Integration and Transition:
Scenarios for Location of Production and Trade in Europe*

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ABSTRACT
Applying a newly developed CGE-model, we present scenarios for the future economic geography of Europe. The model divides the world into ten regions, of which five are European, and there are 14 industries, of which 12 are imperfectly competitive. With a complete input-output structure, the model captures comparative advantage mechanisms as well as intra-industry trade and "new economic geography" agglomeration forces. The simulations focus on successful transformation in Eastern Europe, and on further European or global integration. The results indicate that both transformation and European integration are of great importance for Eastern Europe, while the effects for other European regions are moderate.

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1. Introduction

The purpose of this paper is – through model simulations – to assess the long-term production and trade effects of some of the most important current structural and trade policy changes in Europe. We focus on two sets of scenarios: Eastern European transformation, and further European or global integration. For each of the scenarios we look at several possible ways of specifying the "policy experiments". The purpose is to gain insights about how each one of these possible specifications may affect the pattern of production and trade in various regions in Europe.

While both economic integration and Eastern European transformation have been studied before[1], we believe our analysis has something to add. We apply a newly developed model that incorporates several features that have not been implemented in CGE-models before, and with a regional structure that allows us to identify effects for various parts of Europe. In particular, we include region-specific, complete input-output matrices. By modelling all intra- and inter-industry linkages in a setting with imperfect competition and trade costs, we are able to capture important agglomeration forces. Furthermore, the way we specify the scenarios differs from previous studies. In particular, for Eastern European transformation we include productivity and employment growth as well as closer market integration. The economic integration scenarios allow us to compare the effects of European and global liberalisation, and also to compare the effects of different types of policy changes.

The model is based on both traditional trade theory and more recent theory of international trade and economic geography. In this way it captures comparative advantage effects as well as agglomeration and clustering effects of structural changes or policy events. Five of the ten regions in the model are European ones. Hence, the model should be suitable for analysing regional development in Europe – where things like agglomeration effects and the centre-periphery dimension have been emphasised in the theoretical and applied literature, but so far not been implemented in a full-scale, data based general equilibrium model. Given the focus on European regional analysis, the model is called EURORA (European Regional Analysis).

[1] European integration has been studied in many model-based analyses, e.g. Gasiorek, Smith and Venables (1991, 1992), Haaland and Norman (1992, 1995), Baldwin, Forslid and Haaland (1996), Allen, Gasiorek and Smith (1998), Keuschnigg and Kohler (1996). For studies of Eastern European transformation and eastern enlargement of the EU, see e.g. Baldwin, Francois and Portes (1997) or Keuschnigg and Kohler (1998).

When studying the future economic geography in Europe, the development in Eastern Europe must be a central topic. Eastern Europe has experienced a number of very significant changes since 1989, both on the political and on the economic arena. However, we have not yet seen the longer-term effects of the economic reforms. What we have observed so far in most of the countries is more of the short-term adjustment problems than of the long-term possibilities. If the countries manage to come through the transition phase, the opportunities are there. They may experience productivity growth, and investment and employment booms. Should that happen, the economic conditions in these countries might change dramatically, with potentially significant implications for the transforming countries as well as for other countries or regions in Europe.

Another driving force for the development we have seen lately is the trend towards more integrated markets, both on a regional basis – like in the EU or NAFTA – and on the global arena. While regional policies and regionalisation were in the headlines in the beginning of the 1990s, globalisation has been more focussed on towards the end on the decade. In both cases, however, we have to do with movement towards freer trade in goods and factors – either within a region or globally. In this paper we study further European and global liberalisation, and we compare the importance of the two for different regions. In the European case we combine a deepening of integration in Western Europe and a widening of integration towards Eastern Europe. In the globalisation case we look at changes in both import barriers, export policies and transport costs. While further integration is not the only possible scenario when it comes to trade policies – the world has seen such processes being reversed before – it is clearly an interesting case to look at.

For both scenarios we study stylised characteristics rather than trying to assess the exact nature or magnitude of the exogenous changes. Hence, the results should be read as "what – if" type of experiments; not as complete scenarios for the future economic geography of Europe[2].

In the next section the model is sketched, while section 3 reviews some important aspects of the benchmark data. Section 4 contains the simulation results, while conclusions are given in the final section.

[2] In Forslid et al (1999) the approach is discussed in more detail. Alternative scenarios are also presented in that report – in particular there is a set of scenarios capturing important aspects of successful European or global environment policies.

2. The model

The model we apply has been developed to capture long-term changes in the economic geography, with a special emphasis on European issues. It is a general-equilibrium model of the world economy; there are ten regions in the model, of which five (or six, depending on how we count former Soviet Union) are European regions. The model is designed such that it builds on all parts of modern trade theory. Comparative advantages appear through differences in relative factor endowments and relative productivity between regions. Intra-industry trade follows from product differentiation, scale economies and imperfect competition, and agglomeration and "new economic geography" effects are captured through a combination of a complete input-output structure and imperfectly competitive industries with positive trade costs. Hence, it is a model with focus on fairly long-term structural changes, and it is unique in including all these theoretical channels. The basic model equations are given in Appendix A; in the present section we will only sketch some of the main features of the model. A complete description of the model is given in Forslid et al (1999).[3]

In each region in the model there are 14 production sectors; the regions and sectors are listed in the table below. There are three primary factors of production – capital, skilled labour and unskilled labour; these are mobile between industries within a region, but immobile between regions. The supply of the two types of labour is exogenously given; for capital the supply is endogenously determined from a steady state condition. The factor demand comes from the 14 producing sectors. In addition to the three mobile factors, two of the sectors – energy and agriculture –use sector-specific natural resources. Hence, these two sectors show decreasing returns to scale with respect to the mobile factors. These sectors (energy and agriculture) are modelled as perfectly competitive and with free trade[4].

[3] The model builds on Haaland and Norman (1992), but with significant differences. The regional set-up differs, and so does the input-output structure. Hence the present model is more suitable for economic geography issues. The model has similarities with a few other models, like e.g. the one applied in Baldwin et al (1997) but, again, the regional as well as the input-output structure is richer in the present model. The model sketched in Gasiorek and Venables (1998) captures economic geography effects in a similar way to the present model; however, their model is constructed for a different purpose; hence it is not comparable to what we are doing.

[4] The assumptions of perfect competition and free trade for these two sectors are not realistic ones; however, since the emphasis of the model is on manufacturing, we have kept the resource-based sectors as simple as possible. With perfect competition and homogenous products, the model will only determine the net trade position of a region, and that is why we do not include trade policies for these goods.

Regions and sectors in the model

(model name in parenthesis where necessary)

Regions	***Traded manufactures (imperf. comp., IRS, diff.prod.)***
Europe West (EuropeW)	Textiles
BeNeLux, France, Ireland, UK	Leather
Europe Central (EuropeC)	Wood and pulp products (Woodsprod)
Austria, Denmark, Germany, Switzerland	Metals
Europe South (EuropeS)	Minerals
Greece, Italy, Portugal, Spain	Chemicals
Europe North (EuropeN)	Food products (Foodprod)
Finland, Iceland, Norway,Sweden	Transport equipment (Transeq)
Europe East (EuropeE)	Machiny and equipment (Machines)
Bulgaria, Hungary, Czeck Rep., Poland,	Other manufacturing (Otherman)
Romania, Slovakia, Slovenia	***Non-traded services (imperf. comp., IRS, diff.prod.)***
Former Soviet Union (FormSov)	Public services (PubServ)
China and South Asia (CSAsia)	Private services (PrivServ)
South East Asia (SEAsia)	***Traded resources (perfect comp., free trade)***
USA and Canada (USACAN)	Agriculture (Agricult)
Rest of the World (RestofW)	Energy goods (Energy)

The remaining 12 sectors are all modelled with increasing returns to scale, imperfect competition and product differentiation. For the ten manufacturing sectors in the model, there are trade flows between all regions, but various types of trade costs hamper trade. The model includes both transport costs, import barriers and export taxes or subsidies, and all of these affect trade flows. The two imperfectly competitive services sectors in the model are assumed to be non-traded. Although trade in services is not negligible in reality, it is clear from the benchmark data that a very large share of the output from these sectors is sold in domestic markets.

One important feature of the model is the input-output linkages between sectors. There is a complete input-output system, and with trade costs and imperfect competition we know that this could cause agglomeration through backward and forward linkages (see e.g. Venables, 1996). The data reveals a clear pattern of these linkages: for most industries inputs from own industry dominate, with inputs from the services industries as number two. Hence, the non-traded nature of the services industries as well as the trade costs for manufactures are potential sources of agglomeration in this model.

In each of the differentiated goods industries there is assumed to be Chamberlinean monopolistic competition with free entry and exit of firms. Hence, prices will be a mark-up over marginal costs; the mark-up depending on the elasticity of substitution between varieties. There are increasing returns to scale, and the

The model includes production subsidies in agriculture and energy; however, in the scenarios presented

number of firms in an industry in a region is determined from a zero-profit condition. For the differentiated manufactures, there is demand for each variety in every region; the demand parameters are calibrated based on the benchmark data. Demand for every variety in a region depends on the overall general equilibrium conditions in that region and on the prices and trade costs between regions. Sales within a region are considered as domestic sales with no trade costs; for sales across regional borders, trade and transport costs apply, as mentioned above. The real transport costs are modelled as iceberg costs, while the tariff equivalents of import barriers appear as transfers (to the representative consumer) in the importing country. Export taxes (or subsidies) are transfers in the exporting country.

3. The benchmark situation

In this section we briefly review some key characteristics of production and trade for the regions we focus on. Forslid et al (1999) present the data base and data sources for the model in more detail – in the present section we only focus on characteristics that are important when it comes to understanding the scenarios we analyse later on.

Table 1. Key characteristics - base case

	The region's share (percent) of				
	World GDP	*World manufaturing exports*	*imports*	*World production of energy*	*agriculture*
EuropeW	12.09	17.65	17.70	12.52	8.71
EuropeC	11.75	18.50	17.88	7.09	3.54
EuropeS	8.27	8.84	8.80	7.34	6.05
EuropeN	1.96	3.51	3.45	2.16	1.69
EuropeE	0.89	2.06	2.78	1.53	2.57
FormSOV	2.21	0.78	0.78	3.79	2.11
CSAsia	3.17	4.39	4.37	3.12	17.07
SEAsia	20.27	20.80	20.80	12.94	18.31
USACAN	27.71	15.74	15.75	20.46	16.07
RestofW	11.67	7.73	7.69	29.05	23.87

Table 1 shows some key characteristics. First, it is important to notice the significant differences in size between the regions[5]. In particular when we analyse the effects of successful transformation in Eastern Europe and Former Soviet Union, it should be

in this paper, these policies are kept unaltered.

[5] The benchmark data set is constructed using the GTAP database (versions 3 and 4), EUROSTAT (input-output tables and REGIO) and NBER World Trade Database. With 1992 as the benchmark year, GTAP ver.3 is used for the non-EU regions, while the other sources are used to construct the database for the four Western European regions in the model. GTAP ver.4 is used for some of the share data (e.g. the split in skilled and unskilled labour) and for transport costs. The data we present in

remembered that in economic terms these regions are very small. Secondly, trade is more important for the European regions than for the other ones[6]; in part this reflects the close integration within Europe, but it should be observed that trade flows are relatively important for Europe East as well. Finally, the table shows that the regions differ significantly when it comes to relative importance of the resource-based industries. In particular, for Europe East, former Soviet Union, China and South Asia, and the rest of the world, the shares of energy and/or agriculture production are higher than these regions' overall shares of global GDP. When looking at simulation results, these differences are important to keep in mind.

Next we focus on manufacturing. Table 2 shows the pattern of specialisation as measured by the Hoover localisation quotient; for each industry in a region, the number shows the region's share of global production (measured by value added) in this industry relative to the region's overall share of manufacturing value added. Hence, a number greater than one indicates that this industry is of more than average importance for the region.

Table 2. The pattern of manufacturing specialisation

(Share of the industry's value added relative to share of total manufacturing value added)

	EuropeW	EuropeC	EuropeS	EuropeN	EuropeE	FormSOV	CSAsia	SEAsia	USACAN	RestofW
Textiles	0.78	0.58	1.61	0.53	1.59	0.73	2.51	0.86	0.78	1.71
Leather	0.88	0.56	3.15	0.72	2.75	0.22	2.17	0.86	0.34	1.68
WoodProd	1.06	0.91	0.87	1.63	1.03	1.12	0.48	0.84	1.25	0.91
Metals	0.96	1.05	1.15	1.19	1.16	1.04	0.82	1.07	0.90	0.95
Minerals	0.92	0.70	1.17	1.06	1.57	1.52	1.87	0.92	0.74	1.67
Chemical	1.06	0.98	0.92	0.83	0.89	0.88	0.84	0.97	1.06	1.05
FoodProd	1.08	0.81	1.13	0.89	1.31	1.13	0.92	0.94	0.84	1.57
TransEq	1.15	1.32	0.84	0.84	0.47	1.09	0.38	0.87	1.23	0.61
Machines	0.95	1.18	0.74	1.01	0.60	0.90	0.70	1.22	1.10	0.44
OtherMan	0.96	1.48	0.54	0.64	0.91	0.73	3.74	0.95	0.66	1.01

The pattern of specialisation is, to a large extent, as we should expect. The big, advanced regions like Europe Central and West, USA and Canada and South East Asia have more than average production of what we could call skill-intensive products (transport equipment, machines). Labour intensive products (textiles and leather) are more important in the smaller, poorer regions like Europe East and China and South Asia, but also in Europe South. Europe East is also fairly specialised in energy- and natural resource-intensive industries, like metals, minerals and food

this section are from the constructed benchmark; hence, the actual observations and characteristics may differ somewhat from similar numbers from other data sources.

[6] The table only reports trade between the regions; in addition there may be significant trade flows between the countries within each region.

products. A similar pattern appears for Europe North, with a specialisation in wood products and metals.

Finally, the geographical pattern of trade will be reviewed. Table 3 shows the geographical distribution of manufacturing sales from each region. A couple of observations are due. First, the home market dominance is very clear in all regions, but less so in Europe than in the other regions. The explanation for this is, however, obvious; Europe is split into five regions with close ties between them. Second, geographical closeness seems to matter; Europe Central has strong trade links to the other European regions. In Asia, South East Asia is the most important trading partner for China and South Asia. Thirdly, the strong trade links between Europe East and Europe Central should be noticed; Europe Central is by far the most important market for exports from Europe East, and it is also the most important supplier of imports to Europe East[7]. This pattern is of great importance when it comes to understanding some of the simulation results.

Table 3. Distribution (percent) of total sales of manufactures from the region

Sales to	EuropeW	EuropeC	EuropeS	EuropeN	EuropeE	FormSOV	CSAsia	SEAsia	USACAN	RestofW
From										
EuropeW	69.3	11.2	6.9	1.4	0.5	0.3	0.5	2.5	3.6	3.7
EuropeC	11.9	71.3	5.5	1.9	1.4	0.6	0.4	2.4	2.5	1.9
EuropeS	8.1	7.0	78.0	0.6	0.6	0.4	0.2	1.3	1.8	2.1
EuropeN	8.6	7.9	2.7	73.5	0.5	0.5	0.4	1.8	2.6	1.4
EuropeE	3.6	10.5	3.6	1.0	74.8	1.2	0.6	0.9	0.8	3.1
FormSOV	0.7	0.9	0.5	0.4	0.5	94.3	1.3	0.7	0.3	0.5
CSAsia	1.1	0.9	0.5	0.1	0.1	0.6	82.0	7.2	4.7	2.9
SEAsia	1.3	1.2	0.5	0.2	0.1	0.1	1.6	87.5	5.3	2.3
USACAN	1.8	0.9	0.5	0.2	0.1	0.1	0.4	3.1	89.4	3.5
RestofW	1.4	0.9	0.8	0.1	0.2	0.1	0.5	2.2	4.1	89.8

Forslid et al (1999) give a more detailed description of the benchmark data, including a discussion of the initial trade and transportation costs, which are based on GTAP data. There are significant differences in trade barriers and export subsidies between sectors, with agriculture and food products at the top. As our model is not constructed to analyse agricultural issues, we do not treat trade policies in agriculture in detail. The trade costs in food products, on the other hand, might have a significant influence on the model simulations. There are also important differences between the regions when it comes to trade barriers; as expected, barriers between Western European countries (the EU and EEA countries) are low, while trade barriers and export subsidies between east and west in Europe are more important. Import barriers are significant for most products in the Asia regions and also in the rest of the world.

And for a few products, export subsidies may be of some importance; in particular, there are export subsidies on several important export goods from Europe North, according to the GTAP data.

4. Model simulations

We will look at two main scenarios: i) Eastern European transformation, and ii) European and global integration. Within each of these, a number of different cases will be presented, representing various possible assumptions linked to the broad topic of the scenario in question. It should be emphasised at the outset that these scenarios are not meant to be predictions or forecasts of the actual development; they should be looked at as illustrations of possible consequences of a set of assumptions making up the complete scenario. The assumptions we make in each case are not even meant to be best guesses of the actual, future development; they are just illustrative, to show what the consequences of certain exogenous changes may be. The types of changes we look at are, however, meant to capture some important features of the cases we study.

4. 1 Eastern European Transformation

In this section we focus on Eastern Europe and Former Soviet Union. The aim is to get an impression of what the consequences for trade and development in Europe may be, should the regions manage to transform into well-functioning market economies.

A "successful transformation" of the Eastern European economies includes many things. It is a change from the old command economy to a market system, and it is a change towards freer trade relations and maybe new trade partners. It includes a restructuring of industry and changes in the pattern of production and consumption. It implies an improvement in resource allocation and better investment and employment opportunities, and, ultimately, increased income and welfare. In a general equilibrium model some of these implications appear as endogenous equilibrium effects, while others must be specified as exogenous changes. The model cannot capture the transformation from non-market to market economy endogenously, nor can it tell us how unemployment will develop. But it can help us understand what the consequences for production, trade and welfare may be of various possible scenarios.

[7] See Forslid et al (1999) for a similar distribution from the demand side.

We will look at three "stylised stages" of successful transformation in this section, first for Europe East alone, and then for the former Soviet Union in addition.

The first case is one in which we look at the consequences of improved productivity in all sectors in the relevant region. There are a number of reasons why we should expect such productivity improvements: transformation to market economies implies more efficient organisation of production, more cost-efficient production and more competition in goods and factor markets, both within each country and between the countries in the model regions. All of these changes within an industry will appear as more efficient production for the industry as a whole. In our stylised case we analyse the general equilibrium consequences of an exogenously given five percent Hick-neutral productivity improvement in all industries in the region in question. In reality, there will, of course, be differences between industries; some may experience huge improvements, while for others the scope for improvements is less. Such differences would reinforce the structural changes we get, but lack of information about individual industries prevents us from modelling the sector-specific variation.

Our second case focuses on investments. It is widely assumed that successful transformation would imply a better investment climate in Eastern Europe. While the combination of low production costs and closeness to the big European markets may already give high expected rates of returns to investments in Eastern Europe, uncertainties regarding the general development have so far dampened the actual willingness to invest. In this scenario we lower the required risk premium for investments in Europe East (and Former Soviet Union in the subsequent cases), to reflect the improved confidence following a successful transformation. In the model aggregate investments in a region are determined from a steady state condition such that investments will grow until the marginal rate of return is equal to the steady state required rate. Improved profitability in an industry, e.g. due to changing market conditions or better productivity, implies more investments, and vice versa. Similarly, reduced uncertainties and hence lower required rate of return imply more aggregate investments. It is, however, more difficult to know in which industries the investments will appear. That depends on the relative profitability of various industries, which is one of the endogenously determined results in our simulations. Hence, one interesting feature is where investments will take place, given that the overall investment climate improves.

Thirdly, it is not unlikely that successful transformation also implies reduced unemployment by generating new employment opportunities. We do not attempt to determine endogenously how important such new employment will be; we simply assume aggregate employment to grow by five percent, and focus on the consequences.

Previous analyses, in particular Baldwin et al (1997) and Keuschnigg and Kohler (1998), have focused on market access and EU enlargement; hence, trade liberalisation has been the key aspect. However, they include reduced risk premium as part of the enlargement process. We will look at trade policies in the next section, but before we do that, we believe it is important to get a grasp on to which extent the transformation process itself may affect European markets. Our specification of efficiency gains in terms of productivity improvements, as well as the employment growth, should capture some of the potential growth effects of successful transformation in Eastern Europe. By feeding these into the CGE-model we get an assessment of how strong the "multiplier" effects may be in the transforming regions and of how such successful transformation may affect the economic situation in the rest of Europe and the world. Liberalisation and European integration may be a prerequisite for the transformation to be successful; we will, however, come back to the explicit effects of liberalisation in the next section.

Results

Table 4 shows the real income effects for all the regions for the cases sketched above. The specific model experiments are: i) five percent Hick-neutral productivity improvement in all sectors in the region; ii) the above plus five percent reduced risk premium, and iii) the above two plus five percent increase in the employment of both skilled and unskilled labour. Six cases are presented: in the first three cases exogenous changes only take place in Europe East, in the following three cases, changes take place in former Soviet Union as well, with the assumptions for Europe East remaining as in case 3.

The table reveals that the changes are of great importance for the regions themselves, while the consequences for other regions are small. When a five percent productivity improvement results in 15 percent real GDP growth for Eastern Europe, there are three important mechanisms: first, the direct production effects of higher productivity; secondly, the implied improvements in competitiveness, and thirdly,

induced investment growth. Similar effects appear in the other cases. In the case of Europe East, investments grow by approximately 15 percent in the productivity case, and by another 10 percent (relative to the benchmark data) when the risk premium is reduced. Hence, the induced investment effects through the steady-state condition play an important role for the results. The fact that the model includes pecuniary externalities through forward and backward linkages is also important; these agglomeration forces will typically reinforce the welfare effects of the initial shifts towards growth in manufacturing production. Although it is difficult to compare with previous studies, since the model experiments differ, the results tend to indicate that we get relatively strong welfare gains. To take only one example, the reduced risk premium case is similar to a case studied in Baldwin et al (1997), and when comparing the results, the welfare gains we get are approximately twice as high as in their results.

Table 4. Real income effects of changes in Eastern Europe and former Soviet Union
(Percent change in real GDP from base case)

	Europe East			**Europe East & Former Soviet Union**		
	Productivity improvement +	*Lower risk premium* +	*Increased employment*	*Productivity improvement* +	*Lower risk premium* +	*Increased employment*
EuropeW	0.03	0.04	0.06	0.04	0.04	0.03
EuropeC	-0.12	-0.15	-0.22	-0.22	-0.22	-0.22
EuropeS	-0.01	-0.02	-0.03	-0.04	-0.05	-0.05
EuropeN	-0.05	-0.07	-0.11	-0.12	-0.13	-0.13
EuropeE	15.88	21.16	33.26	33.05	32.97	32.83
FormSOV	-0.01	-0.01	-0.02	12.50	16.83	25.84
CSAsia	-0.13	-0.17	-0.25	-0.40	-0.45	-0.56
SEAsia	0.01	0.01	0.01	-0.01	-0.03	-0.03
USACAN	0.00	0.00	0.00	0.00	0.00	0.00
RestofW	-0.04	-0.07	-0.10	-0.14	-0.18	-0.19

For the trading partners, there are two opposing forces affecting production; they lose in competitiveness relative to Eastern Europe, but on the other hand, increased demand in Eastern Europe could lead to more exports. In addition consumers are affected through lower import prices. The most important trading partner for Europe East is Europe Central, and the table shows that the negative effects through competitiveness dominate. Among the remaining regions, it is worth noticing that China and South Asia lose both from changes in Eastern Europe and in the former Soviet Union. The reason in this case is not the direct trade relations between the regions; it must be a terms-of-trade loss for CSAsia because the transforming regions expand production in industries that are export sectors for CSAsia.

In table 5 the aggregate trade effects are shown. As indicated above, Europe Central – as the most important trading partner for Europe East – is most severely hit on the export side, but there are also significant effects for Europe North. For the other regions the trade effects are more moderate. It is worth noticing that imports to Europe East actually decline in these cases; hence the competition effect dominates over the income effect. As the trade balance for each region is kept unaltered in all scenarios, the counterpart of this pattern of changes in manufactures must be opposite changes in net exports from the perfectly competitive sectors (agriculture and energy). For Europe East that means increased demand for imports of both agricultural and energy products in these scenarios. It should also be noticed that changes in the former Soviet Union have only minor effects on the other regions; this is a consequence of the initial trade pattern (see table 3) where the trade flows between Former Soviet Union and other regions are insignificant. The export growth from Former Soviet Union is also much more moderate than for Europe East.

Table 5. Changes in the value of manufacturing trade

Table 5a. Total value of manufacturing exports (percent change from base case)

	Europe East			**Europe East & Former Soviet Union**		
	Productivity improvement +	*Lower risk premium* +	*Increased employment*	*Productivity improvement* +	*Lower risk premium* +	*Increased employment*
EuropeW	0.3	0.4	0.6	0.6	0.6	0.6
EuropeC	-3.3	-4.2	-6.3	-6.2	-6.1	-6.1
EuropeS	-0.4	-0.5	-0.8	-0.7	-0.7	-0.7
EuropeN	-1.6	-2.1	-3.2	-3.2	-3.2	-3.2
EuropeE	34.9	45.8	73.6	72.3	72.0	71.0
FormSOV	-0.5	-0.6	-1.0	9.5	13.1	20.4
CSAsia	-0.4	-0.6	-0.8	-1.2	-1.3	-1.6
SEAsia	0.1	0.1	0.1	0.2	0.2	0.2
USACAN	0.1	0.1	0.1	0.2	0.3	0.3
RestofW	-0.4	-0.5	-0.8	-0.8	-0.7	-0.7

Table 5b. Total value of manufacturing imports (percent change from base case)

	Europe East			**Europe East & Former Soviet Union**		
	Productivity improvement +	*Lower risk premium* +	*Increased employment*	*Productivity improvement* +	*Lower risk premium* +	*Increased employment*
EuropeW	-1.0	-1.2	-1.7	-1.6	-1.6	-1.6
EuropeC	1.8	2.4	3.9	3.9	3.9	4.0
EuropeS	-0.2	-0.2	-0.1	-0.1	0.0	0.0
EuropeN	0.0	0.1	0.3	0.4	0.5	0.6
EuropeE	-1.9	-2.4	-3.6	-3.1	-3.0	-2.7
FormSOV	1.7	2.2	3.8	3.6	3.7	3.5
CSAsia	0.2	0.3	0.6	1.0	1.1	1.4
SEAsia	-0.3	-0.4	-0.6	-0.5	-0.5	-0.5
USACAN	-0.3	-0.3	-0.5	-0.5	-0.5	-0.5
RestofW	0.3	0.4	0.7	0.8	0.8	0.8

Finally, we will focus on the sectoral effects of successful transformation. While production of all goods in all regions is affected by the changes, it should be clear from the above that the effects are very moderate in most regions. Table 6 shows the production effects in Europe East and Former Soviet Union, respectively, following the region's own transformation, while table 7 gives the production effects in the other regions in one of the cases – the one with all changes taking place in Europe East. It is clear from the results that the former Soviet Union reforms hardly have any effects at all on production and trade for the other regions.

When studying the production effects in table 6, we should distinguish between three groups of industries. Public and private services are non-traded. Hence, these develop in accordance with domestic demand; however, since we have a full input-output structure in the model, and since private services is an important input in most other industries, the strong growth in production of private services reflects to some extent such linkages. Secondly, energy and agriculture are treated as perfectly competitive sectors in the model; hence, these are fairly flexible, and will to a large extent serve as residuals. Should other sectors be profitable enough to expand beyond the possibilities made available by increased productivity and new investments and labour, the resources will have to be taken from the perfectly competitive sectors. It is interesting to note that for Europe East, the growth impetus to other sectors is very strong, since significant resources are drawn out of agriculture and energy production in that region, while in former Soviet Union that is not the case. The difference must be due to different trade and competition relations with other countries. Fairly open economies can use international markets and specialise; fairly closed economies cannot specialise in a similar way. Our results indicate that Europe East is in the former category while Former Soviet Union is not. This is also in accordance with the benchmark data presented in table 3.

Thirdly, there are ten traded, manufacturing goods. This is where the large changes take place, and given that the initial "shocks" in terms of productivity improvements and additional resources are neutral between the sectors, it is interesting to see the significant differences in production effects. Labour-intensive sectors like textiles and leather grow significantly both in Europe East and in the former Soviet Union, but the most surprising effect in the table is the strong growth in production of transport equipment and machines in Europe East. These results indicate that with a successful transformation the region may become very

competitive in such sectors – both productivity, investment climate and increased employment contribute to these effects. For former Soviet Union there is not a similar indication of potential competitiveness in such skill-intensive sectors.

Table 6. Production effects in EuropeE and FormSov from the region's own changes
(*Percent change from base case)*

	Europe East			**Former Soviet Union**		
	Productivity improvement +	*Lower risk premium* +	*Increased employment*	*Productivity improvement* +	*Lower risk premium* +	*Increased employment*
PubServ	9	12	19	8	11	17
PrivServ	12	17	25	10	14	21
Textiles	29	38	59	13	18	28
Leather	22	29	45	31	42	64
WoodProd	16	22	33	10	13	20
Metals	25	33	49	10	13	20
Minerals	18	24	37	9	13	20
Chemical	19	25	38	9	13	19
FoodProd	15	20	33	12	16	24
TransEq	75	97	148	10	14	23
Machines	37	49	74	11	15	23
OtherMan	20	26	40	12	16	25
Agriculture	-11	-16	-23	2	-1	2
Energy	-9	-9	-20	14	21	28

Table 7 shows that among the other regions the production effects are strongest for Europe Central, which is also the most important trading partner for Europe East. In terms of industries, the labour-intensive ones are most severely hit in Europe Central, while the skill-intensive ones also see significant negative effects. For Europe North the strong negative effects in the production of transport equipment should be noticed. The same also applies for China and South Asia. In addition to motor vehicles, things like shipbuilding may play an important role here. Apart from these examples, the table reveals that the production effects in most sectors in most regions are insignificant.

To summarise, we can conclude that successful reforms and transformation in Eastern Europe and former Soviet Union are of huge importance for the economic development in these regions, and that we may see significant changes in the pattern of specialisation and trade in these regions. However, in economic terms both regions are too small to matter very much for the overall production and welfare elsewhere. Even for Europe Central, where some sectors may see successful transformation in Eastern Europe as a threat, the overall effects, in terms of real GDP, are modest, as shown in table 4 above.

Table 7. Production effects in other regions of successful transformation in Eastern Europe
(*Percent change from base case)*

	EuropeW	EuropeC	EuropeS	EuropeN	CSAsia	SEAsia	USACAN	RestofW
PubServ	0.0	0.1	0.0	0.0	-0.2	0.0	0.0	0.0
PrivServ	0.0	0.0	0.0	-0.1	-0.3	0.0	0.0	-0.1
Textiles	3.8	-17.1	0.0	1.5	-0.5	0.1	0.0	-0.4
Leather	1.0	-10.9	-1.7	0.4	-1.9	0.4	1.2	-0.2
WoodProd	0.1	-1.1	-0.6	-0.7	-0.4	0.0	0.0	-0.4
Metals	0.3	-2.7	-0.8	-1.5	-1.1	0.0	0.1	-1.1
Minerals	-0.1	-0.8	-0.5	-0.3	-0.4	0.0	0.0	-0.5
Chemical	0.1	-1.2	-0.5	-0.3	-0.5	0.0	0.0	-0.4
FoodProd	-0.1	0.0	-0.1	-0.1	-0.2	0.0	0.0	-0.2
TransEq	-0.3	-3.1	-0.8	-11.6	-4.1	0.2	0.2	-1.4
Machines	0.6	-2.0	-0.5	-0.7	-1.0	0.1	0.1	-1.2
OtherMan	0.1	-0.2	-0.9	-0.4	-0.5	0.0	0.1	-0.4
Agriculture	-1.6	27.8	1.7	5.6	0.3	-0.1	-0.3	0.6
Energy	-0.6	9.1	1.2	2.5	0.0	-0.4	-0.2	0.2

4.2 European and global integration

In this section we will focus on trade policies. While a number of trade policy scenarios could be interesting to study, we stick to some "stylised" and fairly neutral cases in this paper. We concentrate on further liberalisation both within Europe and globally, and we do not attempt to distinguish between the manufacturing sectors when it comes to the strength of the policy experiments. Hence, what we study in this section are the effects of general liberalisation and integration, first in Europe and then world-wide.

In the model trade and transaction costs for manufacturing goods appear through three parameters: import barriers (tariffs and tariff equivalents of non-tariff barriers), export subsidies (or taxes), and transport costs. In the scenarios in this section we study fairly moderate reductions in all of these; first for trade within Europe only, and then globally. In all cases we look at a five percent reduction in the relevant trade cost; in the European integration cases, there is thus a five percent reduction in tariffs and NTBs, export subsidies and transport costs between Europe West, Central, South, North and East. In the global cases, similar reductions are assumed for trade between all regions. Although we have no particular reason to believe that future liberalisation will be of this magnitude or implemented in such a neutral way, the results should help us understand what type of effects we should expect from further integration. It should, however, be noticed that the exact specification of the liberalisation may be of importance for the results. A proportional reduction in all trade costs implies that the absolute changes in trade costs vary between sectors and regions, depending on the initial pattern of the trade costs.

Hence, the effects of proportional reduction of the type we study, may differ from the effects one would get from other liberalisation schemes – e.g. similar absolute reductions in trade costs in all sectors and regions.

It is also worth noticing that we allow for reductions in all elements of the trade costs. Hence, not only trade policies are altered; we also assume real transport costs to go down. This could either be due to more efficient supply of transport services, or it could stem from closer market integration, with e.g. lower technical barriers to trade. The analysis allows us to distinguish the relative importance of each one of the three elements of trade cost reductions.

Results

Table 8 shows the overall impact of the various stages of integration for each region, as measured by the percentage change in real GDP. The table reveals that the impact of further European integration as specified here, is fairly moderate on average; for Eastern Europe, however, freer trade and closer integration is very important. This is in line with what one should expect; we have already seen substantial steps towards integrated markets in the EU and EEA regions, while eastern enlargement is still to come. Hence the remaining trade barriers within Western Europe are moderate. Between east and west, on the other hand, there are significant remaining trade costs, so that the absolute effects of the five percent reductions are more pronounced with accompanying strong real income effects for Europe East[8]. From the discussion above we know that differences in size and economic importance are such that even strong growth in trade between east and west in Europe will only have a minor impact on the overall situation in the west. It is, however, interesting to notice that global liberalisation will also add significantly to the gains for Eastern Europe.

Global liberalisation turns out to have a significant, positive effect for the two Asian regions, though for China and South Asia the positive impact depends on the type of policy changes. Removing import barriers alone does not yield gains for that region. It is further interesting to notice that for Europe West global integration seems to be more important than further European integration. The reason may be found in the initial trade barriers and the trade pattern. Table 3 shows that trade flows

[8] In fact, the welfare gains from liberalisation for Eastern Europe may well be stronger than these results indicate. Baldwin (1994) emphasises the importance of liberalising east-east trade as well as

with non-European regions are more important for Europe West than for the rest of Europe. And since trade with other Western European countries is already free in the benchmark data, global liberalisation matters more. World-wide, the gains from global liberalisation of approximately half a percent may seem modest; however, it should be remembered that we look at fairly small policy changes here, with only five percent reductions in trade and transportation costs. Historically, we have seen much stronger reductions in transaction costs.

Table 8. Real income effects of European and global integration
(Percent change in real GDP from base case)

	European integration			**Global integration**		
	imp.barr.	*+exp.subs.*	*+trans.cost*	*imp. barr.*	*+exp.subs.*	*+trans.cost*
EuropeW	0.03	0.07	0.17	0.59	0.53	0.58
EuropeC	-0.02	-0.08	-0.10	-0.24	-0.27	-0.29
EuropeS	0.01	0.01	0.06	0.08	0.09	0.09
EuropeN	0.08	0.07	0.11	0.15	0.17	0.18
EuropeE	1.15	2.56	3.33	4.61	5.09	5.30
FormSov	0.00	0.00	0.00	0.06	0.08	0.08
CSAsia	-0.04	-0.05	-0.14	-0.62	0.72	1.61
SEAsia	0.00	0.01	-0.01	1.10	1.39	1.53
USACAN	0.00	0.00	0.00	0.07	0.09	0.13
RestofW	0.00	0.01	-0.01	-0.36	-0.22	-0.18
All regions	*0.01*	*0.02*	*0.04*	*0.27*	*0.39*	*0.47*

The aggregate trade implications of integration are shown in table 9. The following should be observed: First, export growth is strong for the regions that according to table 8 are to gain most from integration, i.e. for Europe East and the Asian regions. Secondly, Europe Central – a region that actually loses from integration – experiences reductions in exports and growth in imports of manufacturing. This strong correlation between welfare gains and exports of manufactures calls for an explanation, as such a result would not appear in traditional trade models. However, our model differs from traditional comparative advantage models in many ways; in particular, there are pecuniary externalities in manufacturing production. Hence, there are self-reinforcing growth effects in manufacturing production, which could give rise to cost advantages and the type of correlation we observe between manufacturing exports and welfare in the simulations. Put differently, we get "externality shifting" effects of trade policies – regions that get more of the industries with pecuniary externalities gain, while other regions may lose.

east-west trade. In our simulation, east-east trade is already free, since this is trade within a region in the model.

Although our simulations do not cover agricultural policies, the implications for agricultural markets in Europe may be of interest. The strong growth impetus to manufacturing sectors in Europe East in these scenarios actually implies increased demand for imports of agricultural products to the region. In a more complete scenario the overall effects for agriculture will, of course, depend on the direct effects of changing agricultural policies and on the implied effects of liberalising other sectors. Our analysis only includes the latter effect. However, the results indicate that the "conventional wisdom" of an expected strong growth of exports of farm products from east to west following European integration, is not necessarily true.

Table 9. Changes in the value of manufacturing trade

Table 9a. Total value of manufacturing exports (percent change from base case)

	European integration			**Global integration**		
	imp.barr.	*+exp.subs.*	*+trans.cost*	*imp. barr.*	*+exp.subs.*	*+trans.cost*
EuropeW	1.0	1.0	2.5	8.4	6.3	7.1
EuropeC	-0.5	-2.6	-3.0	-7.2	-9.2	-10.0
EuropeS	0.3	0.1	1.6	1.2	0.7	0.9
EuropeN	1.1	-3.7	-2.6	-2.7	-3.4	-3.2
EuropeE	10.0	22.1	28.7	38.8	42.9	44.8
FormSov	-0.2	-0.2	-0.4	2.0	3.4	4.8
CSAsia	-0.3	-0.3	-0.9	7.7	15.2	22.3
SEAsia	0.0	0.0	-0.2	10.1	13.7	15.9
USACAN	0.0	0.0	-0.1	0.4	-1.0	-0.1
RestofW	-0.2	-0.2	-0.4	-1.6	0.7	2.3

Table 9b. Total value of manufacturing imports (percent change from base case)

	European integration			**Global integration**		
	imp.barr.	*+exp.subs.*	*+trans.cost*	*imp. barr.*	*+exp.subs.*	*+trans.cost*
EuropeW	0.1	-1.0	-0.7	-2.6	-2.4	-2.4
EuropeC	1.3	1.7	3.4	6.4	7.0	7.8
EuropeS	1.0	0.1	1.0	1.7	1.2	1.5
EuropeN	0.5	-0.1	0.6	0.8	0.2	0.4
EuropeE	0.5	-1.7	-1.7	-3.3	-4.5	-4.6
FormSov	0.1	0.1	0.0	1.4	-1.1	1.2
CSAsia	0.0	0.0	0.0	13.0	13.4	15.1
SEAsia	-0.1	-0.3	-0.3	1.0	0.5	2.5
USACAN	-0.1	-0.2	-0.2	5.5	8.1	10.0
RestofW	0.0	0.0	0.1	6.8	6.1	7.8

Finally, the different effects of global integration for Europe Central and West may be surprising. For Europe West exports increase while imports go down as a consequence of global integration, which is the opposite of the effects for Europe Central. The reasons for this could – as mentioned above –have to do with the trade pattern, and the initial pattern of trade barriers and trade costs. Finally, it should be noted that for China and South Asia, reduction of import barriers implies more growth in

imports than in exports of manufactures. This reflects the fact that this region has a fairly strong degree of import protection at the outset.

Table 10. Changes in exports

(Percent changes in exported quantities from base case)

Table 10a. European integration (reduced import barriers, export subsidies and transport costs)

	Textiles	Leather	Woodpr.	Metals	Minerals	Chemicals	Foodpr.	Transeq	Machines	Otherman
EuropeW	9.6	1.1	2.4	1.1	2.5	1.4	5.7	0.2	0.8	1.5
EuropeC	-28.6	-8.4	2.3	0.5	2.6	-0.7	5.6	0.0	0.6	1.5
EuropeS	4.3	4.0	1.8	0.6	3.1	0.3	3.7	-0.1	0.1	2.2
EuropeN	5.7	0.7	-11.0	2.1	2.5	2.0	10.7	-0.4	0.3	0.8
EuropeE	93.0	21.6	6.9	7.6	9.4	10.0	18.5	19.1	3.4	8.0
FormSov	-2.3	0.0	0.6	-0.3	-0.5	-0.3	-0.5	-0.5	-0.2	-0.8
CSAsia	-0.8	-3.3	-0.2	-0.3	-0.2	-0.3	-0.3	-0.7	-0.3	-0.4
SEAsia	-0.3	-0.1	0.0	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	-0.3
USACAN	-0.2	2.1	0.0	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	-0.2
RestofW	-1.2	-0.5	-0.1	-0.2	-0.1	-0.2	-0.4	-0.3	-0.2	-0.6

Table 10b. Global integration (reduced import barriers, export subsidies and transport costs)

	Textiles	Leather	Woodpr.	Metals	Minerals	Chemicals	Foodpr.	Transeq	Machines	Otherman
EuropeW	11.1	3.7	4.4	5.7	5.0	3.0	4.6	7.7	4.3	16.1
EuropeC	-61.1	-22.6	2.6	-0.3	4.5	-1.3	5.6	-3.8	-0.8	-1.4
EuropeS	6.2	3.2	2.8	1.0	5.7	0.5	2.3	-2.9	-0.4	-1.0
EuropeN	4.7	0.0	-11.8	2.4	3.5	2.5	13.6	-1.6	0.4	-1.0
EuropeE	130.6	25.3	11.4	13.6	14.5	14.9	30.3	32.3	9.3	11.1
FormSov	17.4	-69.2	7.8	3.2	27.6	3.0	21.1	2.8	2.5	-1.0
CSAsia	13.2	150.4	2.2	0.3	5.3	3.5	16.6	-4.2	-3.8	-2.1
SEAsia	54.1	-6.5	7.9	7.0	9.2	5.8	14.9	6.8	9.1	14.7
USACAN	-5.0	-100.0	3.3	2.6	7.0	2.0	20.1	1.1	0.2	-0.9
RestofW	13.7	-9.3	2.7	-0.6	3.5	1.3	19.2	-7.1	-5.7	-6.8

While table 9 shows the overall pattern of changes in manufacturing trade for all cases, table 10 contains more detailed information about the industrial composition of the export changes for two of the cases – European integration (third case in tables 8 and 9) and global integration (sixth case in tables 8 and 9). The table shows that there is significant variation between regions for specific goods and between industries for each region. One clear feature is the growth in exports of food products from most regions, in particular in the global integration cases. This should not come as a surprise, given the initial pattern of protection. Secondly, there is strong growth in exports of labour-intensive products (textiles and leather) from Eastern Europe and the Asian regions; again, this has to do with the pattern of protection and comparative advantages. The counterpart is a reduction in labour-intensive sectors in Europe Central and in USACAN. While the table shows exports, there will be a similar, but dampened, effect on production. In general, the pattern of manufacturing production does not show strong changes in these cases; the most significant change is a five percentage points increase in Europe East's share of European production of textiles, from 8 to 13 percent, with an accompanying reduction in Europe Central's share.

5. Conclusions

In this paper we have presented model simulations for two sets of scenarios. Although the scenarios have been specified in a stylised way, with no attempt at predicting or forecasting real world phenomena, they are intended to capture potentially important structural changes. However, on each one, there is great uncertainty, even about the sign of the changes. We study successful transformation in Eastern Europe, and continued integration in Europe and globally – it could be argued that the opposite development is not an unlikely outcome.

If we look at the results, there are some striking features. Eastern European transformation matters a lot for the transforming regions (Europe East and former Soviet Union), but the consequences for the rest of Europe are limited. Although trade with Eastern Europe increases significantly for most regions in percentage terms, the economic effects of this are very small. And the reason is simply that in economic terms, Eastern Europe and former Soviet Union are small regions, and even if they experience strong growth, the effects for other regions are moderate.

There are, however, regional differences; the neighbouring countries in Europe Central are more severely hit than other European regions, and one feature that was not obvious ex ante, is that the overall effect for Europe Central is negative. Eastern European success could on the one hand imply increased production and exports through improved competitiveness for Eastern European producers; but on the other hand, it would also imply increased income and demand in Eastern Europe, with accompanying growth in import demand in the region. The simulation results clearly indicate that the former effect dominates; the most important trading partners experience strong growth in their imports from Eastern Europe, but not any significant changes in exports to the region. When it comes to production effects, although the overall impression is that successful Eastern European transformation only has limited effects on production in other regions, there are a few exceptions. In particular, the neighbouring region, Europe Central, may expect significant production cuts in labour-intensive sectors, should Eastern Europe succeed as in our scenario. A final observation worth noticing in this scenario, is the negative welfare effect in China and South Asia following Eastern European success. This seems to be a clear terms-of-trade effect; increased competition from Eastern Europe gives downward price pressure on export goods from China and south Asia, and hence a welfare loss in this region.

Secondly, we look at trade policies. We focus on liberalisation and integration, either in Europe or globally. The scenario distinguishes between reductions in import barriers, export taxes or subsidies, and transportation costs. For some regions there are qualitative differences between the three types of changes (e.g. for China and South Asia, where import liberalisation implies a loss, while the region gains significantly from the other two changes), while for most of the regions the changes in various policies reinforce each other.

The simulation results of European integration show that for the EEA-area the effects are very moderate – that simply reflects the fact that these countries are already closely integrated, with few remaining barriers. For Europe East, on the other hand, integration with the rest of Europe is very important. The are large welfare gains as a consequence of significant growth in exports from the region. The bulk of the export growth comes in labour-intensive industries, but there are also substantial effects in some of the other industries. In addition it should be remembered that, although we treat Eastern European transformation and economic integration in two separate sets of scenarios, integration and improved market access might actually be an important prerequisite for successful transformation. This may well turn out to be the most important effect of integration, as a comparison of the two scenarios in this paper could indicate.

The global integration cases reveal three interesting results: first, the Asian regions may gain significantly from further liberalisation, while for other regions the overall effects are moderate. Secondly, for at least one of the European regions – Europe West – global liberalisation seems to matter more than further European integration. Both of these results can be explained from the initial trade patterns for the regions. The Asian regions do rely heavily on trade, but initial trade barriers limit the possibilities; hence, further liberalisation yields gains. And Europe West has relatively more trade than other European regions have with countries outside Europe. The final observation is that trade in food products shows significant growth as a consequence of global liberalisation. Again, the reason must be the initial patterns of protection; food and food products are heavily protected in most regions, and that implies strong effects of liberalisation. In the model we do not capture the effects for agriculture, but we do pick up the importance for food products.

A striking feature of the results is the correlation we find between growth in manufacturing exports and welfare gains. This is a feature we would not expect in

traditional models of trade based on comparative advantage. In our model, however, where the combination of input-output linkages, imperfect competition and trade costs gives rise to pecuniary externalities, such effects may well appear. From theory we know that it may be beneficial to have more of the industries in which externalities are important, since that gives a cost advantage to the country. In our context, pecuniary externalities are linked to manufacturing, while the perfectly competitive sectors do not show such effects. Hence, if policy changes imply shifts in the pattern of manufacturing production and exports between regions, that may well give rise to self-reinforcing agglomeration effects, with accompanying gains for those who get more of the manufacturing industries, and losses for other regions. The similarity to the "profit shifting" effects of strategic trade policies is obvious. There are, however, no pure profits in our model, so we may call this an "externality shifting" effect of trade policies. In reality – and also in our model – the strength of such agglomeration forces differs between industries. A subject for future research would be to look deeper into the sectoral differences in order to identify the more precise relationship between changes in the industry pattern and welfare gains or losses for the regions.

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Appendix A.

Basic model equations

This appendix shows some of the basic model equations to illustrate how specific features of the model work; a complete description is found in Forslid et al (1999).

Consumers have Cobb-Douglas preferences over a set of all goods (AG), implying that they will spend a fixed share of their income on each good:

$$C_{im} = \alpha_{im} \frac{Y_{im}}{P_{im}} \qquad \text{i} \in \text{AG} \qquad (1.)$$

For perfectly competitive goods prices are world market prices given by world market clearing conditions for the respective goods. One of these goods is chosen as numeraire. As for imperfectly competitive, differentiated goods (the set I), the price level for good i is an index of the prices of each variety of the good sold in market m. The calibrated demand parameter for each of the N_{ij} varieties of good i from country j sold in market m, is a_{ijm}.

$$P_{im} = \left(\sum_{j=1}^{R} N_{ij} a_{ijm} PI_{ijm}^{(1-\sigma_i)} \right)^{\frac{1}{1-\sigma_i}} \qquad \text{i} \in \text{I}, \qquad (2.)$$

For non-traded, differentiated goods $a_{ijm}=0$ for all $m \neq j$, since by assumption only domestically produced varieties are consumed. σ_i is the elasticity of substitution between various varieties of good i.

The imperfectly competitive sectors are characterised by monopolistic competition *á la* Dixit and Stiglitz (1977). Producer prices (PPI) of individual varieties are given as a mark-up over firms' marginal costs (MC):

$$\text{PPI}_{\text{ij}} = \frac{\sigma_{\text{i}}}{\sigma_{\text{i}} - 1} \text{M C}_{\text{ij}} \qquad i \in I \qquad (3.)$$

while consumer prices (PI_{ijm}) for the traded goods are subject to trade costs of three types: export taxes (EXTAX), transport costs (TRANS), and tariff equivalents of import barriers (TAREQ). The transport costs are of the iceberg type, while export taxes and import tariffs are transfers (to the representative consumer).

$$PI_{ijm} = PPI_{ij} \times (1 + EXTAX_{ijm}) \times (1 + TRANS_{ijm}) \times (1 + TAREQ_{ijm}) \qquad \text{i} \in \text{ITG} \qquad (4.)$$

Demand for each variety of good i in market m may now be derived as:

$$\text{X}_{\text{ijm}} = \text{a}_{\text{ijm}} \left(\frac{\text{P}_{\text{im}}}{\text{PI}_{\text{ijm}}} \right)^{\sigma_{\text{i}}} \text{C}_{\text{im}} \qquad \text{i} \in \text{ITG} \qquad (5.)$$

Prices and demand for non traded differentiated goods are derived in the same way as for traded goods, but with no need to distinguish between producer and consumer prices since there is only domestic consumption of these goods.

The price index for differentiated intermediate goods (Q_{hm}) is industry specific by purchasing industry (h) and region (m). The industry uses all goods as inputs, weighting the aggregate price of each good by the parameter g_{ihm}. The parameter is calibrated from the use of good i as intermediate input in the production of industry h in country m.

$$Q_{hm} = \left(\sum_{\forall i \in I} g_{ihm} P_{im}^{(1-sq)} \right)^{\frac{1}{1-sq}} \qquad \forall \, h \in AG \qquad (6.)$$

where sq is the elasticity of substitution among imperfectly competitive goods used as intermediates. Observe that we use the same price index (P_{im}) for industry i here as for consumer demand; hence, we assume that intermediate demand and final demand use different varieties of good i in the same proportions. The price indices for perfectly competitive goods (the set PC) as intermediates are constructed in the same way.

$$QPC_{hm} = \left(\sum_{\forall i \in PC} g_{ihm} PPC_{i}^{(1-sq)} \right)^{\frac{1}{1-sq}} \qquad \forall \, h \in AG \qquad (7.)$$

PV_{ij} is a price aggregate for all primary factors used in the production in sector i in region j. The use of each individual factor is industry and country specific and given by the parameter β.

$$PV_{ij} = \left(\sum_{k=1}^{K} \beta_{ijk} W_{jk}^{1-s_i} \right)^{\frac{1}{1-s_i}} \qquad i \in AG \qquad (8.)$$

Finally, the marginal cost for industry i in country j is specified as a nested CES-function, with primary inputs, differentiated intermediates, and homogenous intermediates in one second-level nest each, and with S_{top} as the elasticity of substitution between the nests at the top level. Using the price indices above, the marginal cost function can we written

$$MC_{ij} = \left[BV_{ij} \left(PV_{ij} \right)^{1-S_{top_i}} + BZ_{ij} \left(Q_{ij} \right)^{1-S_{top_i}} + BZPC_{ij} \left(QPC_{ij} \right)^{1-S_{top_i}} \right]^{\frac{1}{1-S_{top_i}}} \qquad (9.)$$

From (9), using (6) – (8) and market clearing conditions for each good, we find the demand for primary factors and intermediate goods from each sector. Together with supply conditions, these form the general equilibrium system.

The use of intermediates from own as well as other industries implies the existence of inter- and intra-industry cost linkages. The presence of these linkages, together with trade costs, means that the number of firms producing in the region affects each firm's costs, i.e. they generate pecuniary externalities. Firms located in a region with a large number of suppliers of important intermediates, will be relatively more competitive.

Agglomeration forces do not directly affect the perfectly competitive sectors. These sectors, however, expand or contract as a consequence of competition for factors with the other sectors. The decreasing returns in these sectors (due to a specific factor) act to dampen the expansion of the ITG sectors.