CEEC's and country composition in the trade with the current members of EU. The intra regional trade within CEEC has not gained the same importance that it used to have in 1929. In the trade with EU the main change has been in the growing importance of Germany as a destination of trade while Austria's role has diminished in this respect.

Table 2.6. Exports of CEEC's in billions of US\$

	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 Republic	8.87	8.59	7.69	8.11	8.77	14.46	15.88	21.27	22.18	22.78	26.36
Slovak Republic	3.51	3.40	3.04	3.21	3.50	5.46	6.71	8.59	8.82	9.64	10.67
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

Source: Economic Survey of Europe, UN, 1999.

Table 2.6 describes the development of exports in CEEC's. Their exports started to decline already in 1988 and reached the bottom line in 1991, when CMEA broke up. The reason for trade decline before the dissolution of CMEA were USSR's difficulties to meet its obligations in bilateral trade (Gács, 1995). Since 1991 exports have recovered and reached the pre-transition levels on aggregate in 1993 and have more than doubled in five years when the lowest level was reached.

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 there was in fact export growth already in 1991. The high export growth indicates fast reorientation and opening up of the CEEC-countries.

Probably the main adverse effect of CMEA dissolution was the terms of trade shock that was due to increased prices of energy imports to CEEC-economies emphasized e.g. by Rosati (1995) and Gács, (1995). Only in the case of Bulgaria it seems to be the case that it has not been able to gain as large share of 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 in the fact that resources were excessively devoted to open sector in because of Ceaucescu's earlier policy to pay back Romania's foreign debt. Thus decline in exports can at least partly be seen as resource shift toward domestic needs.

Several trade policy changes have facilitated the integration of former socialist countries to the rest of Europe in 1990's. The European Agreements, signed bilaterally by EU and all Central European countries, are the most significant elements of these changes. CEEC's have also established free trade agreements

with EFTA countries. Although the significance of these agreements have 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 liberalization to Western Europe the Central European countries have liberalized their mutual 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 agreement was to gradually establish a free trade area in accordance of with article XXIV of GATT during a period ending on January 1 in 2001. Industrial and agricultural commodities are dealt separately in this agreement. The original timing of liberalization of several commodity categories has been speeded up and in 1997 approximately 90 percent of trade in industrial products if free of restrictions (Richter, 1997).

The Europe Agreements liberalizes bilateral trade between EU and the Central European and Baltic States. The Agreements define the relationship between EC and associate countries not only for trade relations but also for commercial practices and law, financial co-operation and political contacts. Besides liberalization in commodity trade, the objective of the agreements are gradual harmonization of economic policies and the progressive adaptation of EU's legal framework in the associate countries (see, Mayhew, 1998). 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. Three Central European countries Czechoslovakia, Hungary and Poland originally signed the agreements in 1995. In 1995 all membership candidates have made the bilateral agreement.

The Europe Agreements does not fully liberalize trade among associate partners. Agricultural trade is included in very limited sense to these treaties. The Europe agreements also follow 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 beginning of 2001, although the slow phasing of tariffs covers only narrow range of products.

2.4 From Plan to market: Structural Change and Progress in Transition

The transition of former socialist economies has been as systemic change of societies from centrally planned towards market oriented economies. In different countries this has taken place at various degrees. Some of the Central European countries and Baltic states of the former Soviet Union have taken most

considerable steps in organizing their economies on the standards and performance that is typical for advanced industrial countries. Initial macro-economic imbalances and distorted resource allocation have conditioned the transition. Basically, those countries which have liberalized their economy fast, have followed fiscal austerity and disciplined monetary policy, have succeeded to stabilize their macroeconomic environment (de Melo et. al., 1996).

Although, the IMF-type orthodox stabilization has led to sharp decline of inflation in countries where it has consistently applied, the cost of this policy has been significant in terms of output decline¹⁶. Despite the uncertainty of the exact size of the output fall, it has undeniably been considerable in all transition economies. The initial contraction in output during the first years of transition was between 15-50 percent according to official statistics. Only Poland has reached its pre-transition output level.

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

It's an unresolved issue, whether there would have been less costly strategy to stabilization. At the moment it seems anyway that the radical reforms has paid off. The output decline was less sharp in these countries and the output recovery has started earlier (de Melo and Gelb, 1997 and Fisher, Sahay, Végh, 1997). Figure 2.1 describes inflation and growth performance of 25 transition economies in 1993. The scatter points of Central European and Baltic countries are picked up individually. The figure clearly indicates that price stability (low inflation) has positive correlation to output performance. Variations of inflation rate explain 40 percent of the variation in output change. The experience of Poland relative to other Central European countries also gives support to the view that stabilizing the inflation might not be that costly. Poland succeeded to come down from

¹⁶ It's debatable how much it has actually declined. Reasons for downward bias in GDP statistics among other things are the ability of Statistical offices to take properly into account the contribution of emerging private sector output and possible underreporting of output in order to avoid commodity or profit taxes.

considerably higher inflation figures with similar initial output loss as Hungary and Czech Republic.

Figure 2.1. Relationship between Inflation and Growth in Transition Economies 1993

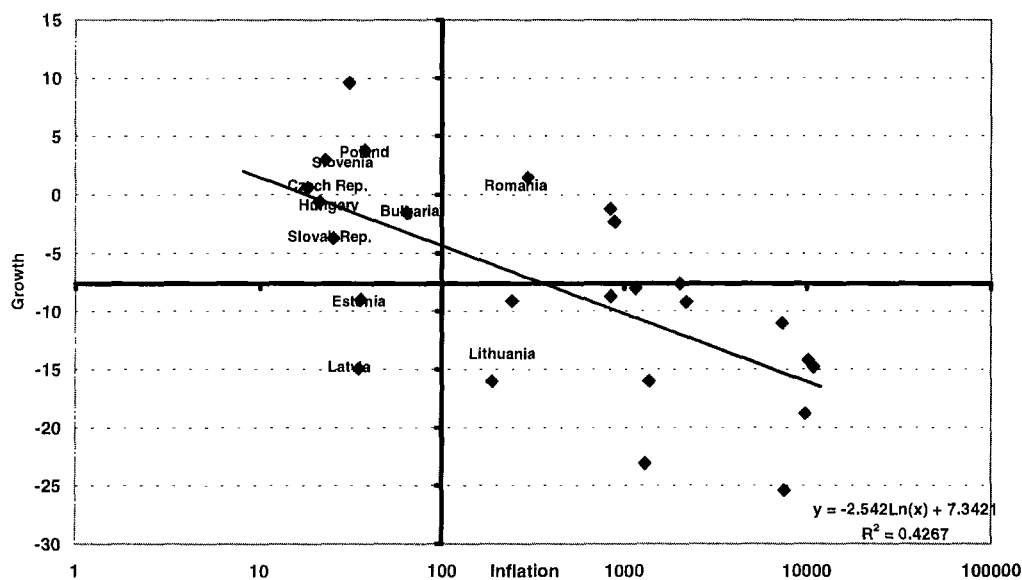


Table 2.7. Structural Change in CEEC's

	Agriculture ^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

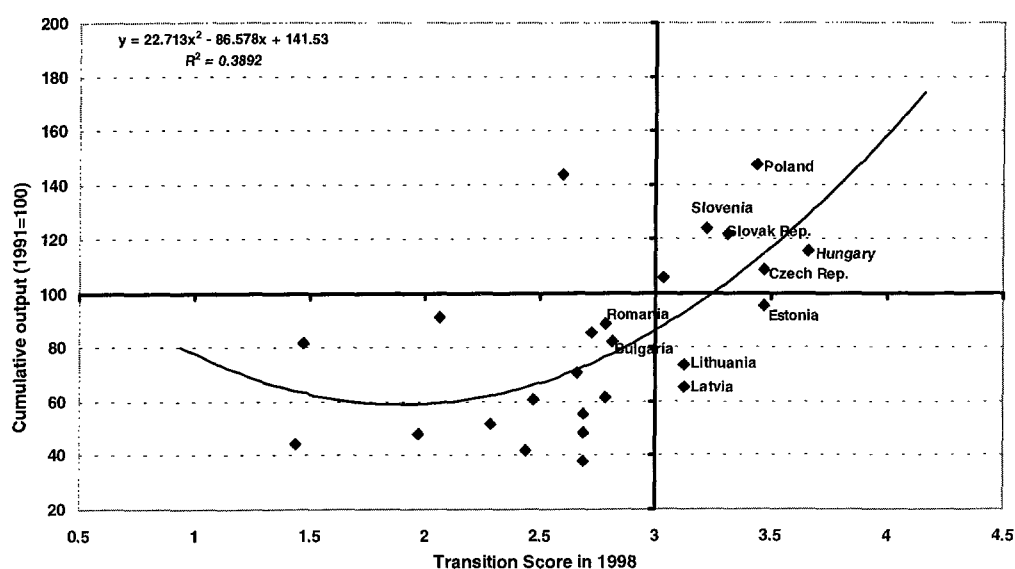
Source: EBRD, Transition Report 1999.

¹ Export shares are for year 1993.

Figure 2.2 presents correlation between structural reforms, 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 Development¹⁷ (EBRD, 1999). Countries that have the overall score of substantial progress in transition have succeeded to achieve their 1991 level of output except the Baltic States. Poland is about 50 % above that level and the next successful countries are Slovenia and Slovak Republic. These countries that performs under the expectation are Hungary and Czech republic. The expectation in the figure is plotted as a polynomial regression of transition score on cumulative growth. This regression explains 40 % of the cross-country variation of growth performance of transition economies.

Figure 2.2. *Progress of Transition and Growth*



The figure 2.2 suggests that countries with advancement stage of structural reforms have been able to recover from the transitional recession and pick up the growth path whereas modest steps in transition have in fact had some negative

¹⁷ EBRD has developed summary indicators of the progress of transition that has been published since 1994. The main aspects on which the transition is monitored by these indicators are enterprises, markets and financial institutions. On 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 4+ standards and performance norms in advanced industrialized economies.

impact on output performance. Together with these structural changes these economies have transformed their economic structure that can be seen by looking at the figures in table 2.7. This table compares 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 in industrial production emphasis was on a heavy industry and production of consumer goods had minor importance. Also consumer related services like retail trade, hotels and restaurant services were neglected.

The resource allocation during the transition process has been characterized by reallocation 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 point larger in 1998 compared to figures in 1991. The change has been most moderate in Hungary and Bulgaria. The reason for small expansion in Hungary is that the share of services was already at rather high level in 1991. In fact, in three of the eight countries services have still in 1998 a lower share of GDP than Hungary had in 1991.

The share of services has remained below 60 percent in 1998 in Bulgaria, Czech Republic and Romania. The lower than average share of services in Bulgaria and Romania can be explained by their living standards. They are the on per capita terms the poorest countries of the region. Since services demand grow more than in proportion to income growth, the lower than average share can be explained by the level of development of those economies. In this respect, the relatively low share of services in Czech Republic is somewhat surprising, since it's, after Slovenia, the second richest nation in the region in terms of per capita income. This probably reflects structural adjustment problems in Czech Republic that has in recent years been mirrored in the weak growth performance. The growth has been very slow and even negative in the last three years (EBRD, 1999). On the other hand the share of services in Czech Republic is the same as in world on average for upper middle-income countries (World Bank, 1999). Service sector share that is around two third of the GDP is more typical for high income industrialized countries.

During the transition the CEEC-countries have become significantly more open economies than they were at the beginning of the systemic change, even though they were not especially closed before the transition started. Poland and Romania are countries to which exports have least importance. Even their export shares are comparable to world average that is 20 percent according to McDougall et al. (1998). The importance of exports as a component of GDP in these countries is of the same magnitude as in Germany. The openness measured by export share in Czech Republic, Hungary and Slovak Republic is similar to that of Taiwan, which has highest export share (47 %) of new industrialized economies of South-

East Asia. Export shares above 40 percent are higher than for example South Korea. These economies are more open measured in terms of exports share as EU in average in which the share of exports was 28 % of GDP in 1995 (McDougall et al., 1998).

3. A Dynamic Multiregional CGE-Model

In this chapter we describe the main elements of a multi-regional computable general equilibrium (CGE) model, with recursive dynamics, that is used in the evaluation of EU's eastern enlargement. Our model is a dynamic extension to a comparative static GTAP-model that has been developed at University of Purdue in Global Trade Analysis Project¹⁸. Hertel and Tsigas (1997) present the main theoretical elements of the GTAP-model. In its main building blocks GTAP-model belongs to the category of conventional neoclassical trade models. However, it has two novel features: It explicitly takes into account costs related to international transactions (transportation costs) and it models international trade as bilateral trade flows between regions in global economy¹⁹.

The main deficiency of conventional CGE models is that they are suitable only in analyzing the efficient use of given resources. All policy-induced effects on factor accumulation are out of the scope of this type of analysis. The existing distortions, caused e.g. by taxes, tariffs and subsidies, may be magnified in the growth context, either because of productivity growth or capital accumulation. In this study the scope of conventional CGE analysis is extended to take into account capital accumulation effects of policy reforms by connecting periodic equilibrium by stock flow dynamics in capital accumulation.

The stock-flow dynamics and investment allocation theory, that is incorporated into GTAP model has originally been formulated in single region setting to an Australian CGE-model MONASH (Dixon and Rimmer, 1997). MONASH is modified and extended version of the ORANI, a single country CGE-model that was developed already in 1970's and, since then, has been extensively used to applied policy analysis in Australia (Powell and Snape, 1992). ORANI is probably the first comprehensively documented numerical general equilibrium model (Dixon et. al., 1982) and it has been the basis for several national models (see Horridge, Parmenter and Pearson, 1998)²⁰.

¹⁸The advantage of adopting GTAP model is that there's comprehensive global trade and production database compatible with the model. This database as well as the model are publicly available at the Center of Global Trade Analysis at the University of Purdue, <http://www.agecon.purdue.edu/gtap>.

¹⁹ Bilateral trade flows is a non-standard thing in trade policy modeling, since there has not been consistent global data on it. Among other things, GTAP-project's major contribution to international trade policy analysis is that they have assembled large amount of data and constructed a globally consistent data base for the use of policy modelers of international economic issues. Various aspects of the GTAP database are presented in chapters 3-5 in Hertel (1997). The contents and construction of version 4 of GTAP database is documented in McDougall et al. (1998).

²⁰ The present implementation as well as documentation of the structure and theory of the model is available at Monash University's Center of Policy Studies web-page: <http://www.monash.edu.au/policy>.

The model is implemented by GEMPACK software, which is a general-purpose program to formulate and solve large-scale numerical equilibrium models. Implementation of CGE models into GEMPACK and carrying out simulations with this software is described in Harrison and Pearson (1996).

In this chapter we first outline the core theory of GTAP model: what kind of activities are specified in the model and how the demand supply relations are formulated. Then, we present the theory used in MONASH model, to endogenize the capital stock growth. First we describe the stock-flow dynamics and how the dynamics is put in operation by the help of our initial database. Then we discuss shortly about the formation of expectations that enables us to formulate the model in recursively dynamic manner i.e. as a sequence of solutions for single period equilibria.

3.1 The Core Theory of GTAP Model

GTAP is a conventional multi-regional trade model²¹. Supply side of the model is characterized by constant returns to scale technology and free entry in the markets. Equilibrium is outcome of optimizing agents' supply and demand decisions. GTAP model has two kinds of commodities. Traded commodities are produced by means of primary and intermediate inputs. Primary inputs (land, labor and capital) are treated, as non-tradable factor endowments owned by regional households. In each region there is also an investment good which is assembled in fixed proportions of the tradable commodities, without use of endowment commodities.

Consumption demand

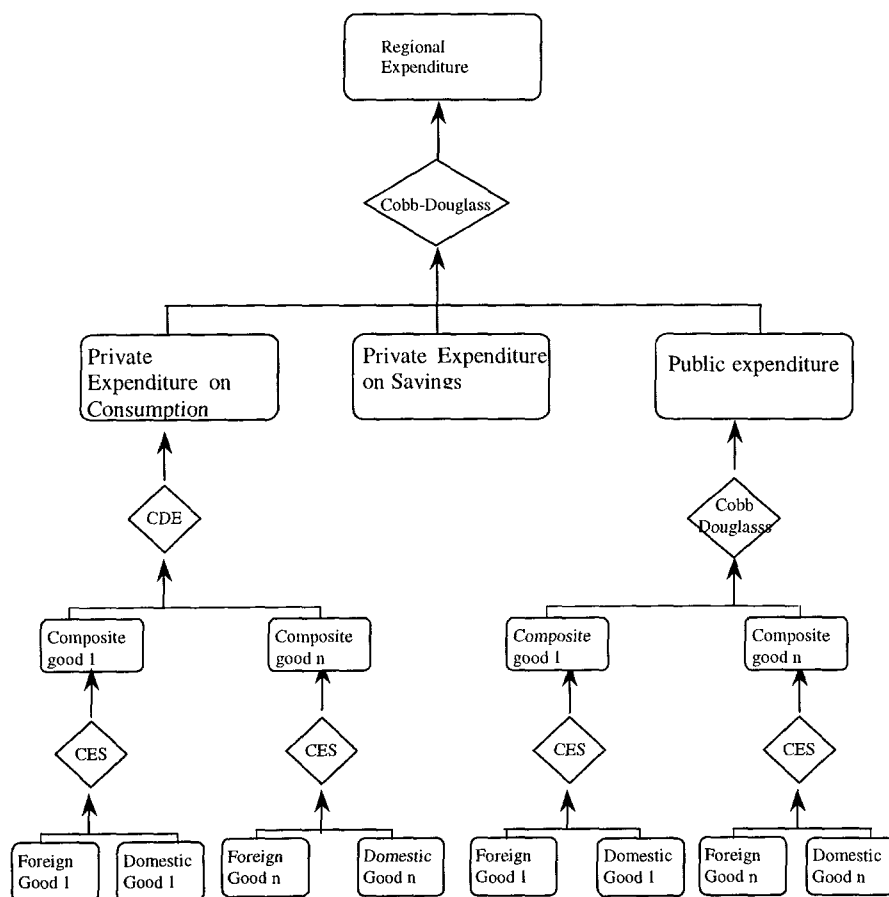
Investment good is interpreted as an asset for savings. Consumers use only proportion of their income on current consumption. They save part of it to be used in a future date. They purchase new capital goods i.e. investments are financed by savings (S). These new investment assets will yield a flow γ of capital services in the future and each unit of these services earns rental P_k per period. The capital income in each future period is used to finance planned future consumption (C_f), which is expected to cost P_f . Thus expected rental income ($P_k \gamma S$) equals planned future consumption $P_f C_f$. When this equality ($P_k \gamma S = P_f C_f$) is multiplied by price of savings we get the relationship between present savings and future consumption as $P_s S = \left(\frac{P_f}{\gamma P_s} \right) C_f$. Since GTAP is a comparative static, one period, model the study of future is out of the scope of the model. The split of expenditure between savings and current consumption is taken into account

²¹ Models of the same genre are WALRAS model of OECD (Burniaux et al. 1990), Michigan model (Deardorff and Stern. 1986) and that of Whalley (1985).

just to make the model compatible with national accounting conventions that are used as a basis of the model's database.

Factors of production (land, labor and capital) are treated, as exogenous endowments owned by a representative household in each regional economy. Services of the productive factors are traded in factor markets and incomes received from these transactions are used as expenditures on three broad consumption categories: current private consumption, savings and consumption of public goods. The allocation of income on the three main consumption categories is governed by Cobb-Douglas utility function. This implies that constant share of income is used on private and public consumption as well as on savings.

Figure 3.1. Structure of expenditure in GTAP



price and income elasticities are needed to characterize the complete demand system²²

Privately consumed commodities are aggregates of regional varieties. Regionally differentiated commodities are imperfect substitutes. They are composites of domestic and imported varieties that are aggregated by constant elasticity of substitution (CES) function, originally suggested by Armington (1969). With this specification the share of imported varieties in any commodity group does not depend on the level of consumption. The consumption share is determined by its relative price by the constant elasticity parameter characterizing the CES-function.

Input Demand

Figure 3.2 summarizes the assumptions on production technology used in deriving the input demand decisions of firms. The demand decisions are separated to several stages of production process. The use of primary factors and other inputs is assumed to follow fixed coefficient technology. Quantities of intermediate inputs and primary factor aggregate are demanded in fixed proportion to output. The primary factor demands are derived from CES-technology. The cost shares of primary factors are independent of the level of activity and depend only on the relative price of the factor (land, labor or capital). Intermediate inputs are composites of regionally differentiated components, which is a CES aggregate. Regional varieties enter the cost structure in a similar way as in consumption.

Equilibrium conditions

We need zero pure profit, commodity and factor market equilibrium conditions to jointly determine relative prices and activity levels of productions. A key element in large group of CGE models is the assumption of constant returns to scale technology and free entry into markets. With constant returns to scale, total costs increase proportionally with the level of activity. Unit costs are independent of the level of activity and they equal marginal costs in equilibrium. Together with free entry constant returns imply zero pure profits. This means that unit cost are equal to output price in production of each tradable commodity. Unit costs are determined by prices of intermediate commodities and primary factor costs.

The decision rules for agents' micro-economic behavior are derived from nested structural presentation of production technology and preferences. The expenditure decisions of firms and consumers have already been schematically described by means of technology and utility 'trees'. All these activities are

²² The properties of this functional form and its use in applied analysis see, Hertel et al. (1991).

conducted in a global environment, which in the case of GTAP is reflected by bilateral trade flows. Relative prices as well as income levels of consumers and activities of industries in each region influence the demand for tradable commodities. The availability of non-tradable primary factor sets resource constraint to the activity level in each region. An equilibrium outcome of interactions between inter-industry and interregional activities is such that commodity prices equilibrate supply and demand for tradable commodities, factor prices equilibrate demand and supply of primary factors and zero profit conditions determine activity levels of production.

Macro economic closure of the model

GTAP model is designed to evaluate the efficiency of allocation of given resources at different policy environments. The efficiency of different policy environments is evaluated by comparing model equilibria under different set of policy parameters. Primary factors are taken as given in the comparative static calculations. However, the model's data is based on input-output representation of some actual economies. The fact that not all incomes are consumed but some of the abstained consumption is invested must be taken into account in the model formulation. Even though in the model applications investments does not add to the availability of capital.

The way, by which the impact of investments is modeled, makes the GTAP a genuinely comparative static model. Namely, investments do not add anything to region's production potential. The implications of investments to the model come from the demand side. Given, that the structure of investment good composite is different from other commodities in the model, the impact of investment demand to production of tradable commodities is different from other demand components.

From national accounting identities we know that the difference between regional savings and investments is equal to trade balance:

$$S_r - I_r \equiv X_r - M_r, \quad (3.1)$$

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:

$$\sum_r S_r = \sum_r I_r \quad (3.2)$$

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

$$\sum_r X_r = \sum_r M_r \quad (3.3)$$

there has to be some variable that balances the equation (2). In 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 balance global savings and investments. Since GTAP is comparative static model it does not evaluate whether the expectations are realized or not.

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

3.2 Introducing MONASH Dynamics in the GTAP Model

In MONASH model (Dixon and Rimmer, 1997), that is closely followed here when the GTAP model is dynamized, capital is assumed to be sector specific. In our new model specification capital is not anymore treated as a tradable endowment which can be freely moved from one sector to another in such a way that rate of returns are equalized within a period²³. Sector specific capital stock increases or decreases when investments exceed or falls short of physical depreciation of the capital stock. Depreciation is modeled by constant rate of decay. Thus, the sector specific capital can de-cumulate most at the rate of (physical) depreciation, and the growth of sector specific capital stock depends on how much the value of investments exceed the depreciation of capital stock. One implication of the sector specificity of capital is that the rates of return can diverge across industries at least in the short run.

To incorporate sector specific accumulation of capital we have to introduce sector specific investments. MONASH model involves explicit capital supply functions for each sector in year to year simulations. In the model it's assumed that investments take one period (a year) to mature. They add to the availability of industry specific capital stock in next year that they have taken place. Investments, on the other hand, depend on investors' willingness to supply funds to industry, as a response to changes in expected rates of return.

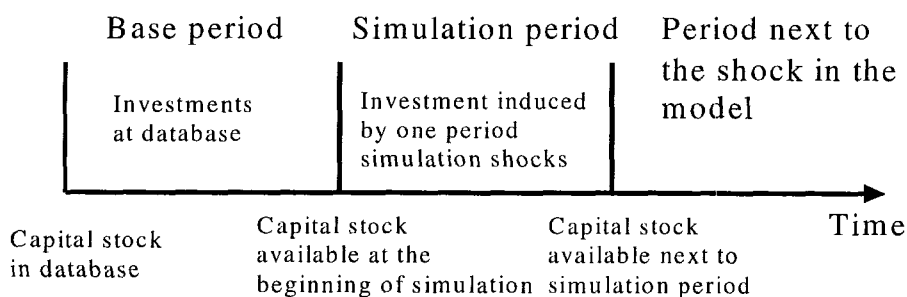
²³ Period in this case is one year. This is not so when comparative static exercises are interpreted. In this context period is time enough to allocate resources in such a way that rates of returns are equalized. In this sense the conventional approach that capital is perfectly mobile but investments does not accumulate the capital stock is somewhat disparate in its assumptions of the working of the model.

The recursive specification of dynamics means that we are connecting periodic solutions of the model by stock-flow relation of capital accumulation. Recursively dynamic specification where periodic solutions are connected to each other means that the only information we need to solve next period in a dynamic sequence exists either in our reference data or it's generated by our one period simulation. This requires that we have backward looking expectations. The advantage of postulating backward looking expectations is that we do not have to solve the whole time path of our exercise simultaneously. The disadvantage of this approach is that we are not able to take into account anticipation effects. However, with a model that is as large as the one we are using, the size of the model puts computational limits to the expectation specification. What we do next in this section is, that we first characterize the stock flow dynamics and then the expectations that determine the sector specific investments.

Stock-flow dynamics

In the model we assume that investments' gestation is one period i.e. it becomes productive capital after one period after its installation. The gestation of investments implies overlap of periods. From the point of view of model formulation this implies that one has to take into account two periods in one period simulation. This is described in figure 3.3. The investments we observe in the initial database contribute to the availability of capital in the period we are experimenting our simulation. The growth of capital stock in our simulation period is predetermined by the investment decisions we observe from our given data. On the other hand the investments induced by our simulation shock increases capital stock at the next period. Even, if we introduce a policy shock just in one period of our dynamic multi-period simulation, the dynamic impact of the shock phases out only after the investments have returned to the initial pre-shock level.

Figure 3.3. *Timing of capital accumulation in MONASH model*



The relationship between the investment flow and the capital stock is:

$$K_t = (1 - \delta)K_{t-1} + I_{t-1}, \quad (3.4)$$

where K_{t-1} is the inherited capital stock from period $t-1$, I_{t-1} are the investments observed in the database and K_t is the capital stock available in the simulation period and δ is the depreciation of the capital stock. The growth rate of capital stock is:

$$\hat{k}_t = \frac{(K_t - K_{t-1})}{K_{t-1}} = \frac{(I_{t-1} - \delta \cdot K_{t-1})}{K_{t-1}}. \quad (3.5)$$

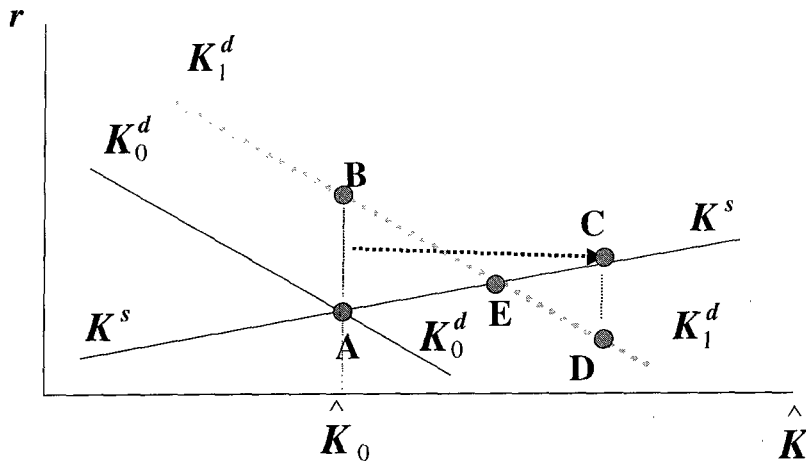
In equation (3.5) K_t has been substituted using equation (3.4). The growth rate of current period capital stock is pre-determined by our database information and is thus exogenous. However, since we are linking our policy-shock simulation period to the future periods in our dynamic simulation we need the stock-flow – relationship in linking the current to the future periods:

$$K_{t+1} = (1 - \delta)K_t + I_t \quad (3.4')$$

Subtracting (3.4) from (3.4') and using the definition of growth rate in (2) we get:

$$K_t \hat{k}_{t+1} = K_{t-1} \hat{k}_t + I_{t-1} \hat{i}_t \quad (3.5)$$

Figure 3.4. Capital stock growth with backward looking expectations



We already know that $\hat{k}_t$ is exogenously determined. Thus induced investments in our simulation period determines the growth rate of capital stock in period $t+1$.

This is the link of periodic equilibria in our dynamic simulations. Next we look at the determination of investments and in what way the expectations about the future returns influence investments.

The demand and supply of capital is described in figure 3.4. On vertical axis we have the user cost of capital or the rate of return (r) and on horizontal axis the growth rate of capital stock $\dot{K}$. The demand for capital K^d is negative function of the rental price of capital. The more expensive the use of capital the less it is used. The supply of capital follows the investors' cautious approach formulated already in the ORANI model (Dixon et. al. 1982). This means that investors require higher rate of return to increase the supply of funds to any given sector in the economy. Capital supply function K^s traces out the growth rates of capital stock that investors are willing to maintain at any given rate of return.

The investment dynamics induced by some shock is illustrated as a positive shift in demand for capital schedule, from position K_0^d to K_1^d . The point (A) depicts the initial equilibrium where demand for capital equals the supply of capital at constant rate of growth of the capital stock $\dot{K}_0$. The upward shift of the capital demand schedule is caused by some positive shock. This means that at the given growth rate of capital firms are prepared to pay higher rental price indicated by point (B). Since the growth rate of capital is exogenous for the given period rate of return increases by the amount indicated by the difference (B-A). However, the rate of return on (B) is not the rate that equilibrates supply and demand, which is at point (E).

In our recursive specification of the model we assume that investors cannot fully anticipate the consequences of their actions, that is, correctly anticipate the future period rate of return that would equate demand and supply of capital. Instead, on the basis of current period information, they guess the equilibrium rate to be somewhere between (A) and (B). In our illustration they guess the point to be at (C). This expectation is not realized and the realized rate of return is at (D), because of too optimistic view about the equilibrium rate. The investors revise their expectation downward for some point between (C) and (D). Iteratively the model approaches the equilibrium point (E). The advantage of this approach is that the information we need in our simulations either exist in our database or is generated by the current period simulation. The alternative for this approach would have been to use model consistent expectations. However, in multi-period simulation this would have required to solve the whole transition path simultaneously.

4. Economic Effects of EU's Eastern Enlargement

In this chapter we evaluate EU's eastern enlargement with a dynamic, multi-regional general equilibrium model. This analysis utilizes a global database on production and trade compiled by Global Trade Analysis Project at the University of Purdue. The database contains information of production and trade for 45 regions or countries and 50 commodities. For our specific purposes we have aggregated this data to 10 regions and 15 commodities.

In first section we discuss about our country and commodity aggregation and provide some descriptive figure of the importance of different regions for world trade and income formation. In section two we characterize our baseline scenario that we use as a reference, when the enlargement scenario is evaluated. Section three traces out some modifications to the original database. Some of the modifications are related to the incorporation of dynamics into the model. It has also been necessary modify data on some policy instruments that relates to EU's common agricultural policies (CAP). Section four discuss about the modeling set-up necessary to evaluate the economic consequences of integration and in section five we present the result of our modeling exercise on EU's eastern enlargement. Some sensitivity analysis with alternative world markets development caused by an assumed slow down in Chinas economic performance is conducted in section six.

4.1 The Data Used in the Model

We are using version 4 of the GTAP database. The data consists of bilateral trade, transport and protection data characterizing economic linkages among regions. In the database there is bilateral data for 45 regions or countries and WTO data on tariffs and other border measures. Input-output data account for inter-sectoral linkages. I-O tables have been specified for 50 sectors. Base year of the data is 1995 with monetary values expressed in millions of US\$. A comprehensive documentation of the database is given in McDougall et al. (1998).

Table 4.1 presents industry aggregation from GTAP database that is used in this study. The GTAP database has strong emphasis on agricultural and resource-based activities. Of the 50 industries included in the database 26 are either agricultural, resource extraction or food processing industries. Only eight of the sectors are classified as services and even of those eight three are public utilities i.e. electricity, gas and water supply.

On agricultural sectors we have distinguished those that are important for EU's common agricultural policies. These are cereals, beef and milk production. These

products comprised 43 percent of agricultural production in 1997 that were subject to market organization measures (Agricultural Situation in Europe, 1998) and they received 58 percent of agricultural subsidies (EAGGF, Guaranteed Section, Financial Year 1997). These sectors are also subject to major economic policy changes in EU's Agenda 2000 reform that is main element in Unions preparation for eastern enlargement. The aggregation in food industries is such that the dairy and beef products have been separated as individual industries. In our aggregation we have eight non-food sectors. All sectors using natural resources outside agriculture have been aggregated into one industry. Manufacturing sectors has three capital-intensive process industries wood, chemical and metal products and three light manufacturing industries textiles, transport and other equipment. Services have been aggregated into one sector.

Table 4.1. Industries in the Applied GTAP Aggregation

Aggregated industries	GTAP database industries
1. Cereals	1.Paddy rice, 2.Wheat, and 3.Cereal grains nec.
2. Beef	4.Bovine cattle, sheep and goats, horses
3. Milk	5. Raw Milk
4. Rest of agriculture	6.Vegetables, fruit, and nuts, 7. Oil seeds, 8. Sugar cane, sugar beet, 9. Plant-based fibers, and 10. Crops nec.
5. Beef manufacturing	11. Bovine cattle, sheep and goat, horse meat prods
6. Milk manufacturing	12.Dairy products
7. Rest of food	13. Meat products nec., 14. Vegetable oils and fats.15. Processed rice, 16. Sugar, 17. Food products nec., 18. Beverages and tobacco products, and 19. Food products nec.
8. Natural resources	20 Wool and silk worms, 21. Forestry, 22. Fishing, 23. Coal, 24. Oil, 25. Gas, and 26. Minerals nec
9. Textiles	27. Textiles, 28. Wearing apparel, and 29. Leather products
10. Wood	30.Wood products, and 31. Paper products and publishing
11. Chemicals	32. Petroleum, coal products, 33. Chemical, rubber, plastic products and 34. Mineral products nec.
12. Metal products	35 Ferrous metals, 36. Metals nec. and 37. Metal products.
13. Transport equipment	38. Motor vehicles and parts 39. Transport equipment nec.
14. Other equipment	40. Electronic equipment, 41. Machinery and equipment nec. and 42. Manufactures nec.
15. Services	43. Electricity 44. Gas manufacture, distribution.45. Water, 46. Construction, 47. Trade and transportation, 48. Financial, business and recreational services, 49. Public administration defense, education and health care, and 50. Dwellings

The regional aggregation we are using in our model consists of the regions listed in table 4.2.

GTAP database has information of 31 individual countries and 14 aggregated regions. Members of the aggregated GTAP regions are described in McDougall

et.al. (1998). The regional aggregation we are using in this study consists of 10 regions. Measured by GDP the main economic regions are European Union, Japan and North America that includes Canada and the United States. Looking at the contribution to world trade the new industrial Asian economies is more important to world economy than Japan even though their GDP is less than one third of that in Japan.

The reason for having three Asian regions in addition to Japan and Pacific OECD is that China, at the moment, is EU's fourth largest trade partner – after USA, Japan and Switzerland – with six its percent trade share (Eurostat, External and Intra-European Trade, 1999).

Table 4.2. Regions in the Applied GTAP aggregation

Aggregated Region	Abbreviation	GTAP Region
1. Pacific OECD	AUZ	1. Australia, 2. New Zealand,
2. Japan	JPN	3. Japan,
3. New Industrial Asian Economies	NIC	4. Republic of Korea, 5. Singapore, 6. Hong Kong and 7. Taiwan,
4. South-East Asia	SEA	8. Indonesia, 9. Malaysia, 10. Philippines, 11. Thailand and 12. Viet Nam,
5. China	CHN	13. China,
6. North America	NAM	14. Canada and 15. United States of America,
7. European Union	EU15	16. United Kingdom 17. Germany, 18. Denmark, 19. Sweden, 20. Finland and 21. Rest of European Union,
8. Central and East Europe	CEEC	22. Central European Associates,
9. Former Soviet Union	FSU	23. Former Soviet Union,
10. Rest of the World	ROW	24. India, 25. Sri Lanka, 26. Rest of South Asia, 27. Mexico, 28. Central America and Caribbean, 29. Venezuela, 30. Colombia, 31. Rest of Andean Pact 32. Argentina, 33. Brazil, 34. Chile, 35. Uruguay, 36. Rest of South America, 37. European Free Trade Area, 38. Turkey, 39. Rest of Middle East, 40. Morocco, 41. Rest of North Africa, 42. South African Customs Union, 43. Rest of Southern Africa, 44. Rest of Sub Saharan Africa, and 45. Rest of World

The growth of imports from China to the EU has been twice as fast as the growth of imports on average. In the last decade the annual average growth in the value of imports have been 13 %. South East Asian countries have on aggregate a similar importance as source of EU's imports as that of China. The growth of the imports from this region has also been as fast as from China. The developed Asian NIC countries together have a share of EU's imports at about eight percent

(Eurostat, External and Intra-European Trade, 1999), but the trade has not been expanding at as rapid rate as with the two other Asian regions.

Table 4.3. GDP and Foreign Trade of Aggregated regions in 1995

	GDP '000 000 \$US	Exports '000 000 \$US	Imports '000 000 \$US	Share of World GDP	Share of World Exports	Share of World Imports
1. Pacific OECD	405302	82969	87856	1.4 %	1.4 %	1.5 %
2. Japan	5091655	502182	435255	18.0 %	8.5 %	7.4 %
3. New Industrial Asian Economies	1506819	622498	559592	5.3 %	10.6 %	9.5 %
4. South-East Asia	546046	247337	257033	1.9 %	4.2 %	4.4 %
5. China	712002	214480	167261	2.5 %	3.6 %	2.8 %
6. North America	7700755	956115	1063129	27.2 %	16.2 %	18.0 %
7. European Union	8209777	2336019	2296833	29.0 %	39.7 %	39.0 %
8. Central and East Europe	295541	111968	118214	1.0 %	1.9 %	2.0 %
9. Former Soviet Union	496396	93588	78342	1.8 %	1.6 %	1.3 %
10. Rest of the World	3350027	723425	827067	11.8 %	12.3 %	14.0 %

Source: GTAP 4 database.

The Central and Eastern Europe in GTAP database is composite of seven countries Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovak Republic and Slovenia. The share of this area of EU's imports was on 1998 about nine percent (Eurostat, External and Intra-European Trade, 1999) and the annual average growth in 1990's was 16 percent when the average growth rate of EU's imports was about six percent. The GDP of Central and Eastern Europe is one percent of world's total, whereas its exports and imports are twice of that. This area is economically more open than world on average. This was discussed already in chapter two, when the outcome of transition in these countries was evaluated.

Measured by GDP Central and Eastern Europe is a small region. Its GDP is only 3.5 percent of that in European Union. This is of importance when the prospects of economic gains or losses of enlargement are evaluated. The gains or losses are always more important to the smaller partner. An extreme example puts this in perspective. Even if the CEEC's would lose all their income to incumbent EU, this would imply only 3.5 percent increase in EU's GDP. On the other hand, if the integration doubles the income in CEEC's and it would have equivalent loss for the EU, there would be 100 % gain for CEEC's and 3.5 % loss for the EU in terms of relative GDP changes.

Central and East European countries measured by GDP is relatively small area. On the other hand the joint population of the region is almost 100 millions (European Commission, 1997). The integration with this region would imply 27 %

increase in the population relative to current situation in EU. Since integration would imply almost one third increase in population and only slightly more than 3 percent increase in GDP, EU's eastern enlargement brings together economic regions that are grossly at different level of economic development.

The economic structures differ also in these regions. The share of agriculture in the candidate countries varies from 3.8 percent in Slovenia to 18.7 in Bulgaria (see table 2.7). The average for EU in 1997 was 1.6 percent (Agricultural Situation in Europe, 1998). Even though the larger relative share of agriculture in output reflects to some extent lower level of economic development it also indicates the comparative advantage of candidate countries. The land area used in agriculture was 45 percent of that in current EU (Agricultural Situation in Europe, 1998). The new entrants certainly have potential, which has partly been unutilized because of EU's restrictive trade regime in agricultural products.

4.2 The Baseline Scenario

Since we are conducting our enlargement simulation in a dynamic framework we have to formulate a baseline scenario, where we assume that integration is not taking place. We then compare a scenario with integration to the baseline.

In our model, we assume that efficiency, measured by total factor productivity, grows at constant rate. The same is true for labor force growth. Capital accumulation is determined endogenously from our database information. Thus knowledge of labor force and total factor productivity growth is sufficient to determine baseline growth rates. The data to calculate regional total factor productivities for our baseline is taken from the study of Coyle et.al. (1998). They have compiled regional data, for the period 1980-1995, on GDP, labor force, and capital growth for GTAP regions that are similar to those used in this study. We have used GTAP data on relative factor income shares to calculate total factor productivity (TFP) growth in the following way:

$$\frac{\Delta TFP}{TFP} = \frac{\Delta GDP}{GDP} - s_L \frac{\Delta L}{L} - (1 - s_L) \frac{\Delta K}{K}, \quad (4.1)$$

where L refers to labor, K to capital, s_L is labor share of output and Δ is operator for annual change. Total factor productivity is the residual that cannot be explained by the income share weighted average of input growth.

We have not applied aggregate productivity growth as indication of efficiency change for all sectors, since it is evident that productivity growth in agriculture as well as manufacturing is much faster than that in services sectors (Bernard and Jones, 1996). Instead we have run the following cross-country regression to determine sectoral factor productivity growth:

$$TFP_i = \alpha_i + \beta_i \cdot \frac{1}{1 + TFP^{agg}} + \varepsilon_i, \quad (4.2)$$

where TFP_i is sector specific total factor productivity growth, TFP^{agg} is aggregate total factor productivity growth α_i and β_i are estimated sector specific parameters used in the determination of industry specific productivities and ε_i is error term in the regression.

The cross section observations for the regression are from latest OECD international sectoral database. This kind of functional form describes fairly well the sectoral pattern of crossindustry variations in productivity growth. The parameters of industry specific TFP-growth regressions are presented in table 4.4.

Table 4.4. The Relation between Aggregate and Industry Specific Total Factor Productivities

	Agriculture	Manufacturing	Services
Constant	1.65 (4.42)	0.76 (1.99)	0.73 (3.91)
$\frac{1}{(1 + TFP^{agg})}$	-1.64 (-4.35)	-0.75 (-1.94)	-0.73 (-3.86)
R^2	0.65	0.24	0.55
Number of Observations.	12	14	14

The reason why we have used this procedure is that we do not have data on on sector specific productivity growth at this level of regional and industry coverage. We have applied this formula for all the regions in our study to differentiate the regional productivity growth across agriculture industry and services.

We have used historical data on determining the total factor productivities for all other regions except for the Central and Eastern Europe and the Former Soviet Union, since it's not reasonable to use their growth history to determine it, because of the systemic changes they have gone trough. For these regions, we have used data presented by Jensen et. al.(1998), who have collected from various source output and input growth data to determine trend growth rates for CEEC's and FSU.

Table 4.5 presents the main characteristics of trend growth rates and its determinants. The trend growth of GDP has been achieved by model simulation where exogenous factor productivity and labor force growth have been used to generate balanced trend growth path. By balanced path we mean growth rates

were capital stock is growing at constant rate at each industry of the regions in the model.

The GDP trend growth rates vary between 0.6 in Former Soviet Union to the 7.7 in China. China's growth is so fast that if it succeeds to maintain the assumed trend growth, it doubles its GDP in every nine years. The growth rates of NIC-countries and South East Asia are somewhat lower than their growth record prior to the Asian crisis. Japans trend growth is above the rate that we have observed in previous years, but it's close to the slow growth scenario presented by OECD (1997).

Table 4.5. Characteristics of Regional Trend Growth Determinants

Regions	Primary factor growth			Sector specific Total factor productivity growth		
	Gross Domestic Product	Labor force	Capital Stock	Agriculture	Manufac-turing	Services
	%-change	%-change	%-change	%-change	%-change	%-change
1. Pacific OECD	2.5	1.4	2.7	1.8	1.4	0.4
2. Japan	2.1	0.6	2.5	1.8	1.4	0.4
3. New Industrial Asian Economies	5.7	1.8	6.1	4.4	2.6	1.6
4. South-East Asia	3.6	2.2	3.6	1.3	1.2	0.2
5. China	7.7	1.1	7.8	5.7	3.2	2.1
6. North America	2.8	1.1	3.1	2.4	1.7	0.7
7. European Union	2.5	0.5	3.0	2.7	1.9	0.8
8. Central and East Europe	3.5	0.3	3.7	3.8	2.4	1.3
9. Former Soviet Union	0.6	0.2	0.7	0.6	0.9	-0.2
10. Rest of the World	2.7	2.4	2.6	0.6	0.9	-0.1

Growth rates of the EU and North America are close to each other. In EU the growth is based more on technical change whereas in North America labor force growth is relatively faster. The trend growth for Central and Eastern Europe is one percent higher than that in present EU. This is mainly based on faster technical change. Capital stock growth in this area is slightly faster but labor force growth on the other hand slower, thus the main differentiating factor of CEEC's growth is faster growth in factor productivity. With one percent growth difference to EU, the applicant countries halves the income gap to current members approximately in 20 years.

4.3 Modifications of GTAP-model and Database

In order to implement our enlargement experiment with a dynamic extension of the GTAP model it has been necessary to revise the base data and model in

several respects. Some of the revisions relate to the requirements of dynamic model and others to the more detailed specification of economic policy design. In this section we discuss first about the new requirements of dynamic model set-up and then about the policy specifications that elementarily relate to EU's enlargement.

Modification to incorporate dynamics in the model

In original GTAP-model capital stock is not industry specific. In the database there is information only about aggregate capital stock. The MONASH dynamics is formulated for sector specific capital. We have distributed the aggregate capital stock across industries according to individual industry's share of capital income. Sector specific investment levels has been calibrated to maintain constant growth rates of the initial capital stocks in the reference scenario.

The other aspect that is not taken into account in the original GTAP model is the cross-ownership of capital stock. Since, in the GTAP, regional investments and savings can be different in equilibrium, trade need not to be balanced. This aspect of the model has already been discussed in chapter three. In dynamic setting this means that in case of balance of trade deficit part of the investments are financed by foreign sources. This means that part of the capital stock is either foreign owned or at least part of the capital income it paid to abroad as compensation of foreign debt. When evaluating the dynamic path, we have to take into account the implications of regional balance of payment deficits to the cross-ownership of capital in order to keep on track with the regional capital income.

We have to take net receipts of investment income into account in our model. The trade balance identity is reformulated as:

$$S_r - I_r \equiv X_r - M + R_r \quad (4.3)$$

where S_r is savings, I_r is investments, X_r is aggregate exports, and M_r is aggregate imports and R_r is net receipts of capital income. The subscript r refers to region in the model. We have used IMF's balance of payments statistics (IMF, 1996) to take into account investment incomes paid to and received from abroad.

In our model we have assumed that all cross regional capital income is based on the ownership of foreign assets. From IMF data we can estimate how large is each regions share of the foreign owned world capital stock. We assume that this stock earns world average rate of return and each region receives part of this return according to its share of this foreign owned stock. We assume that domestic savings are allocated to foreign and domestic assets as constant shares of incomes used in savings. In modeling the cross-ownership of capital stock and

related income flows we follow closely the approach developed by McDougall and Ianchovichina (1996).

Policy related modifications of the model and GTAP database

The modifications to the specifications of policy design are related to the description and functioning of EU's Common Agricultural Policy (CAP). Neither GTAP model nor the database is very specific in explicating the specificities relating to EU's agricultural policies.

The Common Agricultural Policy bases 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 implies 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 for the remainder by budgetary transfers from the member states. These principles will be applied to the new members also. In GTAP model there is no explicit budget for CAP expenditures and incomes. We have introduced this into the model in order to analyze the impact of CAP related transfers between new members in incumbent EU.

Agricultural production is supported in EU through different *market organisation schemes*. Different market organization schemes 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 total the direct payments are 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 as EU's preparation to 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 partly the income losses.

Land and Animal Premiums

The direct income support is not part of the GTAP database, neither are their implications for price formation in agriculture. We have followed Jensen et al. (1998) in incorporating new forms of subsidies in the GTAP database, who also provide information to do this for pre-agenda environment.

In Jensen et al. (1998) the compensatory payments to land are implemented as input subsidies to agricultural land. Therefore, in the initial GTAP data base input subsidies to land (hectare premiums) are added and output subsidies are adjusted²⁴. The implementation of compensatory payments to land is modeled by fixing the total EU budget for this measure and allowing the hectare premiums to adjust endogenously.

The implementation of compensatory payments to livestock reflects the fact that suckler cows and breeding ewes are a part of the production capital used to produce slaughter animals, while male animals and steers are final products sold directly to the slaughter houses. Suckler cow and breeding ewe premiums are added in the database as input subsidies, while bull and steer premiums are maintained as output subsidies. In both cases, the implementation is carried out by fixing the total EU budgetary expenditure on premiums and allowing premiums per animal to adjust endogenously (Jensen et al., 1998).

In one of the agricultural sector, included in our industry aggregation production, is limited quantitatively. Milk production in EU is subject to quotas. In this respect we have also followed the approach by Jensen et al., (1998). They have introduced quota rents into the database as a wedge between the value of output at producer prices and the value of output at market prices. They have fixed the output and allowed the quota rent to adjust to market conditions.

Intervention Prices

Cereal, milk and beef production has price guarantees that are supported by trade policy and intervention measures. In our model formulation we have assumed that EU adjusts import tariffs and export subsidies proportionally to support the guaranteed prices. We have, thus, endogenized boarder measures and fixed the producer prices in these three sectors.

²⁴ Malcom (1998) documents how GTAP tax structure can be modified to fit specific purposes in a coherent way.

4.4 Experimental Design of the Enlargement Scenario

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 CEA and adoption of common trade policy measures against third parties. Since tariffs in industrial trade are removed when the enlargement is planned to take place, 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 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 impedes completely unparalleled access to EU's internal markets. The membership in Union removes these frictions in trade.

Balwin et al. (1997) has emphasized the importance of these aspects for the improved business confidence in new member countries. Harmonized market rules constrains the opportunity 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. Conventional trade policy aspects as well as the common market elements will be taken into account when the economic consequences of enlargement are evaluated.

Agenda 2000

The eastern enlargement is different from the previous enlargements of the EU. In the previous cases new entrants has adopted EU's rules and regulations as such and adjusted their own institutions to be compatible with those of the Union. This is the first time, when the EU has to reform its own institutions and policies to make the enlargement feasible. The motivation of Agenda 2000 is partly in the intention to make EU capable of absorbing new members at manageable costs. The other reason for the reform is EU's need to meet its obligations of Uruguay Round Agreements of GATT (Swinbank, 1999). Next we shortly describe the contents of Agenda 2000 and its implications for enlargement.

The European Council endorsed the Agenda 2000 package in its Berlin meeting on 26 March 1999. In the package that was finally agreed upon the Commission's original proposals were significantly weakened (Swinbank, 1999 and European Commission, 1999a). Essentially, the Agenda 2000 CAP reform is repeating the MacSharry 1992 reform. Guaranteed prices are reduced and direct payments to farmers, to compensate (in part) for the income loss, are increased. Agenda 2000 both deepens and broadens the principles of the 1992 reform. Three agricultural sectors are particularly influenced by the Agenda 2000 reform:

- **Cereals:** Intervention prices are cut in total by 15 % in two years period starting in 2000/01. A non-crop-specific compensatory payment for cereals is increased from 54 EUR per metric ton to 63 per ton multiplied by regional reference yields. This will offset 50 % of the overall price cut. Some specific accommodations are also accorded to certain State Members taking into account yield variability and drying costs of cereals and oilseed.
- **Beef and Veal:** Intervention prices are cut in three equal steps 20 % on total. At the same time, special premium will rise per head of animals to EURO 210 for bulls, to EUR 150 for steers and to EUR 200 for suckler cows annually. A new slaughter premium of EUR 80 is also instituted for bulls, steers, dairy cows, suckler cows and heifers.
- **Milk:** The reform of the dairy sector is delayed until 2005/06. The agreement includes a three-stage 15 % price cut for butter and skimmed milk powder, starting from the 2005/06 marketing year. In parallel with this price reduction, the milk quota regime will be increased by 1.5 % over three years in Member States. In line with the price reduction, a system of direct aids is directed to producers. It will be set up to EUR 5.75/t for 2005 calendar year, EUR 11.49/t for 2006 calendar year and EUR 17.24/t for 2007 calendar year.

The implications of Agenda listed above are taken into account in our baseline scenario. Table 4.6 presents EU's border measures on agricultural and food products in GTAP reference year and in 2003 that is the supposed year of enlargement. The difference in these figures reflects both the impacts of Agenda 2000 reform as well as the endogeneity of these measures. The endogeneity of tariffs stems to the fact that they are used as instruments to maintain target prices.

Table 4.6. EU's Imports Protection and Exports Subsidies in the GTAP Database and at the Time of Enlargement

	EU's import tariffs on food Products from				Export Subsidies on food Product to			
	CEA	ROW	CEA	ROW	CEA	ROW	CEA	ROW
	1995	1995	2003	2003	1995	1995	2003	2003
1. Cereals	0.0	42.6	0.0	3.6	34.4	22.9	0.0	0.0
2. Beef	103.6	103.7	3.1	3.1	106.5	103.7	0.0	3.1
3. Milk	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4. Rest of Agriculture	3.1	7.6	3.1	7.6	4.1	6.5	4.1	6.5
5. Beef Manufacturing	110.6	111.2	112.4	111.3	111.0	111.3	85.9	86.8
6. Dairy	108.1	107.9	53.6	53.5	108.2	107.8	54.2	53.5
7. Rest of Food Manufacturing	17.4	14.0	17.4	14.0	7.0	6.2	7.0	6.2

As we can see the reform in cereals markets abolishes almost all border measures in 2003. The price reduction of beef agriculture introduced by reducing import tariffs and export subsidies eliminates also these measures almost completely, but there still remains considerable protection in manufactured beef products. There are no border measures in production of milk since fresh milk is not tradable commodity. We have maintained the target prices in this sector indirectly, by adjusting the subsidies and tariffs of dairy industry. Protection needed to maintain the target prices in fresh milk has been declining. This is because of the quota regime in milk. In the residual sectors called rest of agriculture and food manufacturing we have assumed no changes in tariffs or subsidies. The CAP reform introduced by Agenda 2000 changes considerably the terms of accession in agriculture. Table 4.7 summarizes the elements we are introducing as model shocks when we conduct our enlargement scenario with our dynamic CGE-model.

Table 4.7. The Enlargement Scenario

- *ENLARGEMENT TAKES PLACE IN 2003*
 - Impacts of enlargement shocks simulated 10 years ahead up to 2012
 - AGENDA 2000 taken into account in baseline
 - *SHOCKS CHARACTERIZING ENLARGEMENT*
 - Formation of custom union between incumbent EU and new entrants; elimination of the remaining trade barriers and export subsidies in bilateral agricultural trade.
 - Introduction of Common agricultural policies.
 - ✓ Intervention prices in cereals, beef and milk; milk quotas
 - ✓ Common finance of export subsidies no other transfers to CEEC's
 - 10 % decrease in the transportation costs due to integration.
 - 15 % decrease in the required rate of return for capital in Central and Eastern Europe, caused by increased business confidence.
-

4.5 Modeling results

In this section we present the key results of our modeling experiment with EU's eastern enlargement. We look first at the some aggregate results and then, at a more detailed level, industry specific results of output growth and resource allocation in Central and Eastern Europe.

Aggregate results

Table 4.8 presents aggregate regional results. The figures are %-deviations from baseline simulation in 2012. They measure the percentage point difference of the variable's levels in our policy scenario relative to that of the baseline. The results are reported at one digits level of precision²⁵. The results demonstrate that the eastern enlargement is profoundly a European issue. It does not have too much impact to any part in the rest of the world. The reason for this is in the size of the Central and Eastern Europe. It contributes one percent to world 's GDP and two percent to the world trade. Two thirds of this trade is with the present members of the EU. Thus, even if the enlargement would double the trade of CEEC's the impact of this would come trough induced effect on the incumbent EU. This is not the case here. The impacts of enlargement for the EU are not sizable and thus the induced effects remain small. There is a small negative impact of enlargement for the incumbent EU. The main reason behind this are CAP-related transfers. We analyze this in more detail when we look at the decomposed welfare effects for EU and CEEC's.

Table 4.8. Aggregate Effects of EU's Eastern Enlargement

	% deviation from baseline in 2012									
	Income	Consum- er prices	Con- sumption	Equiva- lent variation	Invest- ments	Savings	Exports	Imports	Export Prices	Import Prices
1. Pacific OECD	-0.1	0.0	-0.1	0.0	-0.1	-0.1	0.0	-0.1	-0.1	0.0
2. Japan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3. New Industrial Asian Economies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4. South-East Asia	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
5. China	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6. North America	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
7. European Union	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	0.1	-0.1	-0.1	0.0
8. Central and Eastern Europe	3.1	1.4	1.7	1.8	4.3	2.4	2.7	6.9	0.8	-0.1
9. Former Soviet Union	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.0	-0.1
10. Rest of the World	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.1	0.0	0.0

The only significantly visible effects, for the rest of the world, are a small negative impact on Pacific OECD and small positive impact on the region of the Former Soviet Union. The reason for this is a change in the terms of trade that enlargement induces to these regions. The main influencing factor behind this can be detected to be the trade in agricultural commodities. The main destination for

²⁵ This means that all figures that are smaller than 0.05 are reported as zeros.

CEEC's food exports outside EU is the region of Former Soviet Union. CAP subsidies introduced in enlargement expands food trade in this direction. This induces a favorable terms of trade effect for the FSU. Simultaneously CEEC gains a share of agricultural markets, which are important source of export incomes to Pacific OECD. This has a small detrimental welfare effect in this region.

Figure 4.1. *Decomposition of the Welfare Change in CEEC's after Eastern Enlargement*

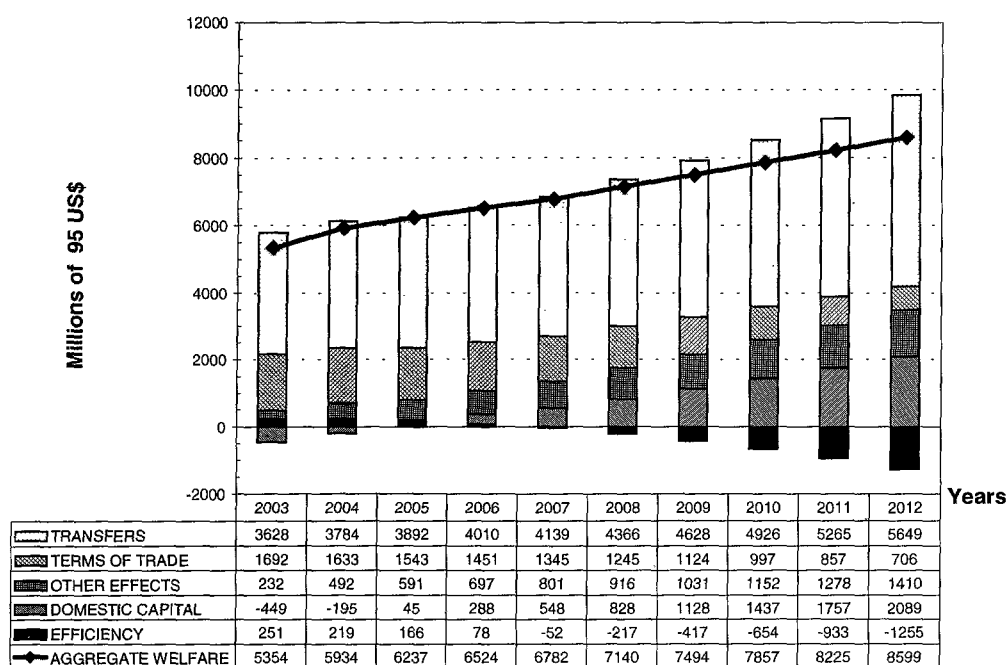
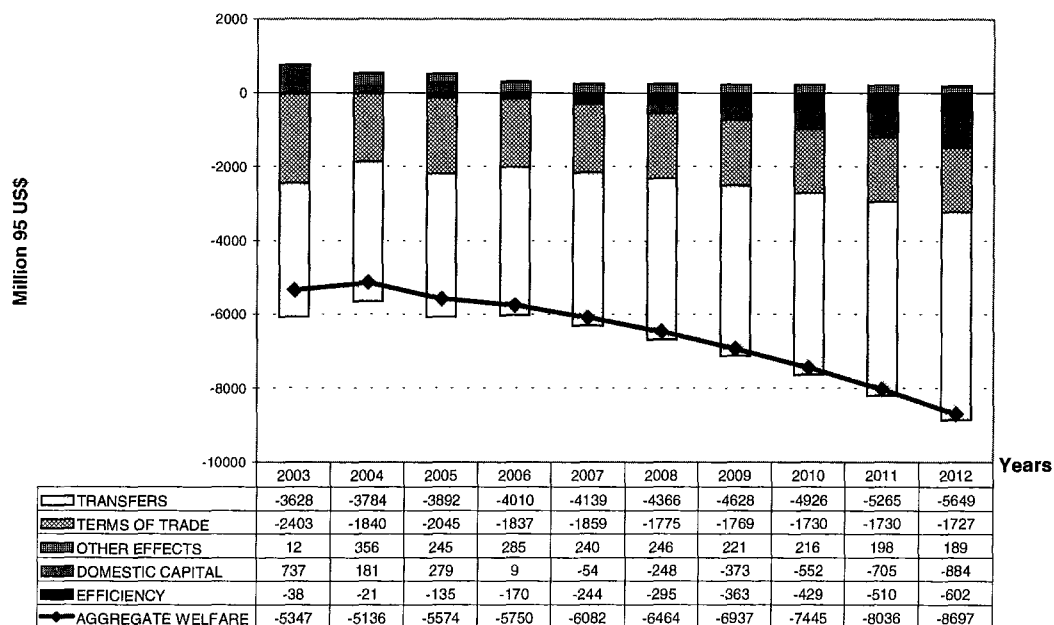


Figure 4.2. *Decomposition of the Welfare Change in the EU after Eastern Enlargement*



The impact of enlargement is largest for the accessing countries. Factor incomes increase by 3.1 percent. At the same time consumer prices rises by 1.4 percent leaving room for 1.7 percentage point increase in consumption. At the same time relative prices change in such a way that welfare measured by equivalent variation²⁶ increases by 1.8 percent.

Investments are growing faster than savings and CEEC-region is running larger trade deficit to finance this gap. This is reflected in the fact that exports are only 2.7 percent higher relative to baseline, whereas the same figure for imports is 6.9 percent. The increased balance of trade deficit implies that at increased proportion regional expenditures are larger than regional incomes. External resources are used to finance larger share of the capital accumulation and the foreign ownership of regional capital will increase in our integration scenario.

Figures 4.1 and 4.2 presents decompositions of the welfare changes for the CEEC's and the EU. The figures are in millions of US dollars compared to our baseline. The aggregate welfare outcomes, plotted in the figure as bold line with

²⁶ Equivalent variation is a money metric measure of welfare change. It compares policy outcome and initial state and indicates how large monetary compensation should be given to the economy at initial prices that would make it indifferent to the reform.

diamond dots, are almost mirror images of each other. In the first year of accession the gain for the CEEC is about 5000 million dollars²⁷ and for the EU there is an equivalent welfare loss. After ten years of the accession welfare gain for CEEC's is about 8.5 billion and loss for the EU approximately as large negative figure.

The welfare change is decomposed into five components. Transfers, terms of trade effect, efficiency, increase domestically owned capital and aggregate of the remaining effects that are not specified in the decomposition. The decomposition is done in similar way as in Huff and Hertel (1996), where the details how equivalent variation can be split is described. Domestic capital and transfers are new model specific variables. CAP related transfer expenditures are caused by export subsidies introduced to CEEC's and financed from the common EU budget. Domestic capital is increased capital income generated by domestically owned capital accumulation. The residual of remaining effects consists of e.g. aggregate factor productivity change caused by change in the industry structure of the economy and decreased transaction costs caused by integration.

The main component of the welfare change comes from the transfers. The amount of transfers are initially 3.5 billion US\$ approximately 4.0 billion ECU at 1995 exchange rates. This accounts for two thirds of the whole welfare change. That is about twice the sum that has been estimated in EU's financial perspective (Official Journal, 1999 C172) that is a preliminary of the budget guideline²⁸.

There are two other recent studies of EU's eastern enlargement that has used CGE-approach in evaluating European integration. Jensen et al. (1998) and Liapis and Tsigas (1998) both use comparative static GTAP model. Jensen et al. (1998) is more sophisticated in formulating the policy instruments of CAP. This study has been in many respects inspired by their work. However, both of the above mentioned studies are different from this study in assuming that new members are obliged to all subsidies that are paid within framework of CAP. They include land and animal premiums in the subsidies that will be paid to new members. In their simulations they both end up to transfers that are approximately 12 billion ECUs that is three times the figure achieved in this study, or twice of the amount of transfers we estimate at the final period of our simulation.

The estimate of four billion ECUs is for the immediate impact effect. As we can see from the figure 4.1 transfers will be increasing gradually and they reach the level of 5.6 billion dollars that is 6.7 billion 95 ECUs in 2012. The growth of

²⁷ The currency unit is 95 US dollar that is the base year of the data. ECU was in 95 about 1.2 dollars, which means that 5000 million welfare gain in US\$ is about 6000 ECU and 36 billion FIM.

²⁸ Even though the difference is 50 %, it's well within the limits of the margin for unforeseen expenditure, budgeted in the expenditure guideline.

transfers relates to the output response in CEEC's. The costs of maintaining target prices specified at current CAP becomes increasingly costly over time, since growing share of East European agricultural products should be exported with subsidies to the rest of the world to maintain the target prices. We look in a separate section in more detail the output responses of enlargement.

Jensen et al. (1998) emphasizes the introduction of a comprehensive set of CAP instruments with enlargement. They mention that if animal and land premiums were excluded in their estimate of CAP costs of enlargement for EU would be 6.9 billion ECUs. This is very close to the figure we get in our model simulation for the year 2012. Since they use a comparative static model, their results should be interpreted as long term implications of the permanent level of the enlargement costs. The advantage of our approach is that we can evaluate the immediate impact of enlargement and trace out the time path of the consequences of the enlargement, whereas they can only look long term level effects.

The reason why we have omitted land and animal premiums in our simulations is that these premiums have been compensation for the farmers on price policy changes. When EU's producer prices have been adjusted closer to the world market prices in 1992 MacSharry reform and currently as a consequence of Agenda 2000 proposals this has been compensated to farmers in these forms of subsidies. Enlargement on the other hand will imply larger divergence of new entrants producer prices to those in world markets. Prices of agricultural and food products will increase and not decline when enlargement takes place. In this sense, there is no need for extra compensation, and on the other hand, this is explicitly stated negotiation position of EU that these specific measures of previous reforms will not be introduced to the new entrants.

In the first years after accession, the terms of trade effect is second in the importance for the welfare improvement in CEEC's. Integration affects CEEC's terms of trade mainly by having an impact on export prices. Import prices are not much effected because CEEC is a small region in world markets. Alteration in its markets conditions can't have major impact in world markets just because of the size of the region.

Export prices of CEEC's increase for two reasons. Removal of bilateral barriers in agricultural trade between the incumbent and new members of EU, induces a resource shift to agricultural and food industries. This must be partly balanced by increased export prices in other sectors to balance the demand and supply. On the other hand increased export subsidies in CEEC's agricultural exports to countries outside internal markets gives also room for price increases.

The negative terms of trade effect for the incumbent EU stems from the fact that increased transfers to new members reduces domestic demand that has to be compensated in production by a shift to exports supply. This is reflected in

decline of these prices. Even though, in terms of absolute changes this is similar size as the gain in the case of CEEC's the relative decline in export prices on aggregate is -0.1 percent as was indicated in table 4.8.

The efficiency gains come from the removal of trade distorting tariffs and subsidies in bilateral trade between integrating regions. At initial stage the bilateral removal of trade barriers in agriculture and food are beneficial for CEEC's but gradually this effect becomes negative, when export subsidies have to be increased to keep the target prices at desired levels. For the incumbent EU the efficiency effects are small but negative already at the beginning. The reason for this is that existing export subsidies have to be increased at the beginning of enlargement and in this case the bilateral liberalization is not sufficient to compensate this effect.

The impact of domestically owned capital for the welfare change is initially negative for the CEEC's. We assume in our simulations that the required rate of return for investments decline because of the increased business confidence in new member countries. Domestic savings are not initially sufficient to finance these increased investments and the ownership structure in Central and Eastern European countries move in favor of foreign ownership. Capital incomes are paid abroad respectively. This phases out gradually and the accumulation of capital beginnings to benefit also the domestic owners. In fact at the end of our simulation period the capital accumulation is the second largest positive effect for welfare deviation from the baseline. Whereas, terms of trade change has largely phased out and efficiency gains have become efficiency losses.

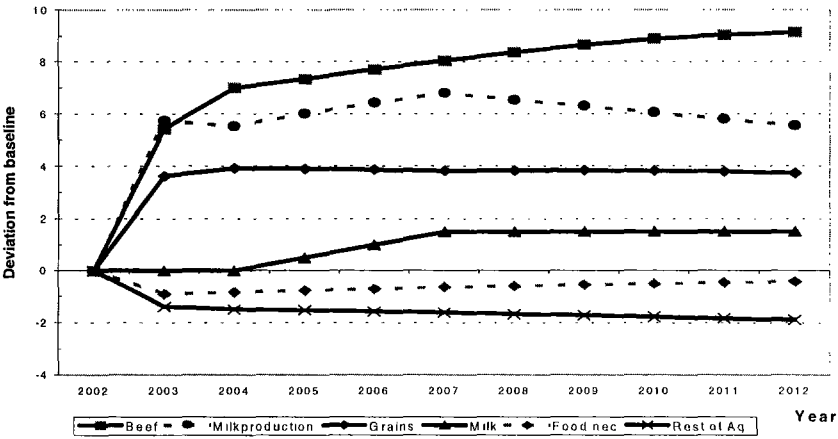
Output and input responses

In this section we first look more closely the development in CEEC's and then evaluate more briefly the impact for the EU. Impacts for the EU are much smaller as one could expect by looking at the development at aggregate level.

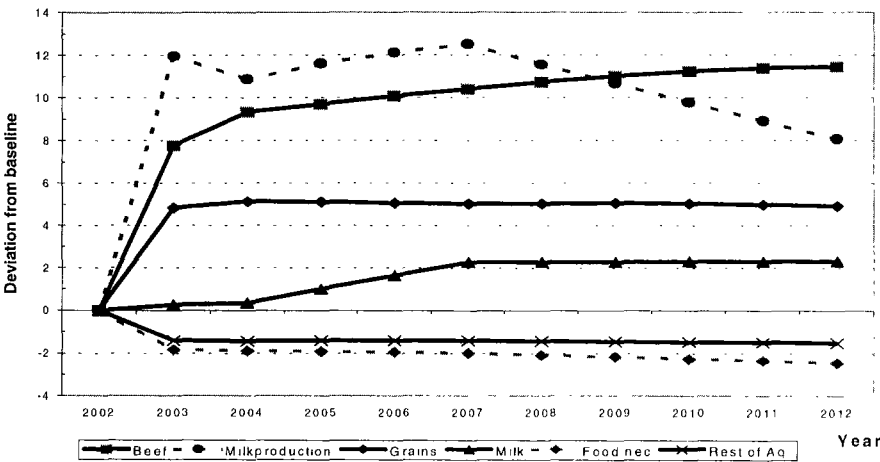
Output and factor market allocations for CEEC's are plotted in figures 4.3 for food production and in figure 4.4 for non-food production. Figures are presented as percentage point deviations from baseline simulations. In the figure of output response in food sectors the EU impact varies from +8 percent in beef production to -2 in the rest of the agriculture, that is, for production that is outside CAP's target price commodities. Bovine meat manufacturing has been left out from this figure since the production effect there is as large as 40 percent. This is documented in a separate appendix table, where time paths of output, price and factor allocations are traced out each individual sector both for CEECs and the EU. Originally this is a very small sector, with 2 % share of the total food manufacturing. The EU enlargement increases its size to 5 % of food manufacturing.

Figures 4.3. a-c: *Output and Input Growth in CEEC's Food Production*

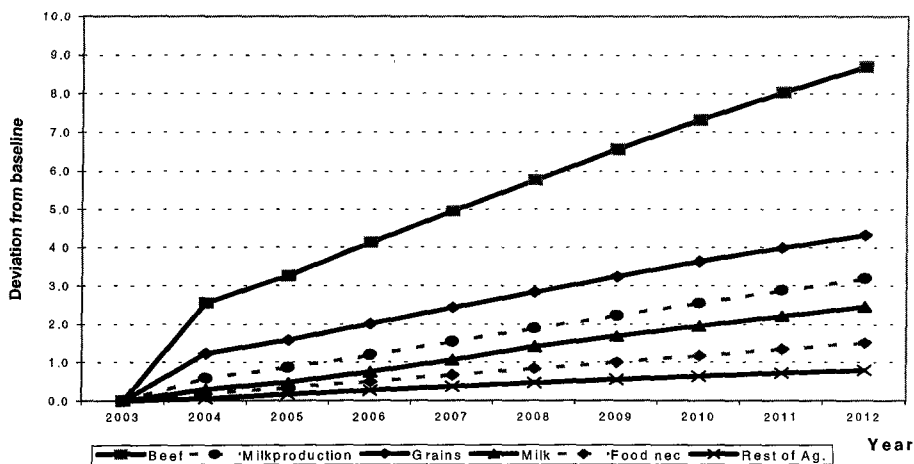
Food Products: Output Growth in CEEC's after Enlargement



Food Products: Labor Force Growth in CEEC's after Enlargement

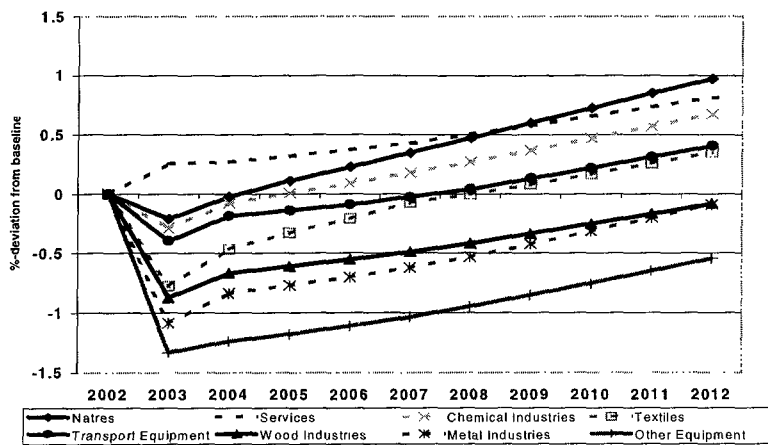


Food Products: Capital Stock Growth in CEEC's after Enlargement

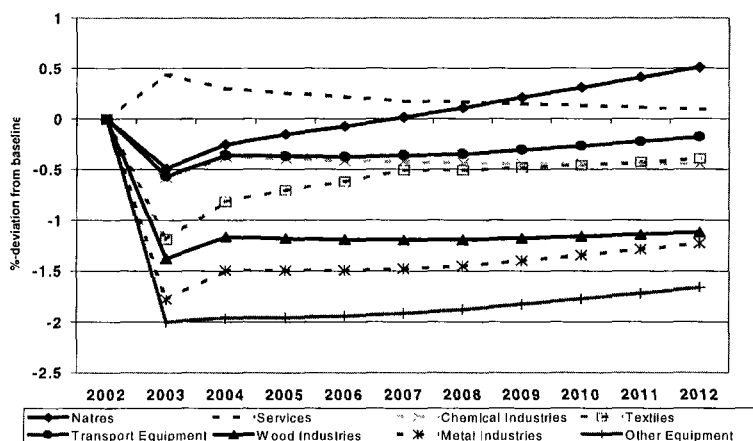


Figures 4.4. a-c: Output and Input Growth in CEEC's Non-Food Production

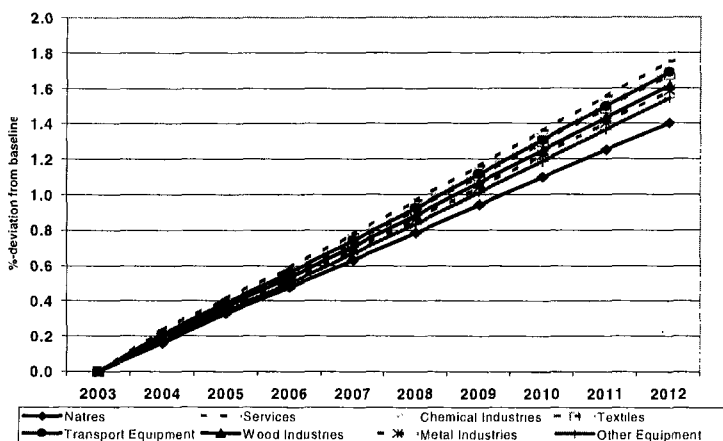
Non-food Products: Output Growth in CEEC's after Enlargement



Non-food Products: Labor Force Growth in CEEC's after Enlargement



Non-food Products: Capital Stock Growth in CEEC's after Enlargement



In fresh milk production the output does not respond at all immediately. This is because of the introduction of quota regime in new entrant region. The quota is expanded gradually according to Agenda 2000 by 1.5 percent in three steps. The two declining sectors, rest of agriculture and rest of food production, are important since they contribute, in both cases, more than one half of the production in total agriculture and food processing and even larger share of labor force.

The adjustment needs of expanding agricultural and food-producing sectors can be met by the declining sectors within these branches. Initially, the output response is based on labor re-allocation. Gradually the capital stock growth relative to baseline starts to follow. The relative changes in labor force and capital stocks indicate that the declining sectors becomes more capital intensive and the expanding ones either more labor intensive or the capital labor ratio remains relatively stable. This is so because the use of labor is smaller in the declining sector relative to baseline but the capital stock is somewhat higher. In both of the declining food producing sectors capital stock growth is below the regional average, which is, 1.8 percent higher compared to the baseline.

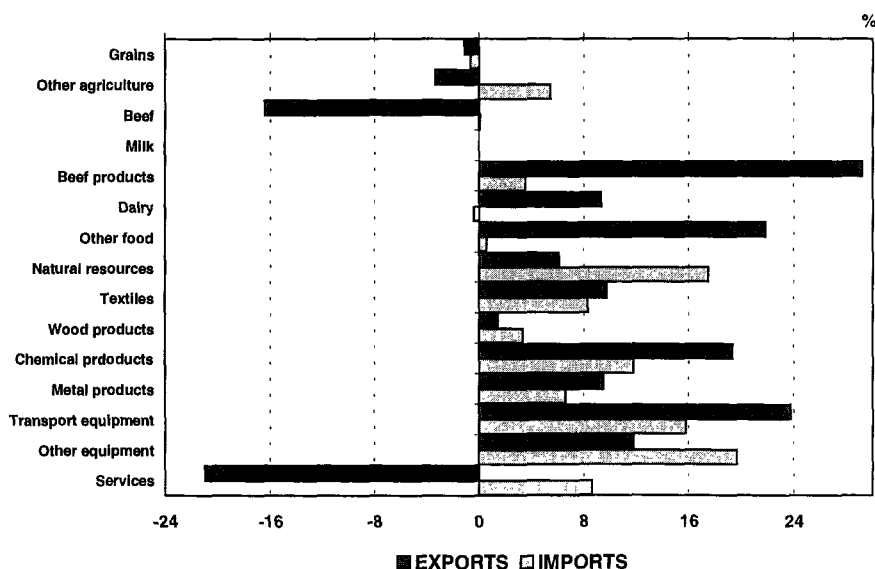
Initially, all other non-food sectors, except services decline. Similarly, the expansion of services is important since it demands approximately 60 percent of the total labor of the region. Two of the declining sectors, natural resource extraction and chemical industries seem to recover within few years, while for textiles and transport equipment it takes five years to catch the level in the baseline. At the final period of our simulation all these four sectors are slightly above the baseline level. This expansion is completely based on capital accumulation effects since labor force is, with the exception of natural resources and services, somewhat below the baseline level.

For the EU, all industry specific responses to enlargement are hardly visible. All output deviations, except that in the bovine meat manufacturing, are less than one percent at the final year of our simulation period. These developments are documented in a separate appendix table that describes the impacts of enlargement on price, output and resource allocation for the EU. The aggregate welfare results in absolute terms are of the same magnitude, although at different direction for the EU. The relatively small importance of these effects for the EU is because EU at the present form is 25 larger region in terms of GDP than is the CEECs.

Trade Effects

The trade composition effects for CEEC's are presented in figure 4.5. Horizontal axis measures in percentage terms the relative contribution of individual industries to aggregate export and import growth. As was pointed out in table 4.8 the aggregate import growth was 2.7 percent and import growth 6.9 relative to baseline. The relative share, for example, of the exports of beef manufacturing was more than one quarter of this 2.7 per cent export growth.

Figure 4.5. Contributions of Individual Industries to Export and Import Growth



As we can see from the figure 4.5, most of the trade expansion in food trade takes place in manufactured and not agricultural products. Fresh milk is not a tradable commodity so no action takes place in there. There are negligible changes in trade with grains. In agricultural beef products, which are mostly live animals, exports decreases and imports increases. These products are used in expanding domestic production of beef manufacturing, which is driven by exports with the help of EU subsidies. Chemical industries and transport equipment are sectors that contribute to export growth, whereas importance of services decline is largest among of the declining exports activities. Commodities contributing to imports growth are distributed more evenly, but natural resources together with transport and other equipment are sectors where imports growth is relatively most important. The growing importance of these sectors is understandable since they are important components in investment demand, which will grow strongly relative to the baseline scenario.

4.6 An Alternative Scenario

In our integration exercise we have assumed a baseline where a business as usual trend growth in world economy has been assumed. To look how sensitive our conclusions are for this baseline, we run our integration scenario under alternative assumption on the world economic environment and compare these

results to our original ones. In this way we can analyze what difference does it make if the world would not look like the one we have assumed.

In our alternative scenario we assume that China's growth will slow down in such a way that its growth will be based solely on factor accumulation and labor force growth and not at all on total factor productivity growth. On average this would mean that China's annual GDP growth would be about 4.5 percent, while in our baseline China's growth was 7.7 percent. In our framework this would imply larger output growth decline in agriculture than in manufacturing or services sectors.

The motivation to look at the implications of deterioration of China's growth performance as an alternative scenario, based on the fact that China is a relatively important trade partner for the EU. This importance has been growing in recent decades as was discussed when the regional breakdown of the model was discussed. On the other hand China in its trade is specialized in exporting labor intensive light manufacturing products. In this sense it's a potential competitor for CEEC's. What is the importance of different output performance of China for Central and East Europe's competitive position in EU markets? In our alternative scenario we assume that China's growth rate declines permanently in 2002 and we look at the consequences after 10 years have elapsed. In table 4.9 we present aggregate figures where we compare our original enlargement scenario with enlargement when China's growth has slowed down.

The slowing down of growth in China has, overall, much larger global implications than EU's eastern enlargement. Income effects are negative in almost all regions, even though they are not even close to the magnitudes they are for China itself. The income declines in China by more than twenty percent. When consumer prices increase at the same time more than forty percent consumption declines to one third of that in our business as usual scenario. Savings do not decline that much and investments even less. This means that investments in China are financed with increasing proportion by foreign sources. The slow down in China seems to globally reduce investments more than savings outside China. Thus paradoxically, it seems that China is absorbing the world's excess savings despite its growth rate having gone down.

Table 4.9. Aggeragate Results in China's Slow Growth Scenario

%- deviations from original integration scenario in 2012

	Income	Consumer prices	Consump- tion	Savings	Invest- ments	Exports	Imports	Export prices	Import prices
1. Pacific OECD	0.0	0.1	-0.1	0.2	-2.1	0.0	-0.9	1.1	0.4
2. Japan	-0.8	-0.3	-0.5	-0.3	0.0	-0.4	-3.4	-0.5	1.4
3. New Industrial Asian Economies	-1.4	0.0	-1.4	-0.6	-1.8	-0.4	-2.2	-0.6	0.7
4. South-East Asia	0.8	1.3	-0.6	0.9	-2.0	0.0	-0.6	0.7	0.3
5. China	-22.5	43.6	-66.1	-24.7	-7.4	-40.0	-10.6	10.4	0.9
6. North America	-0.5	-0.2	-0.2	-0.1	-2.1	0.7	-1.5	0.3	0.4
7. European Union	-1.0	-0.5	-0.5	-0.5	-2.2	1.3	-0.8	-0.4	0.0
8. Central and East Europe	-0.1	0.1	-0.2	0.2	-1.9	0.3	-0.4	0.1	0.0
9. Former Soviet Union	-0.4	-0.1	-0.3	0.0	0.0	0.2	-0.8	0.1	0.4
10. Rest of the World	0.1	0.6	-0.5	0.4	-2.2	0.3	-0.9	0.5	0.4

Outside China, the second largest negative impact is perceived in the current EU. In its impacts deterioration of China's growth performance is far more important for the present members of EU than enlargement, although the income decline even in this case is not that large. EU's exports increase relative to high growth scenario by more than a percent and imports decline somewhat. The very large decline in China's exports gives room for export expansion in the rest of the world and this effect is especially strong in the case of EU. To some extent it's surprising that export expansion in CEEC's is not that strong. The influence as a whole, is smaller for CEEC's than most of the regions in the model. Main reason for this is CEEC's weak direct trade links to China.

Output responses of CEEC and the EU are broadly similar. In nine out of the fourteen²⁹ cases the direction of output response is the same. Proportionally most important positive changes appear in sectors for textiles manufacturing and rest of the agriculture. The reason for this is that China is on global level important textiles exporter and the negative productivity shock has a major impact on this activity. On the other hand China is also net exporter of food products. This explains the expansion in food exports. Besides Chinas diminished supplies to world markets European regions increases food exports to China, which because of the productivity shock, becomes a net importer of food items. The change in trade structure of China has implications for world food markets. The decline in China's supplies and increase in its demand of food products increases world prices. This has implications for the cost of enlargement in regional transfers

²⁹ Milk agriculture is not included in table 4.10, since there is quota regime and in fresh milk there is no trade. In table 4.10 the missing observations (-) indicate that there is no bilateral trade initially. The way the model is implemented is such that we are not able to introduce new activities and thus these remain zeroes also in the perturbed scenario.

related to CAP. Because world market prices are higher export the need for subsidies to maintain CAP prices diminishes and the transfers of current members of EU decline approximately 400 million ECU's.

Table 4.10. Output and Export responses in China's slow growth Scenario

<i>%- deviations from original integration scenario in 2012</i>								
	EU-15				CEEC's			
	Output	Exports on average	Exports to China	Exports to CEA	Output	Exports on average	Exports to China	Exports to EU15
1. Cereals	0.5	-0.2	109.1	-8.1	0.0	-0.1	-	6.9
2. Beef	0.1	-2.9	-	-2.3	-0.7	-0.6	-	0.9
4. Rest of agriculture	3.2	8.5	161.2	2.4	1.4	8.4	163.5	5.0
5. Beef manufacturing	-0.1	0.4	-15.4	-1.0	0.0	2.0	-14.0	2.9
6. Milk manufacturing	0.4	1.7	-	1.5	-0.1	-0.2	-	-0.6
7. Rest of food	-0.1	-0.3	81.0	1.3	0.8	3.3	98.7	3.4
8. Natural resources	0.9	4.4	68.7	1.8	0.2	2.4	66.2	-0.2
9. Textiles	5.4	10.8	-21.5	7.1	3.3	7.4	-22.4	6.8
10. Wood	-0.2	0.3	-20.8	0.4	-0.5	-0.8	-21.7	-0.9
11. Chemicals	0.1	0.5	-30.8	0.9	-0.3	-0.8	-31.5	-0.4
12. Metal products	-0.1	0.8	-21.8	0.8	-0.8	-1.1	-23.0	-0.9
13. Transport equipment	-0.2	0.6	7.4	1.0	-1.3	-1.7	5.2	-2.5
14. Other equipment	0.3	0.9	-12.8	0.7	-0.5	-0.3	-14.0	-0.1
15. Services	-0.5	-0.7	-29.1	0.5	-0.6	-2.0	-30.1	-1.5

The export changes to Chinese markets are for both the EU and CEECs, with the exception of absent trade, exactly identical and the proportional responses are very close to each other. The influence for exports in general is however different. In CEEC's there is decline in most of the export categories outside food production, but in the EU exports are expanding. When outputs and exports go in different directions there is a shift away in domestic demand from domestically produced goods, which is partially compensated by reorientation to export markets and partially a contraction in the production. With the EU this is clearly the case since exports on average are expanding although their prices are declining. In several manufacturing sectors of CEEC's both output and exports are declining. This reflects the resource pull to expanding activities in agriculture and textile production that have more importance in production of CEEC's compared to the current members of the EU.

5. Concluding Remarks

The Central and Eastern European countries have experienced a considerable transformation in their societies during their transition from centrally planned to market oriented economic systems. This transformation has been much more profound in its nature than the forthcoming memberships of these countries in the European Union would be. This process has involved major structural changes. The excessive role of manufacturing industries and agriculture has been diminished and production of services has gained importance. At the same time these economies have become increasingly open to international trade simultaneously with drastic reorientation of regional direction of their trade. Currently two thirds of their trade takes place with present members of the European Union.

The transition in CEECs has been a creation of market enhancing institutions and external and internal liberalization of economic activities. On its part the prospective membership in the European Union will consolidate this process. In our analysis we have taken into account this aspect of integration by evaluating the impacts of lower required rate for invested capital in this region. After a while this impact has a major role in explaining the difference in integration scenario compared to the alternative that it will not take place.

Besides the adoption of common market institutions the enlargement involves introduction of common agricultural policies to new entrant economies of the EU. The common agricultural policy has two kinds of consequences for new members. It removes the barriers in bilateral agricultural trade that still are present in the bilateral trade of the incumbent EU and the acceding countries. On the other hand new price policy instruments will be taken into use. The level of protection in agriculture will increase in these countries. The maintenance of high producer prices will gradually imply efficiency losses that will become a welfare burden for these economies. This is balanced by the fact that the agricultural policy is financed from common budget of the EU. Since the whole community finances new agricultural policy the net welfare effect of the agricultural policy is positive for the new entrants. In fact CAP related transfer is the largest individual factor contributing to the welfare change in these countries.

In terms of transfers, caused by the introduction of CAP to new entrant economies, the costs to the present members are not very large, even though the enlargement implies involves substantial output responses in the new members. The major impact for the incumbent EU comes from CAP related transfers, although there is also a small negative terms of trade effect of the enlargement.

There are several reasons why the economic implications for the present members of the EU are so small. First of all, the European Union is an economic

giant compared to the prospective members. If measured by GDP, the previous enlargement of the Union with Austria, Finland and Sweden was as large an event. This is despite the fact that the integration with these three small nations increased the size of EU's population only with few percentage points. The forthcoming enlargement will, if all applicants will finally be members, increase the population of the EU almost by one third that is more than 100 million people.

Another important reason for proportionally small effects for the present EU countries, is the fact that the trade in manufactured products will at the time of integration be duty free. The decreases in transaction costs, which are due to common market effects, will not be that significant. The CEECs, as a region, is important partner in external trade of the EU, but trade outside common markets is only a bit more than ten percent measured as a share of aggregate GDP in the EU-region. CEEC's share of this external trade is approximately 10 percent's. From this perspective, the enlargement has impact to activities that constitute about one percent of the GDP in the EU.

The relatively more significant effects for the CEECs comes from the same reason. The share of its trade relative to GDP is about 30 percent. Two thirds of this trade is with the EU. Thus the activities directly influenced by the integration covers approximately 20 percent of their GDP. The expected effects should be of different magnitude relative to those in the EU, which they appear to be. Measured by equivalent variation or changes in real consumption the welfare effect for the CEEC's is 18 times larger than it is for the EU.

The Central and Eastern European countries are in economic terms small relative to the EU as well with respect to the rest of the world. In this perspective the eastward enlargement is mainly a regional matter within Europe. The worldwide repercussions of the widening of European integration are hardly visible. It's illuminating that the alternative scenario, where we gear down the trend growth of China about three percent annually has a much larger impact for the world economy, and for the European Union, than our exercise with European integration.

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APPENDIX 1: Price, Output, and Resource Allocation Effects in Integration Scenario

Table A1: Price, Output, and Resource Allocation Effects for CEECs

% - deviations from baseline

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Grains										
Price	4.22	4.22	4.22	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Output	3.62	3.94	3.90	3.87	3.83	3.84	3.85	3.83	3.79	3.74
Land	3.17	3.13	2.93	2.72	2.52	2.40	2.28	2.15	2.01	1.87
Labor	4.83	5.13	5.10	5.07	5.04	5.04	5.05	5.03	4.99	4.93
Capital	0.00	1.23	1.58	2.01	2.43	2.84	3.25	3.63	4.00	4.33
Beef Agriculture										
Price	6.27	6.27	6.27	6.27	6.27	6.27	6.27	6.27	6.27	6.27
Output	5.43	7.00	7.34	7.71	8.05	8.38	8.67	8.89	9.05	9.14
Land	5.51	6.47	6.56	6.66	6.73	6.86	6.96	7.01	7.02	6.98
Labor	7.78	9.36	9.70	10.08	10.41	10.74	11.03	11.25	11.40	11.48
Capital	0.00	2.56	3.27	4.12	4.96	5.77	6.57	7.33	8.04	8.69
Milk Agriculture										
Price	50.32	50.32	42.81	35.29	27.77	27.77	27.77	27.77	27.77	27.77
Output	0.00	0.00	0.50	1.00	1.50	1.50	1.50	1.50	1.50	1.50
Land	-0.47	-0.68	-0.34	0.00	0.33	0.21	0.10	0.00	-0.10	-0.18
Labor	0.28	0.34	0.99	1.63	2.27	2.27	2.28	2.30	2.31	2.32
Capital	0.00	0.30	0.48	0.76	1.07	1.41	1.68	1.95	2.21	2.46
Rest of Agriculture										
Price	1.25	1.49	1.60	1.74	1.85	1.93	1.99	2.06	2.12	2.18
Output	-1.39	-1.49	-1.53	-1.58	-1.62	-1.68	-1.73	-1.78	-1.83	-1.89
Land	-1.82	-2.09	-2.25	-2.42	-2.59	-2.73	-2.86	-2.99	-3.11	-3.22
Labor	-1.40	-1.41	-1.40	-1.40	-1.40	-1.42	-1.45	-1.47	-1.49	-1.52
Capital	0.00	0.07	0.17	0.27	0.37	0.47	0.56	0.64	0.72	0.80
Beef manufacturing										
Price	10.44	9.99	10.00	9.96	9.89	9.77	9.64	9.50	9.35	9.19
Output	41.43	43.17	44.13	45.11	46.09	46.89	47.68	48.44	49.16	49.85
Labor	107.46	104.87	106.32	107.25	107.98	108.00	107.91	107.65	107.24	106.69
Capital	0.00	3.73	4.49	5.53	6.67	7.88	9.15	10.45	11.79	13.15
Milk manufacturing										
Price	19.14	18.94	16.48	14.02	11.54	11.38	11.22	11.06	10.90	10.74
Output	5.73	5.53	6.01	6.43	6.79	6.53	6.29	6.04	5.80	5.56
Labor	11.97	10.87	11.60	12.12	12.52	11.56	10.67	9.78	8.91	8.07
Capital	0.00	0.59	0.86	1.19	1.53	1.88	2.22	2.55	2.87	3.19

Table A1(continues): Price, Output, and Resource Allocation Effects for CEECs

		% - deviations from baseline										
Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	
Rest of Food Manufacturing	Price	1.07	1.12	1.09	1.08	1.05	1.03	1.01	0.98	0.96	0.93	
	Output	-0.91	-0.83	-0.76	-0.70	-0.64	-0.59	-0.55	-0.50	-0.46	-0.42	
	Labor	-1.84	-1.87	-1.91	-1.95	-1.99	-2.08	-2.17	-2.26	-2.35	-2.44	
Natural Resource Production	Capital	0.00	0.18	0.34	0.50	0.67	0.83	1.00	1.17	1.34	1.51	
	Price	0.67	0.84	0.76	0.69	0.62	0.57	0.51	0.45	0.39	0.34	
	Output	-0.21	-0.02	0.11	0.23	0.35	0.47	0.60	0.73	0.85	0.97	
Textiles Industries	Labor	-0.49	-0.25	-0.15	-0.07	0.02	0.11	0.21	0.31	0.41	0.51	
	Capital	0.00	0.16	0.33	0.48	0.63	0.78	0.94	1.10	1.25	1.40	
	Price	1.18	1.21	1.17	1.15	1.11	1.10	1.07	1.06	1.03	1.01	
Wood Industries	Output	-0.77	-0.46	-0.33	-0.21	-0.07	0.00	0.08	0.17	0.26	0.35	
	Labor	-1.19	-0.82	-0.71	-0.62	-0.51	-0.51	-0.48	-0.46	-0.43	-0.40	
	Capital	0.00	0.20	0.38	0.55	0.73	0.91	1.10	1.29	1.49	1.68	
Chemical Industries	Price	1.03	1.07	1.04	1.04	1.02	1.00	0.98	0.96	0.93	0.91	
	Output	-0.87	-0.67	-0.61	-0.55	-0.49	-0.42	-0.34	-0.25	-0.17	-0.08	
	Labor	-1.38	-1.17	-1.18	-1.19	-1.19	-1.19	-1.18	-1.16	-1.14	-1.12	
Metal Industries	Capital	0.00	0.20	0.37	0.53	0.71	0.88	1.07	1.25	1.43	1.62	
	Price	0.72	0.73	0.69	0.67	0.64	0.61	0.57	0.54	0.50	0.46	
	Output	-0.29	-0.08	0.01	0.09	0.18	0.27	0.37	0.47	0.57	0.68	
Transport Equip- ment Industries	Labor	-0.59	-0.38	-0.40	-0.42	-0.42	-0.44	-0.44	-0.45	-0.45	-0.45	
	Capital	0.00	0.22	0.39	0.57	0.75	0.93	1.13	1.32	1.51	1.70	
	Price	0.68	0.73	0.71	0.70	0.68	0.67	0.65	0.62	0.60	0.57	
	Output	-1.09	-0.84	-0.77	-0.70	-0.62	-0.53	-0.42	-0.31	-0.20	-0.09	
	Labor	-1.78	-1.49	-1.49	-1.49	-1.48	-1.45	-1.40	-1.35	-1.29	-1.23	
	Capital	0.00	0.19	0.35	0.52	0.69	0.86	1.04	1.22	1.40	1.59	
	Price	0.33	0.35	0.33	0.32	0.30	0.28	0.26	0.24	0.21	0.19	
	Output	-0.40	-0.19	-0.14	-0.09	-0.02	0.04	0.13	0.22	0.31	0.41	
	Labor	-0.57	-0.36	-0.37	-0.38	-0.36	-0.35	-0.31	-0.27	-0.23	-0.18	
	Capital	0.00	0.21	0.39	0.56	0.74	0.93	1.12	1.31	1.50	1.69	

Table A1(continues): Price, Output, and Resource Allocation Effects for CEECs

		<i>% - deviations from baseline</i>									
	Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Other Equipment Industries	Price	0.72	0.74	0.72	0.72	0.71	0.70	0.68	0.66	0.65	0.63
	Output	-1.33	-1.24	-1.18	-1.11	-1.03	-0.95	-0.85	-0.75	-0.65	-0.54
	Labor	-2.00	-1.96	-1.96	-1.94	-1.92	-1.88	-1.83	-1.78	-1.72	-1.66
Services	Capital	0.00	0.18	0.34	0.50	0.67	0.84	1.01	1.19	1.37	1.54
	Price	1.69	1.69	1.66	1.65	1.61	1.60	1.57	1.54	1.50	1.47
	Output	0.26	0.27	0.32	0.38	0.43	0.51	0.58	0.66	0.74	0.81
	Labor	0.44	0.30	0.25	0.22	0.18	0.17	0.15	0.13	0.11	0.09
	Capital	0.00	0.24	0.41	0.59	0.78	0.97	1.16	1.36	1.56	1.75

Table A2: Price, Output, and Resource Allocation Effects for the EU

[illegible]

Table A2(continues): Price, Output, and Resource Allocation Effects for the EU

[illegible]

Table A2(continues): Price, Output, and Resource Allocation Effects for the EU

Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Wood Industries	Price	-0.07	-0.04	-0.06	-0.05	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07
	Output	0.05	0.03	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03
	Labor	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Capital	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
Chemical Industries	Price	-0.07	-0.05	-0.06	-0.05	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07
	Output	0.02	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Labor	0.03	-0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01
	Capital	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03
Metal Industries	Price	-0.08	-0.05	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07
	Output	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Labor	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04
	Capital	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
Transport Equipment Industries	Price	-0.09	-0.06	-0.08	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09
	Output	-0.10	-0.14	-0.12	-0.14	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14
	Labor	-0.13	-0.17	-0.15	-0.17	-0.16	-0.17	-0.17	-0.17	-0.17	-0.17
	Capital	0.00	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.04
Other Equipment Industries	Price	-0.08	-0.05	-0.07	-0.06	-0.07	-0.06	-0.07	-0.07	-0.07	-0.07
	Output	0.04	0.01	0.03	0.02	0.02	0.02	0.03	0.03	0.03	0.03
	Labor	0.05	0.02	0.04	0.03	0.03	0.03	0.04	0.04	0.04	0.05
	Capital	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
Services	Price	-0.10	-0.06	-0.08	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.09
	Output	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02
	Labor	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	Capital	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03

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