TRADE EFFECTS OF ECONOMIC TRANSITION IN EASTERN EUROPE: MEASURING ECONOMIC BENFITS FOR AUSTRIA'S REGIONS BY A MULTIREGIONAL GENERAL EQUILIBRIUM MODEL

Paper to be presented at the 38th Congress of the European Regional Science Association

Vienna, Austria, August 28 - September 1, 1998

by

Martin Schneider

Department of Economic and Social Geography,
University of Economics and Business Administration,
Augasse 2-6, A-1090 Vienna, Austria.
Phone: +43-1-31336-4808
Fax: +43-1-31336-703
mailto: martin@wigeo1.wu-wien.ac.at
www: http://wigeoweb.wu-wien.ac.at/

Abstract

In this paper we deal with the question how enhanced East-West trade will influence Austria's regions. Therefore we develop the first multiregional general equilibrium model for the Austrian economy. The model contains the 9 Austrian Federal Provinces (NUTS-II) which are linked by trade flows with Austria's neighbouring transition countries (CEEC-4) and with the rest of the world. Trade flows are modelled by sectoral import-supply and export-demand functions. We develop four scenarios of future East-West trade and simulate their effects on welfare and production in Austria's regions with our model. Our main result is that during the catch-up process there will be a pronounced regional pattern of welfare and production effects, while the magnitude is rather small. After integration has completed, the magnitude of the effects becomes larger, while the pronounced regional pattern disappears.

JEL classification: C68, F14, F15, F17, R13

Keywords: multiregional CGE model, trade, catch-up, transition, Austria, Eastern Europe

1. Introduction

The transformation of the formerly planned Central and Eastern European countries (CEECs) into market economies and their integration into the world economy have provoked interest about the consequences on the member countries of the EU. Most of the previous studies about this topic dealt with effects on the European Union as a whole or on effects on individual member states. The effects on regions within a member state seemed to be of minor relevance for most authors. But regions within a country can be affected differently. Austria is affected much stronger from the developments in the Central and Eastern European Countries than the other members of the European Union. This results primarily from Austria's geographical location. Austria has a common border with four of the Central and Eastern European Countries, which applied for membership (Czech Republic, Slovakia, Hungary, and Slovenia, called 'CEEC-4' in the following). Austria's trade with the Central and Eastern European Countries lies clearly above the average of the remaining member countries of the EU.

The question we want to deal with is *how enhanced East-West trade will influence Austria's regions*. Therefore we develop the first multiregional general equilibrium model for the Austrian economy. We then use our model to estimate the effects of some scenarios of future East-West trade patterns on welfare and production in Austria's regions. The outline of the paper is as follows. In order to construct reasonable scenarios, we need projections about future sectoral East-West trade flows. Our method to predict these future East-West trade flows consists of two steps. As a *first* step, we will investigate the characteristics of trade integration between the Central and Eastern European countries and the European Union since 1989. Therefore we divide the way of the CEECs from formerly planned economies into well-functioning market economies, which are fully integrated into Europe, into three phases. Each of these phases has its own characteristics and is own impacts on trade (chapter 2). In addition to these three phases, which give us the framework for constructing scenarios, we have to supplement projections for the volume of future East-West trade flows (step 2). Therefore we will survey some studies about this topic in chapter 3. The model will be presented in chapter 4. In chapter 5 we will develop four scenarios of future East-West trade. The simulation results will be presented in chapter 6. Finally, we will summarize the results and draw some conclusions from them.

2. Economic Transformation and the Pattern of Trade Between Eastern and Western European Countries

The transition of the Central and Eastern European countries from formerly planned economies into well-functioning market economies is a long process, which has a strong impact on East-West trade patterns. So we divide the processes ongoing in Eastern Europe into the following three phases.
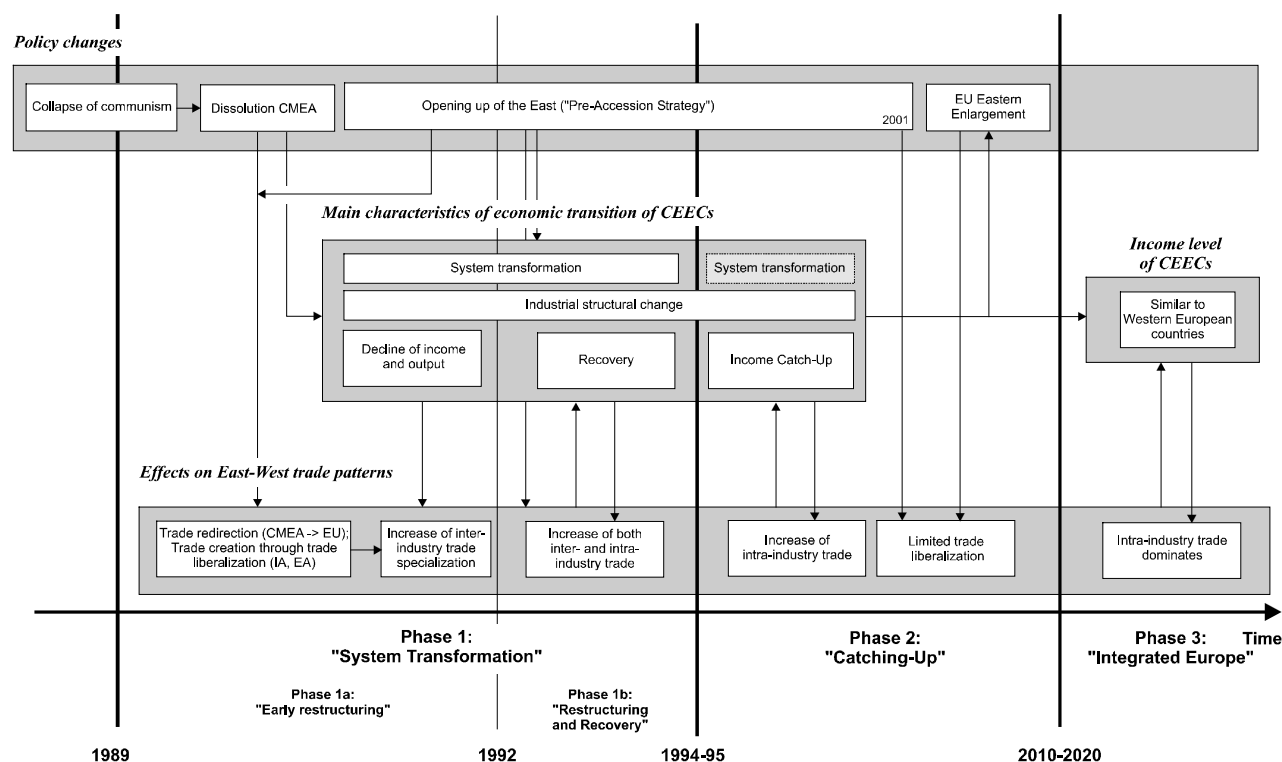
Phase 1: 'System Transformation' (1989-1994/95)

Phase 2: 'Catching-Up' (1994/95-2010/20)

Phase 3: 'Integrated Europe' (after 2010/20)

For each of the three phases, we will take a look at the main characteristics of the economic transition process and their impacts on the trade flows of the CEECs. Figure 1 summarizes our results.

Figure 1:   Phases of economic transition of the CEECs and their impact on East-West trade.

Notes: CEECs   Central and Eastern European Countries
CMEA   Council for Mutual Economic Assistance
EA   European Agreements
EU   European Union
IA   Interim Agreements

Source: The author's own draft.

2.1 Phase 1: 'System Transformation'

Phase 1 ('System Transformation') ranged from 1989 to 1994/95. In the first years of phase 1 *(Phase 1a: "Early Restructuring"*; 1989-1992), the transition economies suffered from the transformation recession. Their economies had to absorb many shocks. They lost their traditional export markets due to the breakdown of the Council for Mutual Economic Assistance (CMEA), incomes and domestic demand declined. Their terms of trade worsened, and they suffered from an acute shortage of foreign exchange. The dissolution of the CMEA and the Pre-Accession Strategy of the European Union has led to trade redirection from the former partners to Western Europe and to trade creation. The effects on the structure of East-West trade were an *increase of*

inter-industry trade specialization, which is based on the comparative advantages of the transition economies (i.e. cheap and relatively skilled labour force). The industrial structure of the CEECs underwent radical changes. From 1993 to 1994/95, the transition economies recovered from the transformation recession, the major part of system transformation were done *(Phase 1b: "Restructuring and Recovery")*. The growth of East-West trade and industrial restructuring persisted. Economic development and the restructuring of the industrial structure of the CEECs led to further increase of inter-industry specialization. In addition to this, the importance of intra-industry trade began to rise. In this phase, the CEECs succeeded in transforming their formerly planned economies into market economies. The most substantial reform projects have been accomplished. Since this time, all CEEC-4 economies have achieved a new growth path, whereas there are great differences in development between countries as well as between industries. There was a significant progress in integrating their economies into the global trading system.

2.2 Phase 2: 'Catching-Up'

In the *second phase ('Catching-Up',* beginning with 1994/95*)*, the process of catching-up[1] determines the pattern of trade. In 1997, the per capita GDP of the CEEC-4 ranged from 37 % (Hungary), 42 % (Slovak Republic) to 57 % (Czech Republic and Slovenia) of EU(15) average. The current economic development in the CEECs indicates that they will grow faster than the expected EU average. So convergence is possible. What remains uncertain is the speed of catching up. In a rather optimistic scenario Podkaminer et al. (1998) assumed a growth rate differential of 2 % to the EU average (see table 1). In this case, no Central and Eastern European country will reach EU average until 2010. The Czech Republic is expected to reach the highest GDP per capita (74 % of EU(15) average).

Table 1:   *GDP per capita of the CEEC-4 (at current PPPs, US$; % of EU (15) average)*

	1990	1991	1992	1993	1994	1995	1996	1997	2000	2005	2010
Czech Republic	62	54	52	54	54	56	58	57	61	67	74
Hungary	37	35	34	35	35	35	35	37	39	43	47
Slovak Republic	47	40	37	37	37	39	41	42	45	50	55
Slovenia	60	53	51	54	55	56	57	57	60	67	73

Notes: Projections assume no population growth and 4 % GDP growth in Eastern Europe and 2 % growth in the European Union.

           GDP   Gross domestic product

           PPP   purchasing power parity

Source: Podkaminer et. al (1998, p. 19, table A/1).

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[1]   Most authors think of income catch-up when they use the term 'catch-up process'. In a broader sense, the catch-up process includes the overall catching-up of the Eastern European economies to the level of the Western European countries. It also includes catching-up of organizational-institutional settings as well as a closure of the existing technological and product-quality gap. The most difficult problem for the CEECs seems to close the technology gap. Catching-up is not an automatically working process. Raising the standard of living of the CEECs requires the creation of institutional and organizational capabilities that put the economy on a higher growth path (Knell, 1996, p. 21).

Also it is desirable, it is not guaranteed that the catch-up process will succeed. There may be a lot of reasons for a 'falling-behind' instead of a 'catching-up' of the CEE economies: dependence on the conjuncture of the Western European economies (60-70% of CEEC-4 exports go to the EU), internal and external imbalances (notably in Hungary), structural deficits (industry, infrastructure, banking) and problems encountered in privatisation etc. have not yet been overcome, the onset of economic growth has spurred imports and hence, balance of trade (balance of current account) deficits (Havlik et. al, 1997, p. 9). Landesmann (1995) has shown that there may exist a 'bifurcation' situation. Some countries are more successful in their catching-up process, while in other countries there may be no closure of an existing gap. So a process of falling behind instead of catching-up might even be a distinct possibility (Landesmann, 1995, p. 20). One common problem of all transition countries is their negative trade balance. This is especially true for the Czech Republic, which suffered from a severe feedback in 1997. The growth rate of GDP fell since 1995, where it has reached its peak (5.9 %). Podkaminer et al. (1998) estimated a growth rate for 1997 of only 1.3 %. The main reason for that feedback is that the Czech authorities tried to keep the nominal exchange rate constant since 1991.

Trade theory tells us that the type of trade between two countries depends on the level of economic development they have reached. If these levels differ very much, inter-industry trade will dominate the trade relations. If they have achieved a rather similar level of economic development, intra-industry trade will dominate. While inter-industry trade is determined by endowment differences, intra-industry trade is based on economies of scale. Scale economies give countries the incentive to specialize and trade even in the absence of differences between countries in their resources or technology (Krugman and Obstfeld, 1994, p. 145).

So the catch-up process leads to an increase of the importance of intra-industry trade. Trade liberalization with industrial products as a part of the Pre-Accession strategy will be finished in 2001 (trade with agricultural products is excluded from this liberalization). However, the main part of the liberalization process has already been done. All EU restrictions on the import of industrial goods from the CEECs have been removed by the end of 1997. In the opposite direction, there are still some barriers.

2.3 Phase 3: 'Integrated Europe'

If the catch-up process succeeds, the income level of the CEECs will be similar to that of the EU average or at least to that of the poorer EU member countries. This will lead to a strong increase of intra-industry trade, which is typical for trade between countries that have obtained a rather similar level of economic development. When the CEECs will join the European Union as members (EU Eastern Enlargement), there will be only modest effects on trade. These effects are the de-regulation of agricultural products and the abolishment of anti-dumping rules and safeguard clauses; minor effects on trade may be expected from the elimination of border formalities and the administrative handling of the rules of origin (Havlik et al. 1997, p. 20). Stronger effects can be expected from the liberalization of trade with services. We refer to this phase as *Phase 3: "Integrated Europe").*

3. Predicting the Volume of Future Trade Flows

Before the Second World War, most of the Central and Eastern European Countries were integrated into Europe's economy. In the post-war period, many economic links - particularly trade flows - between their countries and the Western European countries have been cut. Therefore, it is not surprising that all existing studies about the trade potentials predict that the trade between the Central and Eastern European Countries and the European Union is well below its potential. Most of these studies are based on the *'gravity approach to trade'*, where the volume of trade depends on the distance between the two trading countries as well as on their incomes and their size (see Genosko (1992), Kemming (1980), for example).

We have surveyed three of the many existing studies that try to project trade relations between the CEEC's and Western Europe (Baldwin (1994), Holzmann et al. (1993), Holzmann and Zukowska-Gagelmann (1996)). They all yield similar results. First, the trade volume between the Western and Eastern European countries should increase several-fold. The exports of the CEECs to Western Europe of the projection year are expected to be two to three times the exports of the base year. The imports of the CEECs from Western Europe are expected to be two to five times the imports of the base year. The different results depend on different reference and projection years, different country groups, and different assumptions underlying the scenarios. Second, trade with the CEECs should not lead to trade deficits for the Western European countries; i.e. the projections for Western European countries exports are typically higher than for their imports.

A precise quantitative appraisal of the impact on *sectoral* trade flows is an almost impossible task, because there is a high degree of uncertainty in predicting the economic development of the CEECs and the EU. Methods which are often used to project the future export structure of the CEECs are the comparison of the commodity composition of trade, the factor intensity model, and the revealed comparative advantage approach (see Landesmann (1995), Dobrinsky (1995), Faini and Portes (1995)). One way to project the future import structure is comparing the commodity composition of CEEC trade to a reference group of Western European countries (Landesmann, 1995). We will refrain from performing precise sectoral projections. Instead of this, we use the projections of the gravity studies as guidelines for developing our own trade scenarios in chapter 5.

4. The Computable General Equilibrium Model

4.1 Overview of the Model

This chapter presents the *multiregional computable general equilibrium model* used to measure the welfare and production effect economic integration of the CEEC-4 into the European Union has on Austria's regions. It is a further development and implementation of the model outlined by Bröcker (1998). The model is described in detail in Schneider (1998) and Bröcker and Schneider (1998). So we will refrain from describing the model in all details. So we will restrict ourselves to a brief overview over the model structure. The interested reader is

referred to the above references. The list of all equations and variables can be found in the appendix. All references to equations (e.g. "(eq. 12)") refer to table A-1.

Figure 2: Overview of the model
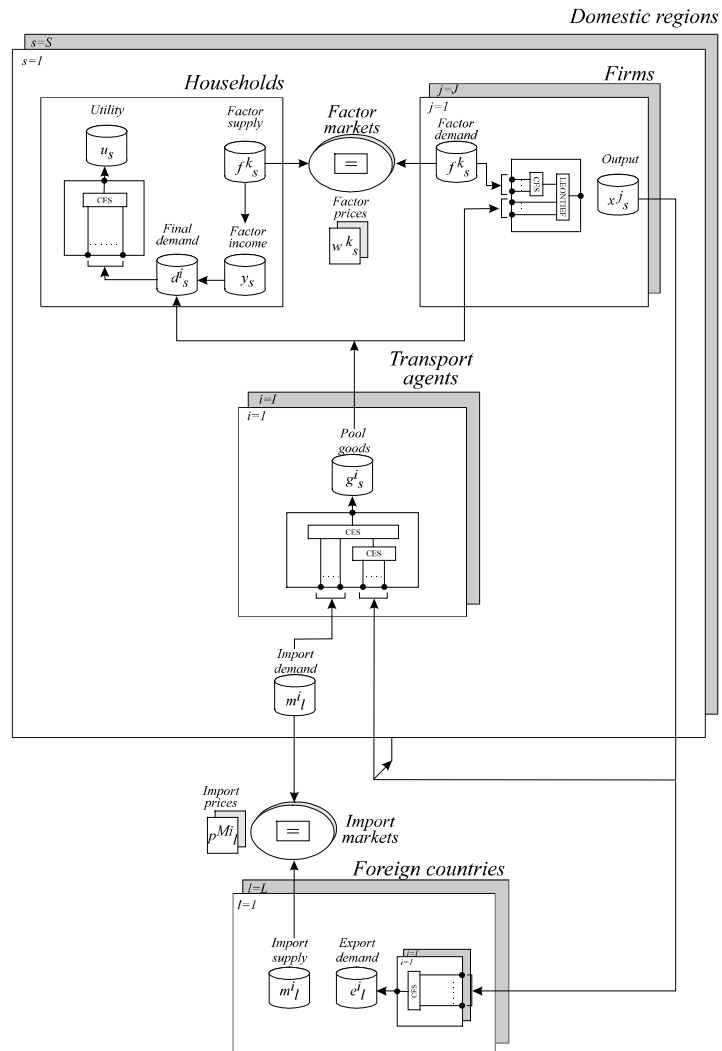
Source: The author's own draft.

Figure 2 gives an overview of the model. It is based on an Arrow-Debreu equilibrium. The leading principle of the model is parsimony. This means that the model can be calibrated with readily available data only. No "data generating" process, usually necessary for such a kind of model and often not in line with the philosophy of microeconomic equilibrium analysis, is required. Perfect competition is assumed. All economic agents are well informed about all prices and take them as given. The model consists of $r=1,...,R$ regions, $I=1,...,1$ sectors and $l=1,...L$ foreign countries (or groups of countries). Every domestic region r consists of *J firms*, *I transport agents* and one *representative household*. Firms and transport agents maximize their profit. Due to the linear-homogeneity of their technologies, the zero profit condition applies. This means that, in equilibrium, prices equal the minimal unit costs and no profits are left (Shoven and

Whalley, 1984, p. 1009). Households maximize their utility under their budget constraint. Factors are assumed to be immobile between regions.

4.2 Production

A *firm j* in region *s* produces the output x^j_s with intermediate inputs *i=1,...,I*, taken from the pool in region s, and with primary inputs *k=1,...,K*. The production technology is assumed to be linear-homogeneous and is described by a constant elasticity of substitution (CES) unit-cost function. As a result of the duality theory this is an equivalent representation of the production technology to the production function (Varian, 1994, p. 82). Since we have a two-level structure of production (intermediate demand and primary factors), we have to nest two CES functions into one. The result of this nesting is known as NCES (nested constant elasticity of substitution) function (eq. 1). We choose a Leontief technology[2] as the outer nest to describe the use of intermediate inputs and a CES technology for the primary factors (capital and labour). According to Shepards Lemma (Varian, 1994, p. 75) we obtain the *derived demand functions* as the first derivative of the cost function with respect to the price (eq. 2 and 3).

4.3 Transport

Transportation technology is modelled using the "pool-concept" of interregional trade (Nijkamp et al., 1986, p. 284). According to this concept, all commodities produced by sector *i* in various regions (*r=1,...,R* domestic regions plus *l=1,...,L* foreign countries) and delivered to region *s* for intermediate and final use are first merged into a pool of commodity *i* in region *s*, from where they are used up for intermediate or final use. This is done by the *transport agent i* in region *s*. The Armington assumption is utilized to distinguish commodities by region of origin and treat them as different goods (Shoven and Whalley, 1992, p. 82). In the absence of data on interregional commodity flows, a gravity approach is used to determine the interregional trade flows. Transport costs are described by the "iceberg model" (Bröcker, 1998, p. 6). The transport technology is also described by a NCES unit-cost function (eq. 4). Eq. 5 and eq. 6 describe the derived demand functions for transport demand and import demand.

4.4 Consumption

The representative *household* in region *s* owns all primary factors *k* and earns its income by selling these primary factors to the firms in region *s* (eq. 7). The household spends its complete income on the consumption of pool goods *i=1,...,I* and derives welfare from this consumption. The welfare is described by a linear-homogeneous minimal unit expenditure function (eq. 8). Eq. 9–11 describe the zero budget condition of the households and the resulting final demands.

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[2] The Leontief technology is a special case of the CES technology with an elasticity of substitution of zero (Schumann, 1987, p. 121).

4.5 Foreign Trade

While the domestic regions are modelled in detail, the foreign countries are modelled in a very rudimentary way only. The basic principles of the external sector closure follows a common closure rule, which has been used by many modellers (Whalley and Yeung, 1984, pp. 127-130; Shoven and Whalley, 1992, p. 232, Hirte and Wiegard, 1988, pp. 179-180): a set of *export-demand* and *import-supply* functions is used to close the model. In a multiregional context, some modifications have to be made to adapt the closure rule. In addition to the national values of exports and imports, the regional distribution of these flows has to be considered. This regional distribution follows the *Armington assumption* of product heterogeneity between different countries.

Exports are modelled by two-level *export demand* functions. At the first level, export demand of the foreign countries for total (national) output is determined (eq. 12). At the second level, total demand for Austrian exports is apportioned to the domestic regions according to regional demand functions, which depend on regional output prices p^i_r (eq. 15). The regional apportion of national export demand to the domestic regions follows the Armington assumption (Shoven and Whalley, 1992, p. 81), i.e. goods from different regions are treated as imperfect substitutes. While exports are one-sided demand-driven, *imports* are determined by both import supply and import demand functions. This approach is an extension and adaptation of the external sector closing rule presented by Whalley and Yeung (1984, pp. 127-130). The *import supply* of goods of sector *i* from foreign country *l* is described by a constant elasticity function (eq. 12). *Import demand m^i_{ls}* in region *s* depends on the complete final demand for pool goods in regions *s*, which is final demand of the households d^i_s plus the intermediate demand of all sectors *j* (right hand side of eq. 19).

In order to model Austria's foreign trade accurately with respect to our research effort, foreign trade will be disaggregated into foreign trade with the CEEC-4, and foreign trade with the rest of the world (ROW). Austria is considered as a "large country" in relation to the CEEC-4 (i.e. export and import prices are endogenous). For trade with the rest of the world Austria is considered as an "'almost' small open economy". This implies that only import prices are fixed, while export prices are determined endogenously by the model (see Harris (1984), Dervis et al. (1982, pp. 226–227), Roberts and Zolkiewski (1996), Breuss and Schebeck (1991, p. 139).

4.6   Model closure

In addition to the equations, which describe the behaviour of the economic agents, some additional equations are needed to close the model. We need an equilibrium condition for the output goods (eq. 17), which states that total demand for commodities of a sector within a region equals regional production output x^i_r. Market clearing conditions for the factor markets (eq. 18) and for the import markets (eq. 19) ensure equilibrium in these markets. A price index equation (eq. 20) is needed to obtain the relative price level. No additional *balance of payment condition* is needed, since the balance of payment is automatically fulfilled owing to the budget restrictions of the households. This implies that the balance of payment of the domestic economy with the

foreign countries is fulfilled. But it is not guaranteed that the balance of payment is fulfilled for *each* of the foreign countries, because they are not modelled as a general equilibrium system.

Regarding the labour markets, two types of closure rules are used. In the first case, a *flexible wage rate* clears the labour markets (i.e. demand for labour equals exogenous labour supply). In the second case, a *fixed real wage rate* occurs. So changes in the economic environment which affect the labour market do so through quantity adjustments rather than price adjustments. Note that the factor price of capital is always obtained from the market clearing conditions.

5. Development of the Scenarios

As we have seen in chapter 2, the way of the Central and Eastern European countries from formerly planned economies into market economies, which are fully integrated into Europe, can be divided into three main phases, namely the *'System transformation Phase'* (1989-1994/95), the *'Catching-Up Phase'* (1994/95-2010/20), and the phase of an *'Integrated Europe'* (after 2010/2020). These three phases give us the framework for constructing our trade scenarios. In order to determine the magnitude of the trade flows, we have surveyed some studies about projections of future East-West trade in chapter 3. Based on this survey and on the characteristics of the three phases presented above, we now want to construct some reasonable scenarios for *sectoral* trade patterns between Austria and the CEEC-4. This is no straightforward task, since most of the surveyed studies about future trade flows are based on the gravity approach to trade, which has the major limitation that the gravity model predicts the volume of total trade only. Although there exist some studies, which predict sectoral patterns of trade between the CEEC-4 and Western Europe (Landesmann 1995b, for example), they are not an appropriate point of departure for constructing our scenarios, mainly because of differences in commodity disaggregation, country groups involved in the study, reference and projection year etc. So we have to supplement some theoretical considerations in order to construct reasonable commodity patterns of future trade flows between Austria and the CEEC-4.

For reasons of clearness and simplicity, we limit ourselves to four scenarios of future trade patterns between the CEEC-4 and Austria, which will be presented below (*'Comparative Advantage', 'CEEC Export Expansion', 'Catch-Up', 'Intra Trade'*; see table 2). Each scenario can be related to one of the three phases mentioned above.

Table 2:   Description of four scenarios of trade between the CEEC-4 and Austria

Scenario	Phase	Time horizon	Policy changes	
			Imports from CEEC-4	*Exports to CEEC-4*
'Comparative Advantage'	'System Transformation'	1989-1994/95	CLOTHES, METAL * 3	-
'CEEC Export Expansion'	'Catching-Up'	1994/95-2000/2010	All sectors: *2	-
'Catch-Up'	'Catching-Up'	1994/95-2000/2010	-	TECH: *3
'Intra-Trade'	'Integrated Europe'	2010/2020	All manufacturing sectors (CLOTHES, METAL, TECH, MINSPEC): *3	

Source: The author's own calculations.

Our first scenario *('Comparative Advantage')* differs from the latter three scenarios (which describe possible future developments of trade), since it describes changes which have already occurred during the 'System Transformation Phase'. The theoretical foundation of this scenario is the Heckscher-Ohlin theory, which suggests us that the composition of trade between countries depends on the relative endowment of factors (and hence, on the relative factor prices) in the trading countries. It gives us a satisfactory theoretical explanation of inter-industry trade between countries, which have reached different levels of economic development (Dobrinsky, 1995, p. 87). According to this theory each country should export the commodities where it has its comparative advantages. So the CEEC-4 should be exporters of labour-intensive commodities. Austria should be an exporter of capital-intensive commodities. Instead of assuming a growth of inter-industry trade in both directions (which would better represent the development of the time after the dissolution of the Council for Mutual Economic Assistance), our departure is the widespread fear that cheap imports from labour-intensive sectors from the CEEC-4 will put pressure on some domestic industries. This gives us the possibility to insulate the effects of increased imports and to draw a more distinct picture of the effects on the Austrian regions. So this scenario should be seen as a *subset* of trade development in the system transformation phase rather than a complete description of it.

In our sectoral disaggregation we assume that the supply of the CEEC-4 of exports to Austria for the sectors *'Manufacturing of Clothes'* (CLOTHES) and *'Manufacturing of metal and other raw materials'* (METAL; i.e. steel, other metals, wood, rubber) increases to the *three-fold* level of the reference year (1994).

During the 'catching-up phase' (1994/95-2010/20), the import demand of the Central and Eastern European Countries gives Austrian firms the possibility to export investment goods, high-quality consumption goods and services (financial services, for example). On the other side, there will be a great pressure for resource-intensive commodities, labour-intensive commodities (leather and clothes) and partly even capital-intensive commodities (steel and coal) (Holzmann and Zukowska-Gagelmann, 1996, p. 194). We divide the expected development of trade into two scenarios (*'CEEC Export Expansion', 'Catch-Up'*). So we can separate the effects of export and imports. Note that both scenarios reflect only a subset of the 'catch-up' phase.

In scenario *'CEEC Export Expansion'* we assume that the CEEC-4 will succeed in increasing their export capacities of all sectors to the three-fold level, whereas in scenario *'Catch-Up'* we assume that the demand of the CEEC-4 for Austrian exports in the sector 'TECH' ('Manufacturing of technical products', i.e. chemicals, electrical engineering, production of transport utilities, medical and optical products, and others) rises to the *three-fold* level of 1994[3]. Although it can be expected that the demand for commodities produced by other sectors rises too, only this sector will be chosen in order to get a more distinct picture of the sectoral and regional results which will affect the Austrian economy.

In the fourth scenario (*'Intra-trade'*) it is assumed that the CEEC-4 have reached the level of Western European countries, i. e. a successful catch-up process has taken place. The CEEC-4 are

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[3] This magnitude is in line with the results of the surveyed gravity studies (see chapter 3).

assumed to be members of the European Union. So this scenario represents phase 3 ('Integrated Europe'). In this case, trade relations are no longer determined by differences between countries (inter-industry trade). Instead of this, intra-industry trade will take place. So we assume that CEEC-4 demand for imports from and supply of exports to Austria for the three industrial sectors 'Manufacturing of metal and other raw materials' (METAL), 'Manufacturing of technical products' (TECH), and 'Mining and other primary industries, special materials' (MINSPEC) will increase to the three-fold level of the reference year. It is not realistic to expect this scenario before 2010/2020.

6. Simulation Results

6.1 Magnitude of National Results

We start by presenting the most important simulation results on the national level (table 3). There is a great difference in the magnitude of the welfare and structural effects between the scenarios, which depends on the increase of the trade volume in the respective scenario. The increase of real income ranges from 0.1 % (scenarios *'Comparative Advantage' and 'CEEC Export Expansion'*) to 1.0 % (scenario *'Intra Trade'*) for flexible wages. No employment effects occur because due to the flexible wages total labour supply is always fully employed. The highest structural change indicator can be reported for scenario *'Catch-Up'* (1.7 %), although the increase of trade volume is higher for scenario *'Intra Trade'*. The reason therefore is that the changes in trade flows are concentrated in only one sector for the primer scenario. So there is more need to reallocate resources between sectors[4].

For *fixed real wages*, the welfare ranking of the scenarios remains the same as for flexible wages. But there is a great difference in the magnitude of the results. Welfare effects are about three times as high (0.4 %-3.6 %), structural effects about two times as high as for flexible wages. While total employment remains constant for flexible wages, an increase of employment will occur for fixed real wages. The increase of employment ranges from 0.5 % (*'Comparative Advantage'*) to 3.9 %. (*'Intra Trade'*). In absolute numbers, increase of employment would range from 15,500 to 131,000 for scenario *'Intra Trade'*[5].

Our results seems to contradict the common-sense argument, that increasing import competition will hurt the respective industry and therefore leads to an increase of the unemployment rate. This is true in a partial equilibrium context. Employment will decline, since demand shifts from domestically produced commodities to imported commodities. In a general equilibrium context, this will happen too. But there are additional forces working which lead to an increase of employment. The crucial point is the improvement of Austria's terms of trade,

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[4] In scenario *'Catch-Up'*, we have tripled the export demand of the CEEC-4 for Austrian exports of one sector (TECH), whereas in scenario *'Intra Trade'* we have tripled export demand as well as import supply for four sectors (CLOTHES, METAL, TECH, MINSPEC).

[5] Total employment in the benchmark equilibrium is 3.11 mill. employees.

which increases domestic welfare (which is equivalent to real income)[6]. An increase of real income leads to an increase of final demand. This effect is the same for flexible and for fixed real wages. The only difference is that labour markets react on excess demand by price adjustment (flexible wages) or quantity adjustment (fixed real wages). So either the wage rate (flexible wages) or employment (fixed wages) increases. In an economy with flexible wages, there is an efficient use of all resources. Fixed wages distort the economy and reduce welfare in the benchmark equilibrium (since a part of the labour supply is unemployed). So there are more 'efficiency reserves' within the economy, which can be utilized by the increase of foreign trade. See *Schneider* (1998) for a detailed description of the driving forces that work inside the model.

Table 3: *National results for Austria for four different scenarios of trade with the CEEC-4 (% changes compared to the benchmark equilibrium).*

	'Comp-Adv'	'CEEC- EE'	'Catch-Up'	'Intra-trade'
	Flexible wages			
Increase of real income	0.1%	0.1%	0.5%	1.1%
Increase of employment	-	-	-	-
Structrual change indicator	0.4%	0.3%	1.7%	1.3%
Increase of trade volume	0.8%	1.7%	3.6%	6.6%
	Fixed real wages			
Increase of real income	0.4%	0.5%	1.7%	3.6%
Increase of employment	0.5%	0.6%	2.0%	4.2%
Structrual change indicator	0.7%	0.5%	2.1%	3.0%
Increase of trade volume	1.0%	2.0%	4.3%	8.2%

Source: The author's own calculations.

6.2 Sectoral Results

Table 4 gives us the effects of our trade scenarios on Austria's trade with the CEEC-4 and on Austria's total trade (=trade with CEEC-4 and with the rest of the world). Since the resulting trade flows are very similar for both model specifications, we concentrate on the flexible wage specification. For scenario *'Comparative Advantage'*, we have tripled the import supply of the CEEC-4 for the sectors CLOTHES and METAL. Note that the increase of the imports is lower than 200 % (CLOTHES: 104 %, METAL 169 %). This results from the decline of the import prices, which clear the import markets[7]. The increase of exports is nearly the same for all sectors

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[6]   In the case of an import-driven scenario (*'Comparative Advantage'* and *'CEEC Export Expansion'*), the market-clearing mechanism on the import markets leads to a decline of the import prices and therefore to an improvement of the terms of trade. In the case of an export-driven scenario (*'Catch-Up'* and *'Intra-Trade'*), the additional export demand increases the domestic price level, which improves the terms of trade.

[7]   The Austrian demand for imports depends on the relative price of imported to domestically produced commodities. As long as this relative price remains constant, import demand remains constant. A disequilibrium in form of excess supply occurs on the respective import market. So the price of the imports has to fall in order to clear the import market. Falling import prices lead to a rise of Austrian import demand and to a fall of CEEC-4 import supply. This leads to a new equilibrium on the market for imports. The resulting market clearing amount of additional imports is smaller than the initial amount of additional import supply of the CEEC-4.

(0.3 %-1.0 %). For scenario *'CEEC Export Expansion'*, import supply of all sectors is doubled, which leads to increases of imports from 53 % to 87 %. Once again, the increase of exports does not vary very much about sectors. In the scenarios *'Catch-Up'* and *'Intra Trade'* we have sectors with a decline of exports. The reason therefore is that the sectors with increasing export activities draw away resources from the other sectors.

Table 4: *Effects on the sectoral level of Austria's trade flows for four different scenarios of trade with the CEEC-4 (% changes compared to the benchmark equilibrium; flexible wages).*

	'Comp-Adv'				*'CEEC- EE'*			
	Imports from CEEC-4	Total imports	Exports to CEEC-4	Total exports	Imports from CEEC-4	Total imports	Exports to CEEC-4	Total exports
AGRICUL	-0.4%	-1.1%	0.5%	0.6%	57.5%	2.2%	0.7%	0.8%
CLOTHES	104.2%	2.0%	1.0%	1.2%	57.1%	0.9%	0.9%	1.0%
METAL	169.4%	11.2%	0.7%	1.0%	86.9%	5.1%	0.7%	1.0%
TECH	0.0%	-0.4%	0.5%	0.6%	87.3%	0.6%	0.7%	1.0%
MINSPEC	-0.3%	-0.7%	0.5%	0.6%	57.1%	2.8%	0.9%	1.0%
FOOD	-0.3%	-0.8%	0.4%	0.6%	53.4%	-0.1%	0.6%	0.8%
CONSTR	-0.3%	-1.0%	0.5%	0.7%	65.0%	5.1%	0.5%	0.8%
TRADEACC	-0.2%	-0.7%	0.3%	0.5%	65.1%	2.4%	0.4%	0.6%
SERVICE1	-0.2%	-0.6%	0.3%	0.5%	65.2%	-0.8%	0.4%	0.6%
SERVICE2	-0.2%	-0.7%	0.3%	0.5%	65.1%	2.4%	0.4%	0.7%
Sum	64.5%	1.4%	0.5%	0.7%	74.5%	1.5%	0.7%	0.9%
	'Catch-Up'				*'Intra-trade'*			
	Imports from CEEC-4	Total imports	Exports to CEEC-4	Total exports	Imports from CEEC-4	Total imports	Exports to CEEC-4	Total exports
AGRICUL	2.4%	6.6%	-3.9%	-4.5%	3.8%	10.5%	-5.7%	-6.6%
CLOTHES	0.8%	2.0%	-3.2%	-3.7%	108.1%	7.0%	187.6%	9.4%
METAL	0.5%	4.5%	-3.0%	-4.0%	171.4%	18.0%	188.1%	7.7%
TECH	0.5%	4.8%	192.1%	15.3%	172.5%	8.1%	189.9%	14.2%
MINSPEC	2.3%	6.2%	-3.6%	-4.2%	113.3%	17.1%	185.4%	14.3%
FOOD	2.4%	6.2%	-2.9%	-3.7%	3.7%	9.4%	-4.2%	-5.4%
CONSTR	1.8%	6.0%	-2.4%	-3.7%	2.6%	8.9%	-3.3%	-5.2%
TRADEACC	2.0%	6.8%	-2.5%	-3.9%	3.0%	10.4%	-3.8%	-5.9%
SERVICE1	1.9%	6.7%	-2.6%	-4.2%	2.9%	10.3%	-3.9%	-6.3%
SERVICE2	1.9%	6.6%	-2.5%	-3.9%	2.9%	10.0%	-3.7%	-5.7%
Sum	1.1%	5.0%	108.8%	6.6%	137.5%	10.9%	164.4%	10.6%

Source: The author's own calculations.

Table 5 presents the effects on the sectoral level of production in Austria for both flexible wages and fixed real wages. The effects on the total level of production are almost zero for flexible wages, whereas total aggregated output rises for fixed real wages. Note that the sectoral results are predetermined by the sectoral trade flows we have used to define the scenarios. In addition to this, the results are mainly determined by the reallocation of resources between sectors own to the factor prices and by the inter-industry relations stated by the input-output table.

Taking a look at scenario *'Comparative Advantage'* shows us the differences of both model specifications (flexible wages and fixed real wages). For flexible wages, the level of production for the sectors with the increasing import penetration (CLOTHES, METAL) is falling. These

results seem to be plausible. For fixed real wages we can obtain an increasing level of production for the sector CLOTHES. The reason therefore is that the increase of real income in Austria leads to an increase of final demand for the commodities of all sectors. If final demand rises and the wage rate is fixed, total aggregate output rises. The sectoral results for the scenario *'CEEC Export Expansion'* seem to be unpredictable, because import supply of all sectors is rising. The resulting sectoral pattern we obtain is determined by the reallocating force of the factor prices and by the inter-industry relations. The results for scenario *'Catch-Up'* are once again straightforward (an increasing level of production of the sector with the increasing export demand). The results for scenario *'Intra-Trade'* are determined by the interplay between all markets. Summarizing the sectoral results stresses the differences of our general equilibrium approach compared to a partial equilibrium approach. The sectoral results are no longer determined by the driving forces within that sector only. Instead of this, the complicated interplay between all markets of the economy determines the results.

Table 5: *Effects on the sectoral level of production in Austria for four different scenarios of trade with the CEEC-4 (% changes compared to the benchmark equilibrium).*

	'Comp-Adv'		*'CEEC- EE'*		*'Catch-Up'*		*'Intra-trade'*	
	flexible	fixed	flexible	fixed	flexible	fixed	flexible	fixed
AGRICUL	0.0%	0.4%	-0.5%	-0.1%	-2.5%	-1.0%	-3.3%	0.0%
CLOTHES	-0.3%	0.1%	0.3%	0.7%	-4.3%	-2.9%	3.0%	5.9%
METAL	-3.4%	-3.1%	-1.4%	-1.0%	-3.1%	-1.6%	-2.6%	0.4%
TECH	0.7%	1.0%	0.4%	0.8%	6.7%	8.1%	4.5%	7.5%
MINSPEC	0.5%	0.8%	-0.5%	-0.1%	-2.4%	-1.1%	-0.1%	2.7%
FOOD	0.3%	0.6%	0.2%	0.6%	-1.2%	0.1%	-1.5%	1.1%
CONSTR	0.1%	0.4%	0.1%	0.5%	0.1%	1.4%	0.4%	3.1%
TRADEACC	0.1%	0.3%	0.1%	0.4%	0.0%	1.2%	-0.1%	2.4%
SERVICE1	0.1%	0.4%	0.1%	0.5%	-0.5%	0.8%	-0.9%	1.8%
SERVICE2	0.1%	0.4%	0.1%	0.4%	0.1%	1.4%	0.3%	3.1%
Sum	0.0%	0.3%	0.0%	0.4%	0.3%	1.6%	0.2%	3.0%

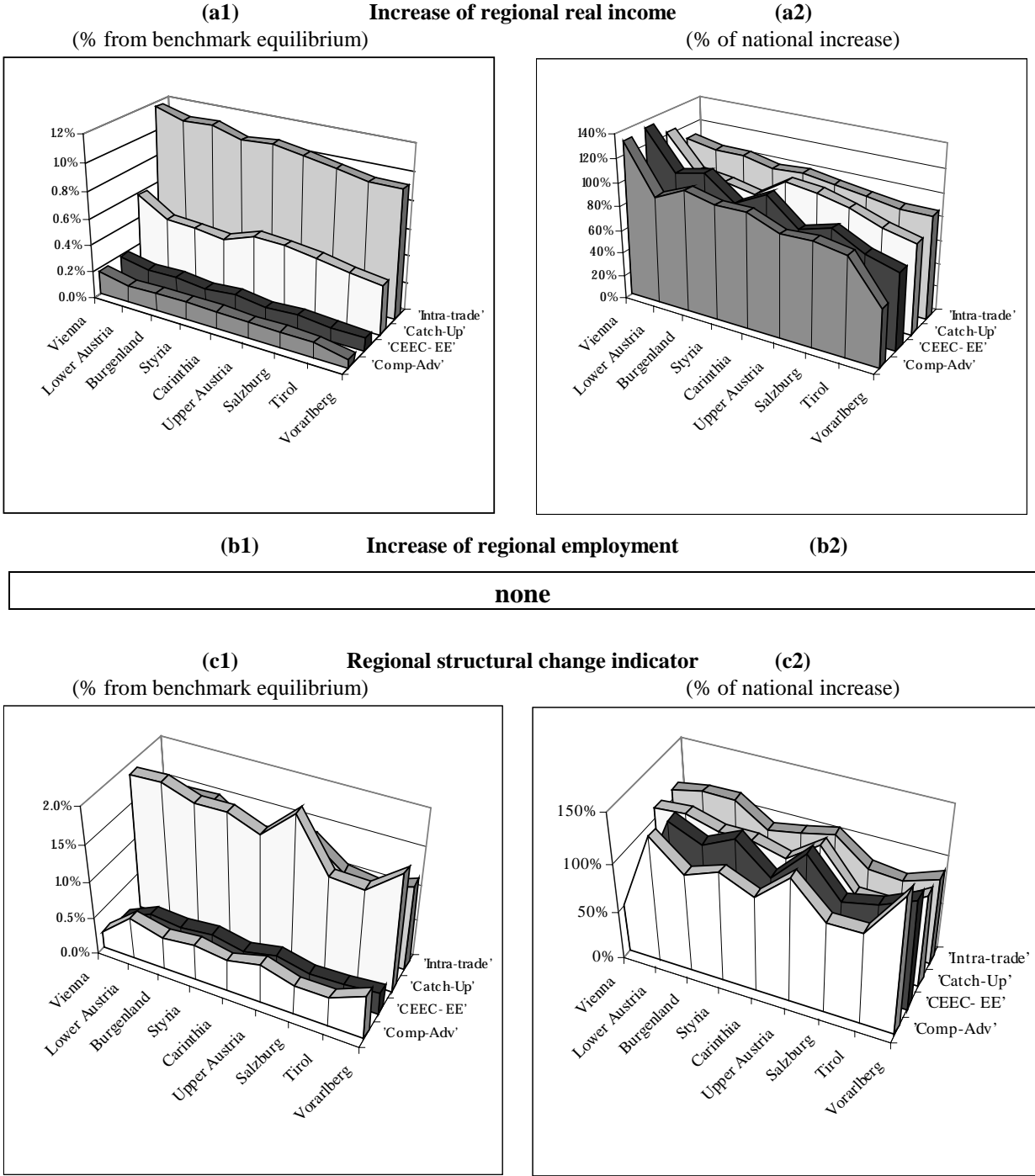Source: The author's own calculations.

6.3 Regional Results

Taking a look on the regional distribution of the welfare and production effects of the four scenarios gives us some interesting insights. The increasing volume of foreign trade increases the terms of trade and permits a more efficient use of the resources of the Austrian regions. As a result of this, all Austrian regions gain in all four scenarios. The regional distribution of the welfare gains varies between the different scenarios. Figure 3 and figure 4 give us the results on regional real income, regional employment, and regional structural change. Figure 3 shows the results for flexible wage; figure 4 for fixed real wages. Each figure includes the results for all four scenarios. The results are reported twice: the left figure gives us the increase of one variable in percent from benchmark equilibrium for all four scenarios. The right figure shows us the same numbers, but in percent of national increase of the variable for the respective scenario. This helps us to compare the regional distribution of the respective variable between the scenarios. One characteristic of the graphical representation has to be mentioned. All values in figure 3 and 4 are

discrete values for the respective region, although the graphical representation may suggest a continuum of regions. Nevertheless, this representation has been chosen for reasons of clearness. A normal bar diagram (which would be the correct representation) would be extremely difficult to survey.

Two factors primarily cause different results for the Austrian regions: *distance* to the CEEC-4 and the *sectoral composition* of a region. Distance matters because the nearer an Austrian region lies to the CEEC-4, the higher the share is the CEEC-4 have in the total volume of foreign trade of the region[8]. Due to interregional trade flows, supply as well as demand shocks ripple throughout the economy. In case of import driven scenarios, regions with a high share of sectors which suffer from import competition have the lowest welfare gains (see figure 3 (a2), Scenario *'Comparative Advantage'*, Vorarlberg). In case of export driven scenarios, regions with a high share of sectors with an increased export demand have the highest welfare gains (see figure 3 (a2), Scenario *'Catch-Up'*, Vienna, Upper Austria, Carinthia). This can be explained by taking a look at the welfare gains and structural change indicator for an 'import-driven' ('Comparative Advantage') and an 'export-driven' scenario (*'Catch-Up'*). What we can obtain is that the *relation between regional welfare gains and regional structural change* is two-fold (Figure 3 (a2) and (c2)). In the case of an import-driven scenario, structural change is a consequence of spurred import competition and deficient demand for regional commodities and resources, which will lead to decreasing commodity and factor prices. This weakens the welfare gains for the region. What follows is that the higher structural change is, the lower will be the welfare gains. In the case of an export-driven scenario (*'Catch-Up'*), structural change is a consequence of excess demand for regional commodities and resources, which will lead to an increase of commodity and factor prices and therefore to higher welfare gains. So there is a positive relation between the magnitude of regional structural change and the regional welfare gain.

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[8]   This results from the gravity approach to trade.

Figure 3:   *Increase of regional real income and regional structural change indicator in Austria for four different trade scenarios (flexible wages)*

(a1)   **Increase of regional real income**   **(a2)**

(% from benchmark equilibrium)   (% of national increase)

(b1)   **Increase of regional employment**   **(b2)**

none

(c1)   **Regional structural change indicator**   **(c2)**

(% from benchmark equilibrium)   (% of national increase)

Notes: All values are discrete values for the respective region, although the graphical representation may suggest a continuum of regions.

         'Comp-Adv':   Scenario 'Comparative Advantage'

         'CEEC-EE':   Scenario 'CEEC Export Expansion'

         'Catch-Up':   Scenario 'Catch-Up'

         'Intra-trade':   Scenario 'Intra-industry Trade'

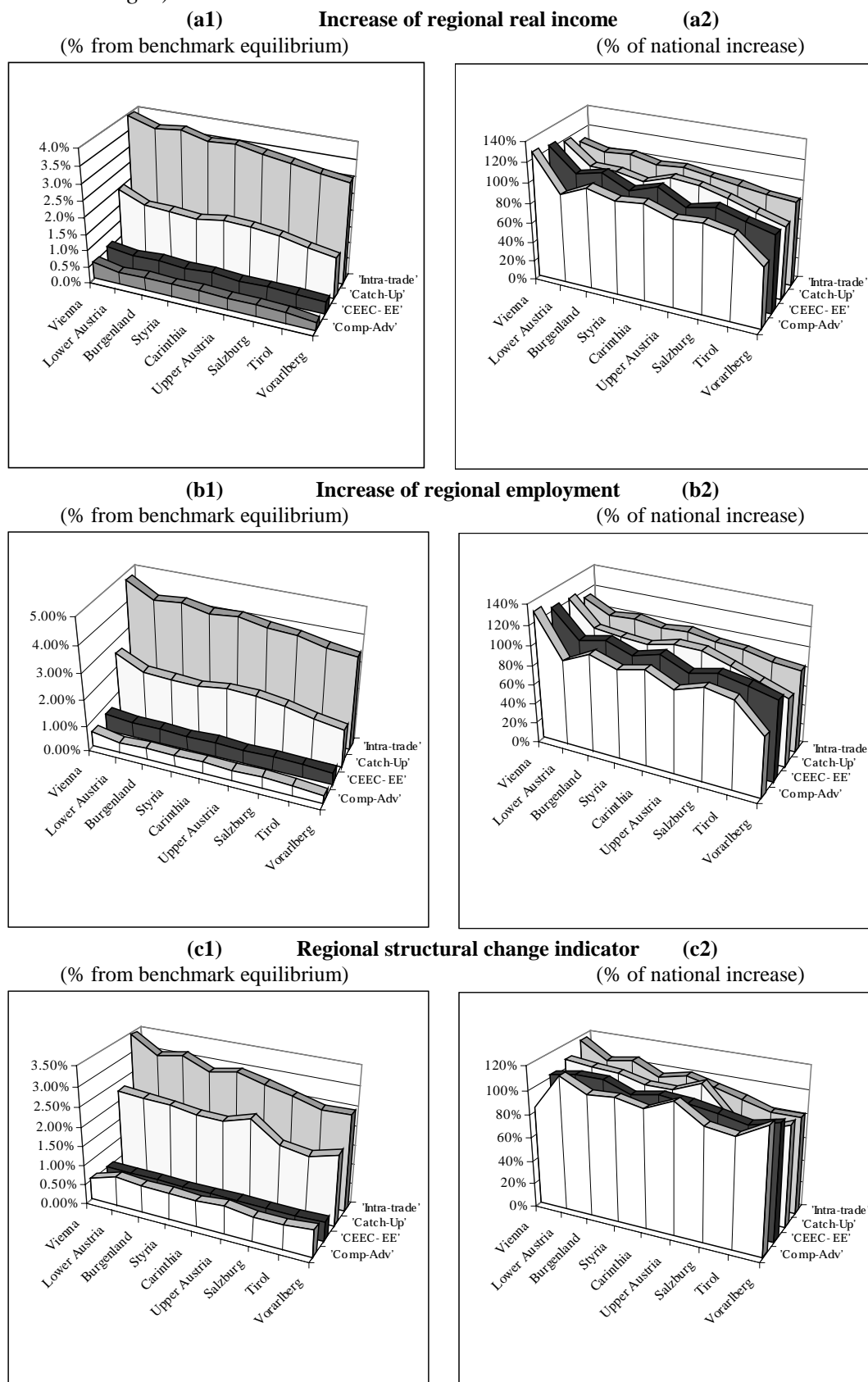Source: The author's own calculations.

Figure 4:   Increase of regional real income, increase of regional employment, and regional structural change indicator in Austria for four different trade scenarios (fixed real wages)

(a1)   **Increase of regional real income**   **(a2)**
(% from benchmark equilibrium)   (% of national increase)

(b1)   **Increase of regional employment**   **(b2)**
(% from benchmark equilibrium)   (% of national increase)

(c1)   **Regional structural change indicator**   **(c2)**
(% from benchmark equilibrium)   (% of national increase)

Notes: See figure 3 (previous page)

Source: The author's own calculations.

Regional results are more unequal for flexible wages than for fixed real wages. This is especially true for structural adjustment needs (see figure 3 and figure 4 (c2)). This occurs because in the primer model specification, the only way to ensure a new equilibrium in case of disequilibrium is resource reallocation between sectors due to changes in relative prices. The less flexible the prices are, the less resource reallocation between sectors can take place. In the case of fixed real wages, only capital is reallocated between sectors, whereas an elastic labour supply fulfils labour demand. Although regional results differ over the scenarios, one region can be identified as the main winner in all four scenarios. Vienna's welfare gains range from 109 % to 134 % of national welfare gains. This results from Vienna's geographical position and its sectoral composition. Vienna's need to adopt its economic structure as the consequence of an increasing import supply is much lower for both import-driven scenarios ('*Comparative Advantage*' and '*CEEC Export Expansion*').

One problem when performing a general equilibrium analysis is the uncertainty about the values of some parameters (esp. elasticities and transport rates). Though we have consulted an extensive body of econometric literature, a considerable degree of arbitrariness remains, because estimates vary over wide ranges. We have performed extensive sensitivity analysis for evaluating these uncertainties. For reasons of space we can not present the results in detail. Instead of this, we concentrate on the conclusions we can draw from them. The interested reader is referred to Schneider (1998). The first conclusion is the confirmation of the well-known property of single country general equilibrium models that the magnitude of the welfare gains crucially depends on the values of the foreign trade elasticities. The second concerns the determinants of the regional results. The differences between regional results depend mainly on two factors, namely geographical distance and sectoral composition. With the assumptions about transport costs and elasticities that have been used in the simulations, the sectoral impact seems to outweigh the distance impact in determining the regional results. As it can be expected, there is a great sensitivity of the different regional results with respect to the transport costs. Doubling the transport costs will lead the distance impact to overweigh the sectoral impact.

6. Summary and Conclusions

The question we have dealt with is *how enhanced East-West trade will influence Austria's regions*. Therefore we have developed a multiregional general equilibrium model for the Austrian economy. We have developed four scenarios of future East-West trade (which are based on a survey of the relevant literature) and have simulated their effects on welfare and production in Austria's regions with our model. The effects of future trade patterns between Austria and the CEEC-4 depend heavily on the projections used and the underlying assumptions made in the model (esp. treatment of the labour markets and values of foreign trade elasticities). So the precise magnitude of the simulation results should not be taken too literally. Nonetheless, some interesting conclusions can be derived from them.

Our simulation results have shown that the magnitude of the welfare effects depends on the increase of the trade volume with the CEEC-4. The highest increase of trade can be expected when the CEEC-4 have completed their catch-up process and when they are integrated into the

European Union. This requires economic growth and political stability in these countries. Therefore policy makers should try to support the Central and Eastern European countries during their catch-up process. Our simulation results have shown that all regions are gaining in all scenarios. This result should not be overrated, since it is determined by the characteristics of the model. Especially the assumption of regional immobility of factors limits the relevance of our results[9]. On the sectoral side, there are contracting as well as expanding sectors[10]. So the effects of enhanced East-West trade on Austria seem to be primarily a question of sectoral rather than regional concern. The main conclusion we can draw from the *regional* results of our scenarios is the following. The magnitude of the welfare effects for scenarios, which may be characteristic for the catch-up phase (*'CEEC Export Expansion'*, *'Catch-Up'*), is much lower than for scenario *'Intra Trade'* (which describes an integrated Europe, i.e. the CEEC-4 have succeeded in catching-up and have become members of the EU). This scenario cannot be expected before 2010/20. The regional distribution of the welfare gains for the latter scenario is much more equal than for the primer two scenarios. What follows from these two points is that *during the catch-up process there will be a pronounced regional pattern of welfare and production effects, while the magnitude is rather small. After integration has completed, the magnitude of the effects becomes larger, while the pronounced regional pattern disappears*. Nevertheless, one Federal Province can be identified as the main winner. The welfare gains for Vienna are the highest of all Austrian Federal Provinces for all scenarios. This is especially true for the import-driven scenarios (*'Comparative Advantage'* and *'CEEC Export Expansion'*) and results from Vienna's geographical position as well as from its sectoral composition. Vienna has the lowest share of sectors that suffer from the increased import competition.

As we have seen above, the magnitude of the results crucially depends on the model closure (flexible wages of fixed real wages). But the choice of the model closure leaves the regional and sectoral distribution of the results nearly unaffected. So the results seem to be relatively robust in their regional and sectoral distribution (at least in their regional and sectoral ranking).

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[9] Assuming regional mobility of factors could lead to completely different results.

[10] Note that the sectoral results are predetermined by the definition of the respective scenario.

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Appendix

Table A-1: Formal structure of the model

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Firms

(Minimal) unit-cost function	$p_s^j = cf^j(q_s, w_s; \alpha^j, \gamma^j)$	(1)
IO coefficients intermediary inputs	$a_s^{ij} = \dfrac{\partial cf^j(q_s, w_s; \alpha^j, \gamma^j)}{\partial q_s^i}$	(2)
IO coefficients primary inputs	$c_s^{kj} = \dfrac{\partial cf^j(q_s, w_s; \alpha^j, \gamma^j)}{\partial w_s^k}$	(3)

Transport

(Minimal) unit-cost function	$q_s^i = ct_s^i(p^i, p^{Mi}; \vartheta^i, \vartheta^{Mi})$	(4)
IO coefficient transport	$t_{rs}^i = \dfrac{\partial ct_s^i(p^i, p^{Mi}; \vartheta^i, \vartheta^{Mi})}{\partial p_r^i}$	(5)
IO coefficient imports	$t_{ls}^{Mi} = \dfrac{\partial ct_s^i(p^i, p^{Mi}; \vartheta^i, \vartheta^{Mi})}{\partial p_l^{Mi}}$	(6)

Households

Income	$y_s = \sum_{k=1}^{K} f_s^k w^k$	(7)
(Minimal) unit expenditure function	$ch_s = ch_s(q_s, \delta)$	(8)
Total expenditures	$eh_s = eh_s(ch_s(q_s, \delta), u_s)$	(9)
Budget restriction	$y_s = eh_s(q_s, u_s)$	(10)
Final demand	$d_s^j = \dfrac{\partial eh_s(ch_s(q_s, \delta), u_s)}{\partial q_s^i}$	(11)

Foreign sector closure rules

Foreign export demand function	$e_l^i = \lambda_l^{Ei} \tau_l^i \left(\dfrac{q_l^{Ei}}{er}\right)^{-\varepsilon^i}$	(12)
Foreign export price	$q_l^{Ei} = ce_l^i(p^i; \vartheta^i)$	(13)
IO coefficients exports	$t_{rl}^{Ei} = \dfrac{\partial ce_l^i(p^i; \vartheta^i)}{\partial p_r^i}$	(14)
Regional export demand	$e_{rl}^i = e_r^i t_{rl}^{Ei}$	(15)
Foreign import supply function	$m_l^i = \lambda_l^{Mi} \pi_l^i \left(\dfrac{p_l^{Mi}}{er}\right)^{\mu^i}$	(16)

Equilibrium conditions

Output goods	$x_r^i = \sum_{s=1}^{S} t_{rs}^i \left(d_s^i + \sum_{j=1}^{J} a_s^{ij} x_s^j\right) + \sum_{l=1}^{L} t_{rl}^{Ei} e_l^i$	(17)

Market clearing conditions

Factor markets	$f_r^k = \sum_{i=1}^{I} c_r^{ki} x_r^i$	(18)
Import markets	$m_l^i = \sum_{s=1}^{S} t_{ls}^{Mi} \left(d_s^i + \sum_{j=1}^{J} a_s^{ij} x_s^j\right)$	(19)

Miscellaneous

Price index	$r = \dfrac{\sum_{s=1}^{S} u_s ch(q_s)}{\sum_{s=1}^{S} u_s}$	(20)

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Variables of the model

Indices

j	1	Number of sectors (output goods)
i	1	Number of sectors (pool goods)
r	1	Number of regions (source regions)
s	1	Number of regions (destination regions)
k	1	Number of primary factors
l	1	Number of foreign countries

Endogenous variables

Quantities

x^j_s	JxS	Output of sector j in region s
d^j_s	JxS	Final demand for good j in region s
m^i_l	IxL	Imports of good i from foreign country l
e^i_l	IxL	Exports of good i to foreign country l

Prices

p^j_s	JxS	Price of one output unit of sector j in region s
q^i_s	IxS	Price of one unit of pool good of sector i in region s
q^{Ei}_l	IxL	Price of one unit of export good i in foreign country l
p^{Mi}_l	IxL	Price of one unit of import good of sector i foreign country l
w^k_s	SxK	Price of one unit of primary factor k in region s
r	1	Price index

Coefficients

a^{ij}_s	IxSxJ	Demand for pool goods i to produce one unit output in sector j in region s
c^{kj}_s	JxSxK	Demand for primary factor k to produce one unit output in sector j in region s
t^i_{rs}	IxSxR	Demand for output goods i in region r to produce one unit of the pool goods i in region s
t^{Mi}_{ls}	IxLxS	Demand for imports from foreign country l to produce one unit of pool goods i in region s
t^{Ei}_{rl}	IxRxL	Demand for output goods i in region r to produce one unit export goods i in foreign country l

Income and utility

y_s	Sx1	Income (=real income) of the representative household in region s
u_s	Sx1	Level of utility of the representative household in region s

Exogenous variables - calculated during calibration

Parameters

α^{ij}	JxI	Position vector of CES function: production - intermediary goods
γ^{kj}	JxK	Position vector of CES function: production- primary factors
δ^j	1xJ	Position vector of CES function: households
ϑ^i_r	IxR	Position vector of CES function: transport
ϑ^{Mi}_l	IxL	Position vector of CES function: imports
π^i_l	IxL	Import supply parameter
τ^i_l	IxL	Export demand parameter

Quantities

f^k_r	RxK	Factor inputs of primary factor k in region r

Exogenous variables

Elasticities

σ_P^j	I	Elasticity of substitution - production
σ_M^i	I	Elasticity of substitution - transport imports vs. domestic commodities
σ_T^i	I	Elasticity of substitution - transport domestic regions
σ_H	1	Elasticity of substitution - households
μ^i	IxK	Price elasticity of foreign import supply
ε^i_l	IxK	Price elasticity of foreign export demand

Parameters

λ^{Mi}_l	IxL	Import supply shift parameter
λ^{Ei}_l	IxL	Export demand shift parameter

Miscellaneous

η^i	x1	Transport rate (share of commodity i lost per unit of distance)
z_{rs}	RxS	Interregional distances between domestic regions
z_{rl}	RxL	Distance from domestic region r to foreign country l
er	1	Exchange rate (=1)