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Structural Change, Innovation and Growth in the Context of EU Eastern Enlargement

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Summary: EU Eastern enlargement has brought trade creation, growth and shifts in trading patterns in the context of opening up, structural change, foreign direct investment and rising domestic investment. We focus on outsourcing and changes in relative prices, RCAs, and export unit values in new EU member states. From a theoretical perspective, it is argued that real exchange rate changes, shifts of RCAs, as well as product innovations/product upgrading will influence the pattern of foreign direct investment. Thus a hybrid Heckscher-Ohlin-Dunning-Schumpeter perspective is an adequate approach. From an empirical point of view, the results of a dynamic panel estimation reveals that industrial production, export unit values, FDI and wages are the most important factors driving comparative advantages in trade. However, their impact and significance depends to a great extent on whether we deal with labour intensive industries, high technology industries or total manufacturing.

Zusammenfassung: Die EU-Osterweiterung hat Handelsschaffungseffekte sowie Effekte auf Einkommen bzw. Wirtschaftswachstum und die Außenhandelsstruktur, wobei diese Änderungen sich im Kontext von außenwirtschaftlicher Öffnung, Strukturwandel, Direkinvestitionen und Investitionen inländischer Unternehmen vollziehen. Wir untersuchen die Outsourcing-Dynamik und Änderungen relativer Preise und der Exportdurchschnittserlöse bzw. RCA-Entwicklungen. Aus theoretischer Sicht wird argumentiert, dass Änderungen des realen Wechselkurses, Verschiebungen des RCAs sowie Produktinnovationen und Produkt-Upgrading die Struktur der Direktinvestitionen beeinflussen. Von daher ist ein hybrider Heckscher-Ohlin-Schumpeter-Dunning-Ansatz mit Blick auf Osteuropa sinnvoll. Aus empirischer Sicht sind die Schätzergebnisse der dynamischen Panel-Analyse wesentlich, die zeigen, dass die Industrieproduktion, die Exportdurchschnittserlöse, Direktinvestitionen und Löhne die wichtigsten Einflussfaktoren des RCAs im Außenhandel sind. Allerdings sind Einfluss bzw. Signifikanz in den einzelnen Sektoren unterschiedlich, wobei die Differenzierung nach arbeitsintensiven Industrien, Hoch-Technologie-Industrien und Gesamte Industrie wichtig ist.

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This paper partly is based on research in the EU project *Changes in Industrial Competitiveness as a Factor of Integration: Identifying Challenges of the Enlarged Single Market (5th framework)*

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1. Introduction

While the formal EU eastern enlargement started on May 1, 2005, the actual EU enlargement started with German unification in 1990 as well as with the Europe Treaties giving post-socialist transition countries particular trade concessions in 1991 and onwards. From a theoretical perspective, one should expect that enlargement goes along with trade creation and some trade diversion effects. However, the Vinerian trade integration model is rather simple and probably misleading to the extent that foreign direct investment (FDI) is not taken into account. However, FDI has been a major ingredient of EU eastern enlargement, and it has also played a major role in southern EU enlargement. In the run-up to southern enlargement, FDI inflows into Spain, Portugal and Greece increased strongly and certainly contributed not only to capital accumulation and technology transfer but also to structural change. Structural change is beneficial in economic terms if it helps to relocate resources from low productivity sectors to high productivity sectors which in turn should go along with a rise in the real wage rate. Enlargement of regional integration schemes is not only an important issue in Europe but also in Asia where ASEAN – a free trade area – is considering options for medium term enlargement and in North America where the US is more or less pushing for a southern enlargement of NAFTA. Within Latin America, the customs union, Mercosur, is likewise considering enlargement options.

It is rather unclear which theoretical concept is adequate when looking at EU eastern enlargement (or other enlargements), and the changes of industrial specialization and trading patterns. The traditional Heckscher-Ohlin-Samuelson approach suggests that countries in relatively poor accession countries – having low capital intensity initially – will specialize in labour intensive products. However, the picture is more complex than the HOS two country model – with its assumption of equal technology at home and abroad – suggests, namely for the following reasons:

- There is trade in intermediate products – often in the context of intra-company trade - which will affect the relative demand for skilled labor in country I and country II; according to FEENSTRA/HANSON (1996; 1997) the demand for labor would benefit in both countries would benefit which could impair HOS-type economic catching up through factor equalization in a model with full employment. If there is insufficient downward flexibility of wages in the unskilled labor market economic opening up will go along with rising unemployment among unskilled workers (or an expansion of the shadow economy).
- There is trade in differentiated products which gives rise to intra-industrial trade; as economic catching up will go along with a rising per capita income the scope of intntra-industrial trade will rise over time
- There are dynamic market imperfections related to Schumpeterian innovation dynamics which should be expected to be particularly strong in some EU15 countries but which also could play a role in some sectors within certain accession countries in the long run.
- Foreign direct investment (FDI) matters in the real world and also affects productivity. JAVORCIK (2004) has shown that productivity of domestic firms is

correlated with the presence of multinationals in downstream industries. As regards EU enlargement FDI occurs mainly in the form of inflows into Eastern Europe. FDI inflows change relative factor abundance over time but also bring about technology transfer. The latter does not, however, necessarily imply technological convergence. Recent empirical analysis by JUNGMITTAG (2005, 2006) suggests that even among EU15 countries there is only conditional convergence in terms of innovativeness – as covered through patents per capita – and per capita income. The very existence of FDI outflows from countries with multinational headquarters suggests that international technology differentials are provided which follow the OLI (ownership, location, internalization) model of DUNNING (1977), emphasizing that ownership-specific advantages – typically related to technology – are one necessary condition for FDI outflows.

EU eastern enlargement has witnessed not only considerable growth of trade but also high FDI inflows into various prospective accession countries. Hungary took the lead here since the government decided early on to massively involve foreign investors in the privatization process. The Czech Republic (with a delay, the Slovak Republic as well) also favours to some extent FDI inflows in the context of privatization. Other than direct trade sales of some large companies to foreign investors, however, the Czech Republic relied on investment fund privatization which brought a rather indirect involvement of FDI inflows and also raised the problem of lacking strategic investors – with associated governance problems – in many firms and sectors. Poland should expect high FDI inflows to the extent that potential market size matters, but the Polish economic policy was rather slow in opening up for FDI. Rising trade and rising FDI flows can be expected to contribute to structural change.

Economic opening up and regional integration should go along with changing relative prices which translate into structural changes and changing relative factor prices. As regards structural change in Eastern Europe, it is clear that one should expect considerable structural change in the initial transition stage and possibly also once high foreign direct investment inflows occur. This occurred early on in Hungary and the Slovak Republic, but only with a considerable delay in Poland. The various subsequent indicators show different intensities of structural change, and the intensity of change is not equal across the various indices. On theoretical grounds (see appendix), one should focus mainly on the Lilien index and the modified Lilien index (that is LI and LIM in the following table). The reason for this is that these two indicators consider the sectors' relative weights and also meet other standard requirements. As we can see in the subsequent table, the various indicators which summarize the intensity of structural change in the period from 1993 to 2001/02 point to rather strong structural change in several accession countries. Ideally, workers move out of sectors with low productivity growth towards sectors with high productivity growth, the latter often being found in sectors with high foreign direct investment inflows (FDI). FDI and investment of domestic firms will increase capital intensity and this, along with improved technology, will raise productivity. A positive gap between the growth rate of the wage rate and sectoral productivity growth will reinforce sectoral profit rates which in turn should stimulate sectoral FDI inflows. To the extent that economic catching-up and modernization is associated with high cumulated FDI inflows, one should expect that a

considerable part of trade is shaped by FDI. Intra-company trade accounts for roughly 1/3 of trade in OECD countries.

By contrast, the degree of structural change in Germany was rather low, though this might be related to rather rough sectoral decomposition. For example, if international outsourcing to Eastern Europe takes place, this can be associated with considerable structural change although at the two-digital level one would not note that less automotive parts are being produced in Germany in the early 21st century than a decade ago.

Table 1: Various Indicators Measuring Structural Change based on Production Data at the NACE 2-digit level (LI=Lilien Index; MLI= modified LI)

		NaV	EuN	SRD	IG	GRP	LI	MLI
Germany	93-02	0,1727	0,0760	4,0043	0,0434	0,0731	0,1097	0,0327
Greece	95-02	0,2181	0,0737	5,7420	0,0529	0,0912	0,1222	0,0318
Hungary	93-01	0,5903	0,1967	20,7673	0,4593	0,2248	0,4124	0,0814
Poland	93-01	0,2601	0,0656	9,5737	0,0756	0,1146	0,1427	0,0282
Portugal	95-01	0,1503	0,0409	4,5519	0,0246	0,0640	0,0820	0,0177
Slovak Rep.	93-99	0,2749	0,1119	8,7107	0,1933	0,0994	0,2766	0,0442
USA	93-01	0,0825	0,0222	2,6044	0,0097	0,0364	0,0497	0,0096

Source: OECD STAN Database, own calculations

As regards structural change this is partly related to technologies, while also partly to other factors including real exchange rate changes. There are two alternative definitions of the real exchange rate $q=P/(eP^*)$ – with * denoting a foreign variable and P and e representing the price level and the nominal exchange rate, respectively; P represents a basket of goods which is composed of tradables and nontradables. An alternative for defining the real exchange rate is $?' = P^T/(eP^{T*})$, where T stands for tradables. A rise in q or a rise in ?' can be identified with a real appreciation.

In many EU15 countries there is fear of outsourcing. As plants are relocated from Western Europe to Eastern Europe, there could be considerable job losses. If the production of intermediates is outsourced to Eastern Europe, there also seems to be a risk of job losses. The fears expressed in this context in the popular press and in the political system rarely are warranted since they typically are part of a broader adjustment process in the international division of labour. However, several publications by SINN (2005) have emphasized that in particular Germany's unemployment problems strongly reflect a silent weakness in international competitiveness:

- While Germany has been recording a positive trade balance for many years, the employment effect of exports is on the decline as the share of intermediate imports has increased over time.
- At the bottom line, there is a bazaar effect meaning that some EU15 countries, above all Germany, are selling more and more exports which translates into no significant job creation since export goods contain an ever larger share of intermediate imports, in particular from Eastern Europe and Asia.

It is noteworthy that similar fears have been expressed in North America with respect to the US services sector when popular press reports pointed to the massive outsourcing of software firms to India and other Asian countries. As BAILEY/LAWRENCE (2005) have shown, there is indeed outsourcing in the software sector, but on average rather simple software jobs have been outsourced to Asia while in the US software sector new jobs were created in the period from 1998 to 2001, with the US benefiting from the fact that there was an expansion of top software expert jobs. In the context of EU Eastern enlargement the problems are more related to the manufacturing sector.

Another important issue can be understood only in the context of models with heterogeneous labour. To the extent that economic integration and enlargement benefit skilled and unskilled labour in both the old integration club and in the accession countries in different ways, policymakers might face unpleasant side effects of integration. For example, if the skill premium rises, there could be distribution conflicts and if the relative wage of unskilled workers falls, there could be rising unemployment in this group as a rising number of workers are laid off in the context of international outsourcing and FDI outflows. Depending on the asymmetry of FDI flows, both the source and host country could be affected with respect to the skilled/unskilled labour topic. If enlargement is just a textbook exercise by which FDI flows in equal proportion to all sectors – once the economy has opened up and adjusted to the new tradables price vector – and where trade (both extra-company and intra-MNC) contributes to convergence of factor price ratios, there will be no real policy challenge. As development in Europe shows, the picture is indeed different and part of the problems are well covered by the model of FEENSTRA/HANSON (1996; 1997) who consider the role of outsourcing of intermediate products in a two country model and suggest that skilled labour in both countries would be the winner of outsourcing and FDI flows.

In the following analysis, we will look into some theoretical aspects of structural change, integration, innovation and growth. Section 2 takes a closer look at some key issues from a theoretical perspective and presents several selected indicators to describe the dynamics of structural change. Section 3 presents a statistical and empirical analysis of trade dynamics for the case of EU accession countries, and the final section looks at policy implications.

2. Theory of Structural Change, Innovation and Growth in Open Economies

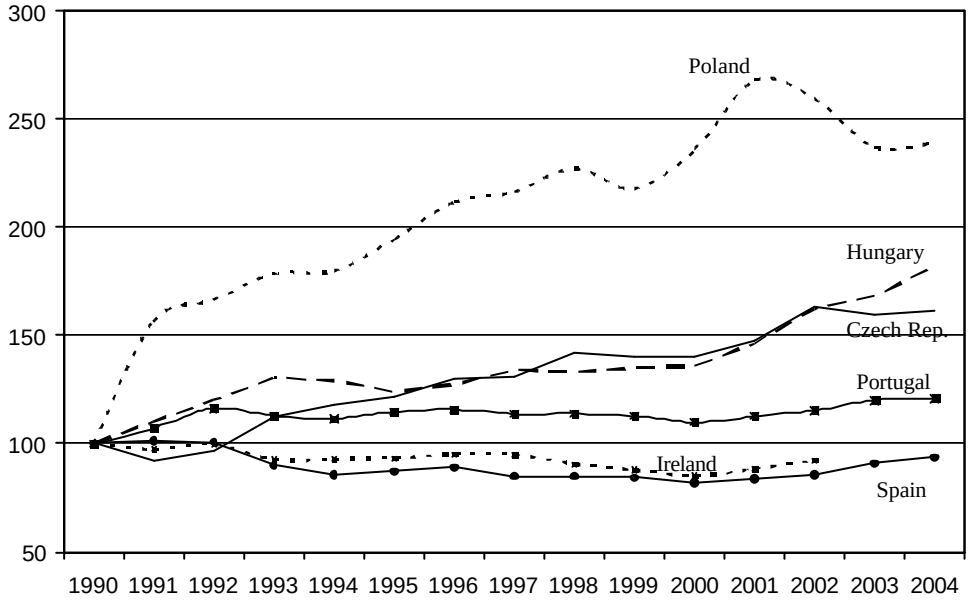
2.1 Outsourcing, Structural Change and Growth

EU eastern enlargement is creating a larger single market on the one hand, while on the other hand, the political risk premium has fallen to zero in accession countries after

effective enlargement in 2005. The latter implies that foreign direct investment inflows will increase, provided that no other influences have an offsetting effect.

A potential offsetting effect can be expected in the context of a real appreciation if we follow the approach of FROOT/STEIN (1991). They have argued that in a world of imperfect capital markets, a real appreciation will reduce FDI inflows as foreign firms – aiming at mergers or acquisitions in the potential host country with an appreciating currency – will have less equity capital, expressed in currency units of the host country. Hence a leveraged buy-out which involves taking loans for financing M&As will be more difficult than prior to the depreciation of the currency of the source country of FDI. A real appreciation should indeed be expected in EU accession countries (see figure 1) in the course of economic catching up, namely through the Balassa-Samuelson effect (BALASSA, 1965, SAMUELSON, 1952). This effect foresees a real appreciation in the context of a rising per capita income where the main drivers of the appreciation are productivity differences in the tradables and the nontradables sector, respectively (or the income elasticity of the demand for nontradables exceeds the elasticity for tradables). While there has been a real appreciation in EU accession countries, the relative FDI inflows have risen over many years in several accession countries. This development has to be explained through empirical analysis. A strong real appreciation could dampen FDI inflows (FROOTS-STEIN effect)

Figure 1: Real Appreciation (Real Effective Exchange Rate) in EU Accession and Cohesion Countries, 1990 = 100



Source: World Development Indicators 2004, IFS Statistics (IMF)

From a theoretical perspective there is a link between technological progress, foreign investment and growth:

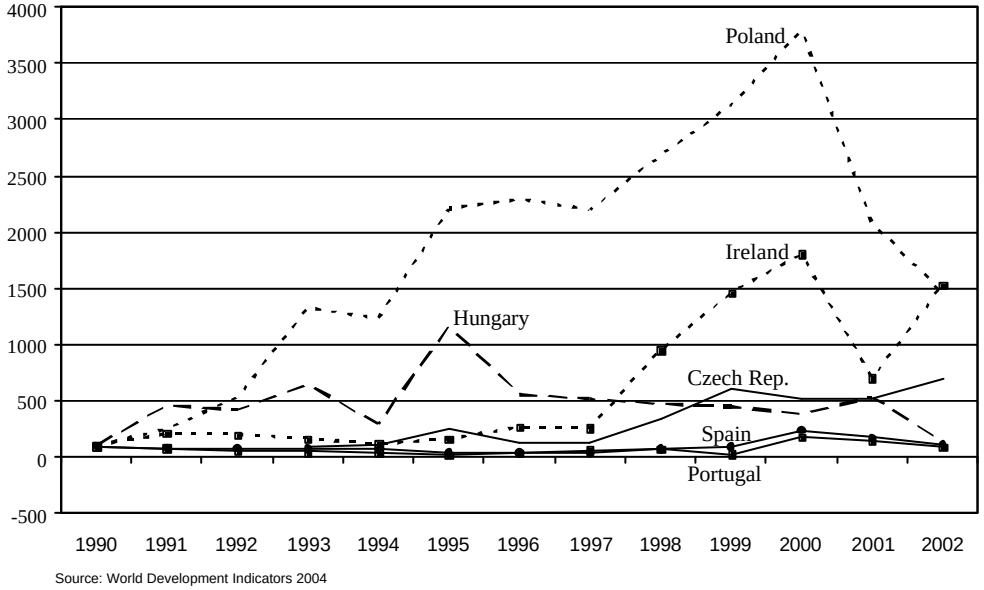
- In a medium term analysis of a Schumpeter-Mundell-Fleming model - taking into account product innovations which stimulate consumption and investment, respectively - equilibrium output is raised by innovations (WELFENS, 2005).

- In a long run model with FDI inflows (WELFENS, 2006) - making it necessary to carefully distinguish between GDP per capita and GNP per capita - one can show that there is a critical ratio of reinvested earnings of subsidiaries to the share of foreign investment in overall investment which determines whether or not the steady state capital intensity is raised through FDI; moreover, there also could be a link between cumulated FDI inflows and the rate of technological progress - the strength of this link will depend on the sectors chosen by foreign investors (high diffusion dynamics/high technology content).
- In the presence of FDI one should carefully observe that convergence in terms of GDP per capita will not imply convergence in terms of GNP per capita.

One may argue that previous studies have anticipated many of the macroeconomic dynamics in the context of EU eastern enlargement (e.g. BLACK, 1997), but the sectoral adjustment patterns and structural dynamics have been rather unclear for many years.

With respect to Eastern Europe, FDI flows from the relatively capital abundant EU15 countries to accession countries could be high. However, there have been considerable changes over time and across countries (see figure 2). Particularly, outsourcing of intermediate products is a natural element of EU eastern enlargement. Firms located in EU15 countries relocate the sourcing of intermediate products towards eastern European countries where wage costs and energy costs are lower than in Western Europe. Eastern European accession countries stand to benefit economically if both trade and FDI dynamics generate efficiency and productivity gains.

Figure 2: FDI Inflows Relative to GDP in EU Accession and Cohesion Countries, 1990 = 100



Source: World Development Indicators 2004

FDI flows from EU15 countries – as well as the US, Japan and other countries – to eastern Europe obviously are motivated through high anticipated profit rates of subsidiaries in accession countries or through increased profit rates to be obtained in world markets on the basis of cheaper intermediate products used in export goods shipped from final goods

production in EU15 to the US and other non-EU countries. We thus expect global traditional RCAs of selected EU15 countries in the US to positively depend on sectors in which EU15 has a negative RCA vis-à-vis EU accession countries; the respective sectors must be net importers of intermediate products from accession countries so that "vertical trade" in Europe ultimately reinforce EU15 competitiveness in the global market.

Triangular Trade

If a triangular competitiveness perspective is important, one should expect that firms from EU15 countries particularly improve RCAs in profitable markets in the US and also should fetch relatively higher prices in the world market (see appendix for a figure on a triangular perspective on trade, structural change and efficiency gains). Triangular trade dynamics concern one form of a potential link between trade with intermediate imports and the revealed comparative advantage of the respective sector.

Relative export unit values (with the US export unit values being the benchmark) should increase. Taking Germany as one example we can see that this, however, has not been the case. On the contrary, Germany's relative export unit value in industry deteriorated in the 1990s. It is remarkable that the (output) weighted average export unit value for industrial products remained flat in the 1990s while that of the US strongly increased. Hence, the relative German export unit value has fallen considerably.

2.2 Balassa-Samuelson Effects, Bazaar Effects, RCA-Dynamics and Export Unit Value Position

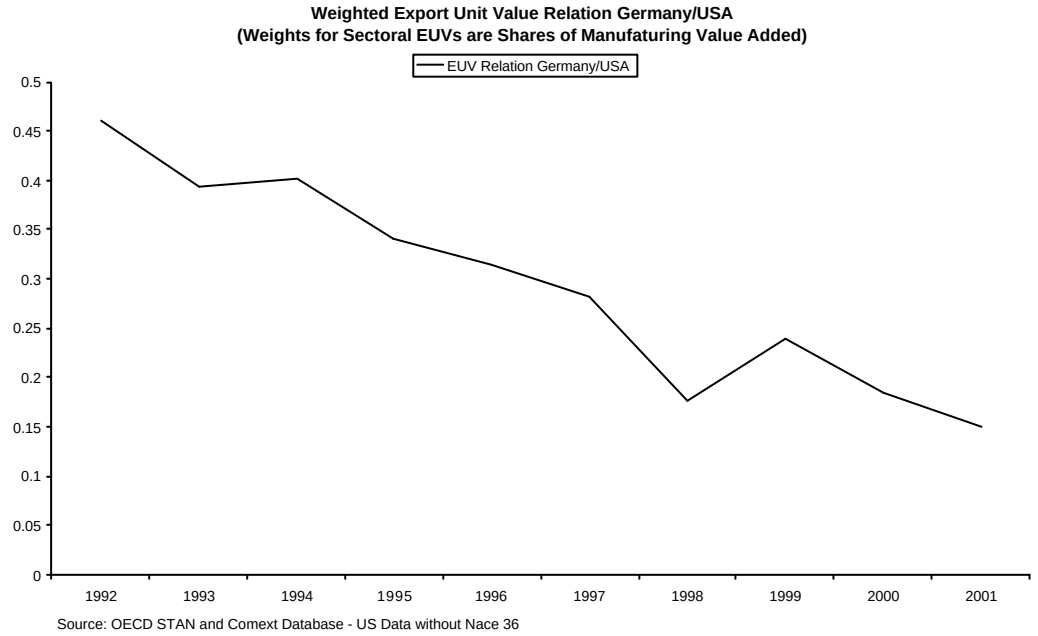
What should we expect in accession countries in the course of EU enlargement? In eastern European accession countries, economic catching-up should go along with several major changes:

- a rise of capital intensity and hence of per capita income which will affect aggregate demand and the domestic structure of demand with demand for differentiated products increasing
- product upgrading and moving up the technology ladder so that product innovations and process innovations will occur, the latter translating into improved RCAs in sectors which are knowledge-intensive or technology-intensive; recent analysis has shown that specialization in high-technology sectors indeed contributes to economic catching-up and growth (JUNGMITTAG, 2005)
- as regards FDI inflows, there is a historical gap which basically implies one-off-catching up in terms of inflows followed later by normal FDI inflows.

Within a neoclassical growth perspective, a rise in capital intensity – requiring a critically high savings rate – will lead to a rise in the level of the growth path while technological catching up in the sense of process innovations increases the long run growth rate itself. In a modified modelling perspective, the capital accumulation process may include FDI inflows, and indeed one can show that under certain conditions, such inflows bring not

only a faster transition to the steady state (BARRO et al. 1995) but also a higher level of the growth path (WELFENS, 2006). Moreover, if the presence of foreign investors should stimulate the rate of process innovations there also would be a rise in the permanent growth rate. The latter issue is partly related to the topic of structural change, in particular whether or not FDI inflows goes – at least to some extent – towards technology intensive sectors or to sectors in which process innovations abroad (read in the source country of FDI) are relatively high. From this perspective, it is useful to distinguish production patterns and trade specialization in a multi-sector perspective and to rely on an analytical break-down of sectors (e.g., labour intensive, resource intensive, technology intensive). If we can adequately describe and explain the dynamics of EU eastern enlargement in terms of trade specialization in the respective countries, trade pattern convergence across countries and FDI inflow dynamics over time, we may well have an innovative approach which can be applied to many regions in the world. Moreover, we are interested in a broader international perspective, since we want to shed light on the issue whether EU15 outsourcing to Eastern Europe reinforces the competitiveness of EU15 countries in world markets and the US. Thus, one could take a look at a triangular trade perspective and indeed also at the eastern European dynamics of imports and exports, raising the issue as to which extent imports contribute to improving export competitiveness as measured by (modified) revealed comparative advantage. Besides RCAs, we consider medium term export unit value development to better understand trade specialization patterns.

Figure 3: **Relative Export Unit Value of German Industry (Germany relative to US)**



EU15 countries might strongly benefit from outsourcing to Eastern Europe, namely by getting more and cheaper intermediate inputs which could improve competitiveness on the global market. International outsourcing would also free up skilled labour in Germany, France, Italy and elsewhere, so that product upgrading could be achieved in Western European countries. Such improvements should particularly translate to a rising relative export-unit value. Taking a look at the case of Germany, however, one finds that the relative export unit value has declined over more than a decade (see figure 3).

According to SINN (2005), the Bazaar-Effect states that the share of domestic value added in total output of an industry *i* falls to the benefit of foreign countries. This means that a declining part of the final product's value added is generated domestically. There is a tendency toward outsourcing and offshoring, while the first implies the purchase of intermediate products from external firms and the latter indicates that a (mostly labor intensive) part of the value added production chain is relocated to a foreign country. In the extreme case, the economy would merely buy and sell products, just like on a bazaar. The question of outsourcing and offshoring is especially brigand within a EU25 perspective, since many western European companies offshore production to Eastern Europe and also buy Eastern European intermediate inputs.

This can be called the "gross" bazaar effect, which controls for the intermediate imports in production and thus in exports in country I. Nevertheless, one should also consider that imports of country I from country II also contain to some extent exported intermediates from country I to country II. Controlling for this would reduce the "gross" bazaar effect, which we call the "net-bazaar effect". Table 2 provides an overview of different types of bazaar effects.

Table 2: Types of Bazaar Effects in the Context with Trade in Intermediate Products

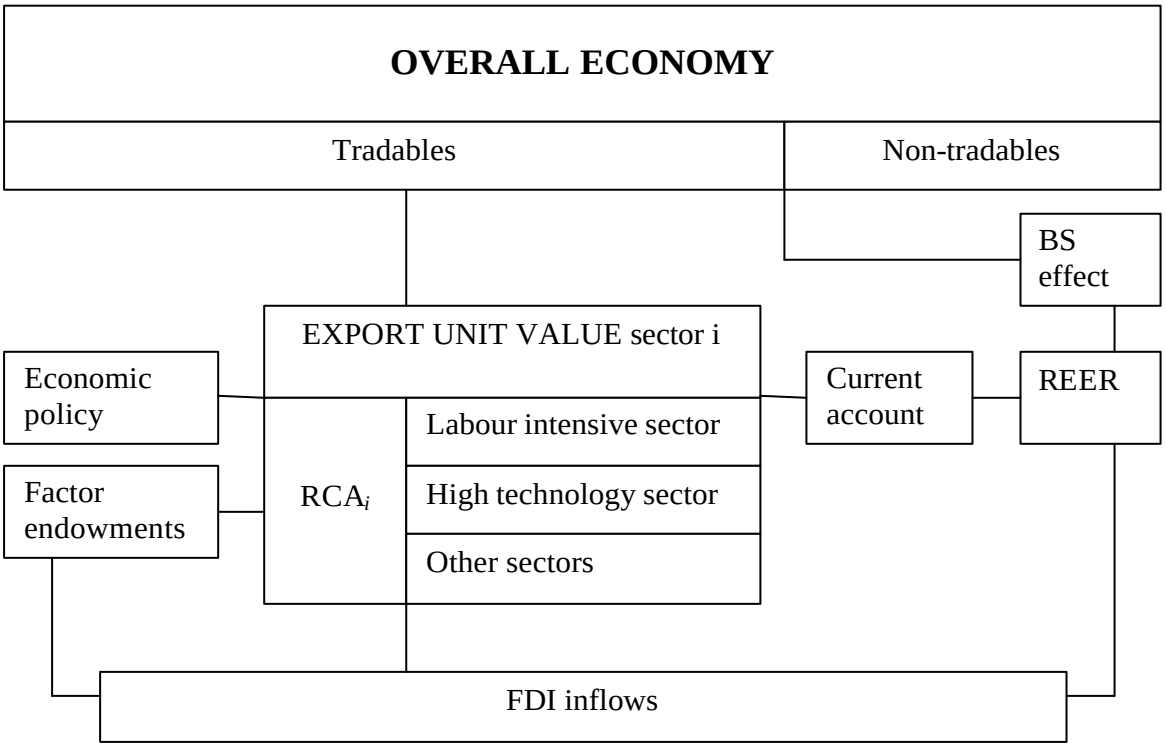
Exports in Sector i (Final Product of Country I)		Imports from Country II	Exports of Final Product j of Country II		
A: Value-added in sector i			A* Value-added in sector j		
B: Domestic intermediates supplied to i	B' Foreign input in domestic input	B' Country I exports in country II exports (outside C)	B* Domestic inputs (country II)	B'* Foreign input in domestic input	
C: Foreign intermediates supplied to i		C' Country I exports in country I imports into sector i	C*: Foreign inputs		C' Country II exports in country II imports into sector j
Gross Bazaar Effect ß= C/A	Effective Gross Bazaar Effect ß'= [C+(1-b)B]/A	Effective Net Bazaar Effect on Export Side ß"=: [C(1-b')+ (1-c')B]/A	Gross Bazaar Effect ß*	Effective Gross Bazaar Effect ß'*	Effective Net Bazaar Effect on Export Side ß"*

(b' is share country II imports in domestic intermediates; c' is the share of country I exports in directly imported foreign intermediate products; total effective net bazaar effects is composed of ß" and ß"*)

If we assume for simplicity that B=C we have an effective net bazaar effect on the export side which is equal to C(1-b')(1-c')/A. As a numeric example, assume that C/A=1/3 and that b' and c' = 0.2. The effective net bazaar effect is then 38% lower than the gross bazaar effect.

Only part of international outsourcing goes through captive offshoring, namely outsourcing to foreign subsidiaries. In accession countries FDI inflows have played a considerable role in both the transformation process and in the subsequent regional integration dynamics. The interplay of domestic policy shifts – including systemic transformation – and external adjustment impulses (in particular FDI inflows) can be expected to affect the structure of production and the trading patterns (see figure 4). A priori it is unclear which sectors will particularly benefit from FDI inflows whose sectoral pattern will be influenced by specific policy incentives, factor endowment and expected profitability. The latter is related to cost structures on the one hand and export revenue on the other, with export unit values playing a potential role. If a major export sector i (or a group of sectors) expands in volume terms while raising the export unit value, this will improve the current account, which together with medium term Balassa-Samuelson effects will contribute to a real appreciation. The latter in turn will affect both FDI inflows and the trade structure. With quality upgrading in exports, the sensitivity of exports to changes of the real effective exchange rate (REER) will reduce. Quality upgrading and product innovations should therefore become increasingly important for sustained export and output growth.

Figure 4: Trade, FDI, Exchange Rate and Export Unit Value: Main Interplays in the Overall Economy



Let us consider a model with two sectors i and j which both are tradable and in which inflows of foreign direct investment occur in both sectors. A simple model with sector i – assumed to labor intensive – and a technology intensive sector j may be stated as follows: The RCA in the labor intensive sector positively depends on the sectoral capital stock, including the stock of inward FDI in this sector (K^{**}_i) which reflects here a supply side perspective: The higher the sectoral inward FDI stock the better is the access to foreign technology and to markets abroad so that modified RCA will benefit from the presence of foreign investors. At the same time relative sectoral unit labor costs ? can be expected to negatively affect the sectoral RCA since a relative costs disadvantage in relative unit labor costs should translate into a poorer international market position. The labor intensive production could, however, face a relative decline in the long run as the relatively technology and capital intensive sector j is expanding: The overall capital intensity will determine the relative international wage position so that initial dominance of the labor-intensive sector i not only will give way over time to a rising role of sector j in terms of output and exports. Rather, the key bargaining sector which initially is sector i will be sector j in the long run. For sector i we can state (with a positive parameter a_1 and a negative parameter a_2) the following equation.

(1) $RCA_i = a_1 K_i^{**} + a_2 ?_i$

For simplicity output in sector i may be assumed to be $Y_i = K_i^{**a} L_i^{1-a}$ (labor input L could be exogenous in a simple approach, but endogenous labor input also can be considered). Assuming a wage-elastic labor supply it is clear that in the case of an exogenous export share of country II implicitly the RCA_i is reflecting shifts in the position of the supply curve in sector i and the relative level of domestic demand for i-goods, respectively: The economy considered is assumed to record exports in sector i which correspond to the domestic excess supply in sector i. This reflects the assumption of a small open economy producing a homogenous good i. However, as regards the second sector j we will assume that the export unit value is not given as j-output is a heterogeneous product.

As regards the technology-intensive sector j we may assume for simplicity that all output is on the basis of (cumulated) FDI inflows plus some initial capital stock which has been sold to foreign investors in the context of privatization in the initial period. FDI inflows will react positively to the sectoral RCA and the export unit value: both variables effectively are a proxy for profit opportunities, but also to improving opportunities for imports of technology-intensive imports: the higher the opportunities for using foreign intermediate imports the more attractive looks the sector for foreign investors. The import perspective could be covered by an import RCA variable: actually modified RCA for imports of intermediate products (JRCA) which is the share of intermediate imports of country I in the integrated market area relative to the share of country II – the FDI source country - in that area (we thus have a three country model). The easier firms can get imported intermediate products the higher will FDI in the respective sector be. Furthermore taking into account q* as a relevant variable suggested by FROOT-STEIN we get the following hypothesis for sectoral FDI inflows:

(2) $FDI_j^{**} = b_1 \ln RCA_j + b_2 \ln EUV_j + b_3 q^* + b_4 JRCA_j$

A straightforward analytical solution can be obtained under a simple set of assumptions (and ignoring for the sake of simplicity q*): If we assume that $b_1=b_2$ and that the ln of the "price weighted RCA_j", namely ln[EUV RCA] =b'K_j**, and that b_4 effectively is reflecting the stock of FDI in sector j (K_j**) we can write (with positive parameters b, b', b"):

(2') $dK_j**/dt = b'K_j** + b\ JRCA_j\ K_j**^{b"}$

Assuming that 0<b"<1 we get – denoting the Euler number as e' - for the simple case of a constant JRCA a non-stationary solution for the inward FDI stock K_j**:

(2") $K_j** = [C_o e'^{\ b'(1-b")t} + (b/b')JRCA_j]^{\ 1/(1-b")}$

The parameter C_o is determined from the initial conditions. Cumulated foreign direct investment in sector i is now positively related to sectoral import specialization as measured by JRCA. Thus we have a rather simple long run equation for asset-exploiting investment. In an empirical context one would want to consider different types of sectors, e.g. labor-intensive sectors or technology-intensive sectors.

A potential extension would be to consider also the role of JRCAj where j is a technologically adjacent sector with positive spillover effects. Moreover, one may want to consider a slightly modified version where the stock of inward FDI in sector j has a positive effect on the export unit value – that is product upgrading is supported by the stock of inward capital in sector j - which then yields a slightly different result; but there is no qualitative change in the analysis.

If output (with ß denoting the output elasticity of capital) in sector j is determined by the equation $Y_j = K_j**^{ß}$ and if the export price of the labor-intensive good is exogenous (indicated by parameter h) it is clear that in a situation without portfolio capital inflows:

- that the share of output of sector j will grow relatively to sector i, namely as there is continuous capital accumulation through FDI inflows in sector j;
- that long run balance of payments equilibrium in can be written (with K_{j**} being a proxy for net exports in sector j) in a rather compact way as $hRCA_i + a'K_j** = a"\ JRCA_j$ (a" is a parameter indicating the import price of intermediate j products, a' is a parameter which indicates the link between production of j-goods and nominal revenue generated in sector j). On the left-hand side we implicitly have export revenues, the right-hand side indicates the import bill to be paid for the import of intermediate products in sector j. Assuming h= a" we simply can express balance of payments equilibrium as $a' K_j** = a"(JRCA_j - RCA_i)$. In an economy with a growing FDI capital stock in sector j there will be a balance of payments deficit if - assuming that initially $JRCA_j = RCA_i$ - the import RCA for imported intermediate products in sector j rises faster than the export RCA in sector i. If at some critical value for K_j** the RCA in sector i grows relatively faster than $JRCA_j$ this implies an improvement in the current account and ultimately a current account surplus. A declining $JRCA_j$ will occur if an international insourcing process is occurring so

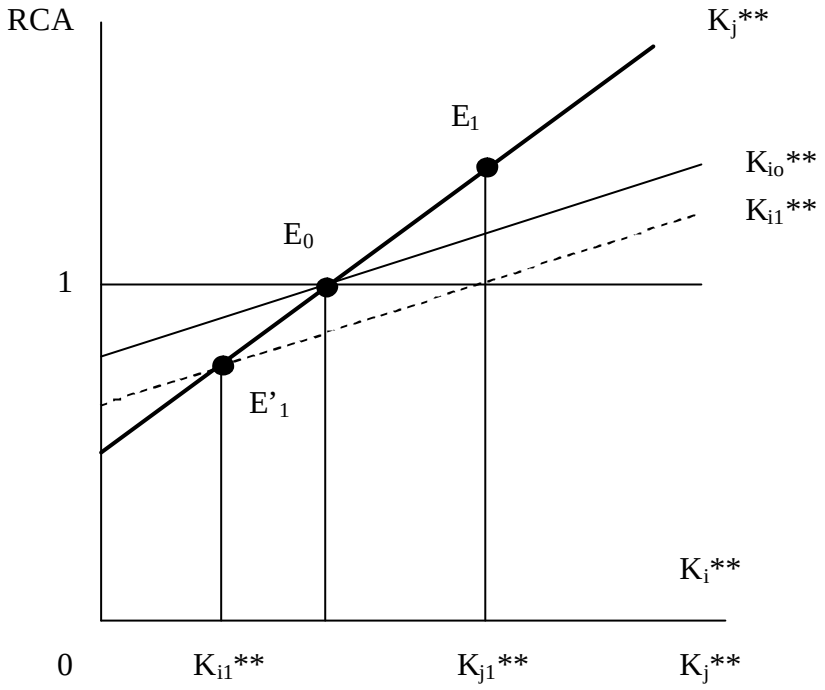
that a higher share of value-added in the sector is produced in the country considered. The economic catching-up process of the US and Germany in the late 19th century (TILLY, 1995) can be characterized by this mechanism as can be similar dynamics in Korea and Japan in the 1980s and in Ireland in the 1990s - and a similar process may be expected for some EU accession countries in the long run.

We can conveniently display equations (1) and (2") as a quasi-equilibrium for both sectors, namely as implicit equilibrium conditions for foreign investment in both sectors. Both equilibrium lines have a positive slope in RCA-K** space. In the subsequent diagram the line KK^{**}_i is the equilibrium line for the i-sector. The initial intersection point is E_0 which corresponds to a balance of payments equilibrium in which net imports are financed by the sum of foreign direct investment inflows in both sectors: In point E where the i-equilibrium line intersects with the quasi-equilibrium line for the j-sector (the line KK^{**}_j) so that we get the equilibrium figures for FDI capital stocks in both sectors. Note that the scale for K^{**}_i and K^{**}_j on the horizontal axis are different. As regards the j-line the RCA refers to imports (read JRCA) while with respect to the K^{**}_i.line the RCA refers to exports of i-goods. Over time the economy moves along the equilibrium line for sector j where a rise of the FDI stock in sector j corresponds to moving forward on the time axis.

One may assume that the relative wage ratio $?_i$ in sector i (relative to the sectoral wage abroad) will rise over time, namely as a consequence of capital accumulation and FDI inflows, respectively; unit labor costs indeed could rise in both sectors. A rise of $?_i$ will cause a downward shift of the equilibrium line of the i-sector; by contrast the quasi-equilibrium line for the j-sector is invariant. There will be a new optimal FDI inward capital stock in the i-sector which is smaller than initially; the FDI inward stock in the j-sector will, however, increase continuously (note as a potentially useful modification that one may want to scale both the FDI inward capital stock for the i sector and the j-sector with overall output Y which effectively stands for the overall capital stock K(t) while overall labor input L may be assumed to be constant in time; K is the sum of inward FDI stocks in both sectors plus exogenous domestic capital accumulation in both sectors). It is crucial to note that in point E_1 the variable $JRCA_j$ determines K^{**}_j while in point E'_1 the variable K^{**}_i determines RCA_i.

Moreover part of the intersectoral adjustment process will consist of cumulated FDI inflows in sector i being shifted to sector j. Finally, if the j-sector is innovation intensive – matching a strong technological progress rate in sector j abroad - and generates positive technology spillovers for sector i this also will amount to a rise of $?_i$. One also might want to additionally consider changes in corporate governance in both sectors. Trade intensity should be positively correlated with governance.

Figure 5: RCAs and Foreign Direct Investment Capital Stocks in a Two-Sector Model



The basic empirics for the RCA of sectors and the FDI inflows in technology intensive sectors - and other sectors - for Eastern Europe will be analyzed subsequently.

3. Dynamics of Structural Change and Trade in the Enlarged EU

One may anticipate accelerated structural change in Eastern European accession countries since the middle of the 1990s, as the impulses from system transformation and from EU membership have stimulated a dynamic adjustment process including a shift in specializations in particular countries. These impulses included trade liberalization and rising FDI inflows from EU countries. This process should be accompanied by shifts in revealed comparative advantage. Moreover, it is widely accepted that the regional trade orientation of eastern European countries shifted strongly towards the EU in the 1990s. It is therefore clear that major changes in sectoral specialization in Western Europe will reflect major changes in new EU member states.

This leads to an increasing interest in analysing foreign trade patterns, in particular export specialization, within the EU market, to which the following empirical analysis contributes. It aims at analysing the determinants of export specialization patterns of the new EU member states. First, an overview of the trade specialization patterns in the new EU member states is given. Then we carry out a dynamic panel estimation in order to find out the determinants of these trade specialization patterns.

3.1 Basic Findings for Selected New EU Member Countries

The subsequent analysis makes use of a Revealed Comparative Advantage (RCA) Index (Balassa 1965). The focus is on trade with the EU15 countries. Data on exports to the EU15 in the manufacturing sector are used at a 2-digit-level.[1] Data are classified according to NACE rev.1.1. The list of product groups can be found in the appendix.

There is a wide range of modifications of the original RCA commonly used in the economic literature.[2] The specialization indicator used here is a modification of the classical RCA index. This modification is often referred to as relative export shares. It reveals the relative comparative advantage of an industry within a country by comparing the share of that particular industry in the country's total exports to the share of that industry in total world exports at a certain point in time. Since we are interested in the question of whether a country has a comparative advantage compared to the EU15, we take the respective country's exports to the EU15 instead of total exports worldwide and intra-EU15 exports instead of worldwide exports. The modified RCA-Balassa index for a specific industry k in country i is defined as follows:

$$RCA_{ik}^{modified} = \frac{x_{ik} / \sum_{k=1}^{n} x_{ik}}{x_{jk} / \sum_{k=1}^{n} x_{jk}} \tag{2}$$

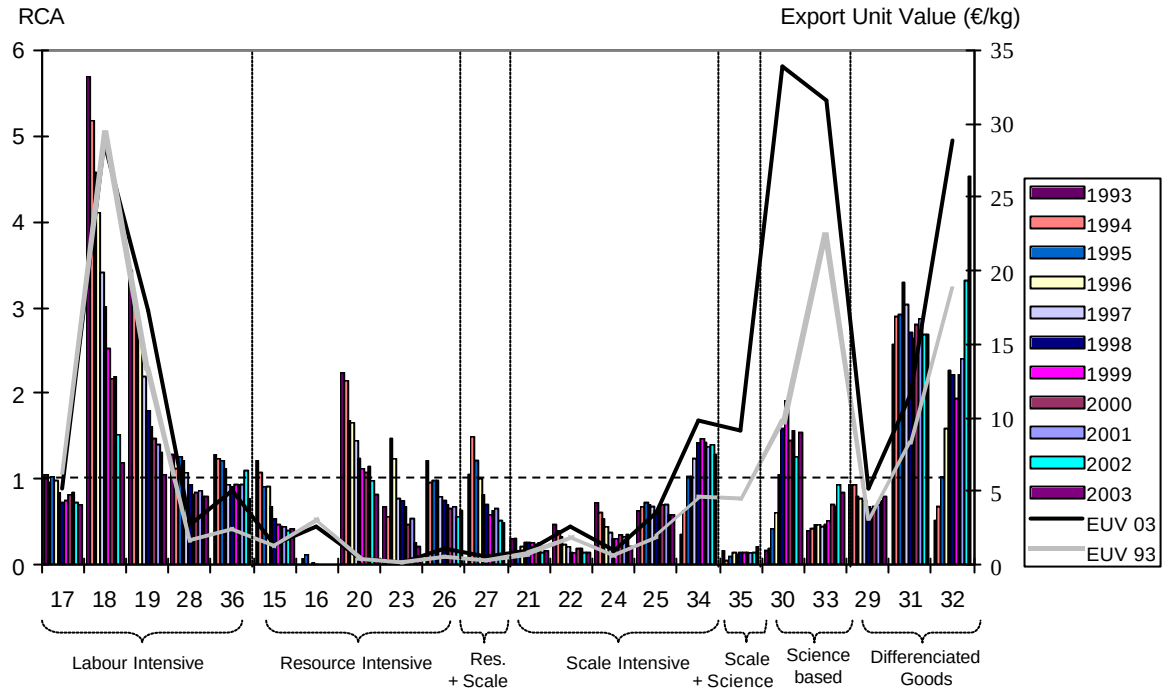
where j stands for the EU15. The modified RCA-Balassa has a minimum value of 0 and a maximum value of infinity. If $RCA_{ik} > 1$, country i has a comparative advantage in that industry k as compared to the EU15. If $RCA_{ik} < 1$, there is a comparative disadvantage of country i in industry k.

Figures 6-8 show the modified RCA indices for three of the new Eastern European EU countries. The horizontal dotted line at 1 (on the left hand scale) indicates the boarder between comparative advantage and disadvantage. The vertical dotted lines indicate the border between the different product categories according to the OECD taxonomy (OECD 1987). At the same time, one should take a closer look at export unit values (EUV), whose development over time indicates the ability of a country to fetch adequate – if possible higher – prices in world markets. The black line on the right hand side scale shows the export unit values – expressed in €/kg – of the respective product group in the year 2003, the shaded line the export unit values for 1993.

[1] Data are extracted from the COMEX database of the European Commission.

[2] The original RCA shows the export/import share of an industry as compared to the total export/import share of an economy.

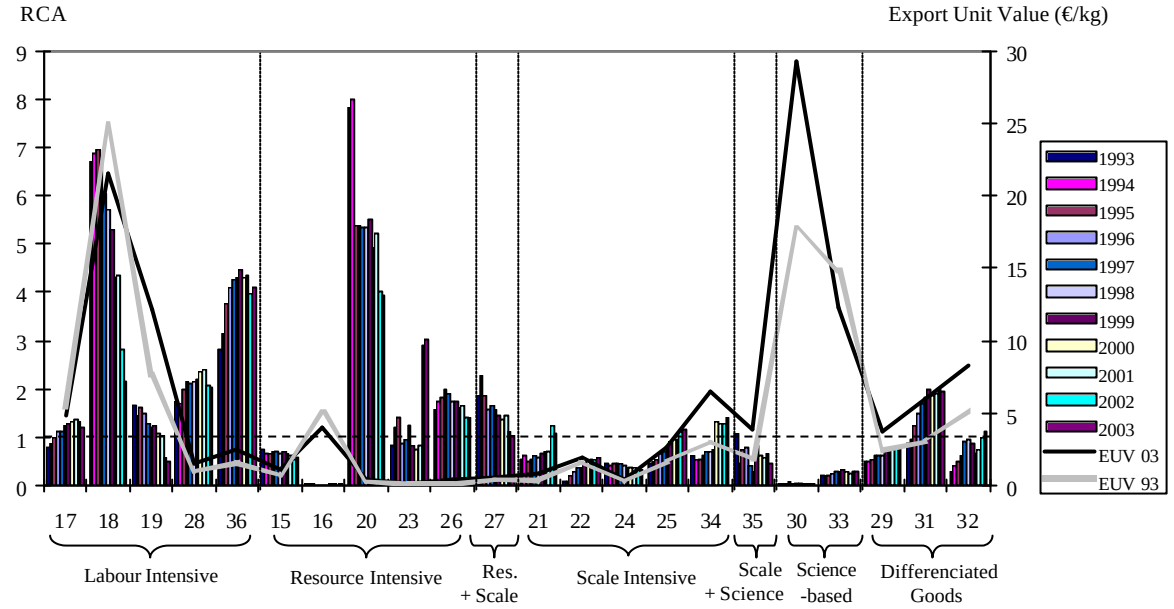
Figure 6: Hungary – RCA of exports 1993-2003 and Export Unit Values 1993 and 2003



Source: Borbély, 2006

Figure 6 clearly reveals that some very high and some very low technology intensive products play the most important role in Hungary's EU exports. RCAs exceed unity in two labour intensive product groups, wearing apparel (18) and leather products (19), with export unit values of 30 and 17 Euro/kg, respectively. However, RCAs declined throughout the 1990s in these and in other labour and resource intensive – low and medium technology – product groups. On the contrary, RCAs are rising and exceed unity in the differentiated goods' sectors, especially in electrical machinery and apparatus (31) and in radio, television and communication equipment (32) industries. Here, export unit values rose between 1993 and 2003, reaching roughly 10 and 30 Euro/kg, respectively, in the year 2003. In most of the other product groups, especially in resource and scale intensive industries which mostly belong to medium technologies, both RCAs and export unit values are rather low. One exception might be the manufacturing of motor vehicles (34), for which Hungary had a comparative advantage throughout the second half of the 1990s with steadily rising RCAs and an export unit value of 10 Euro/kg in the year 2003. Furthermore, there is a comparative advantage in one science-based product group, namely office machinery and computers (30), where export unit values rose considerably between 1993 and 2003.

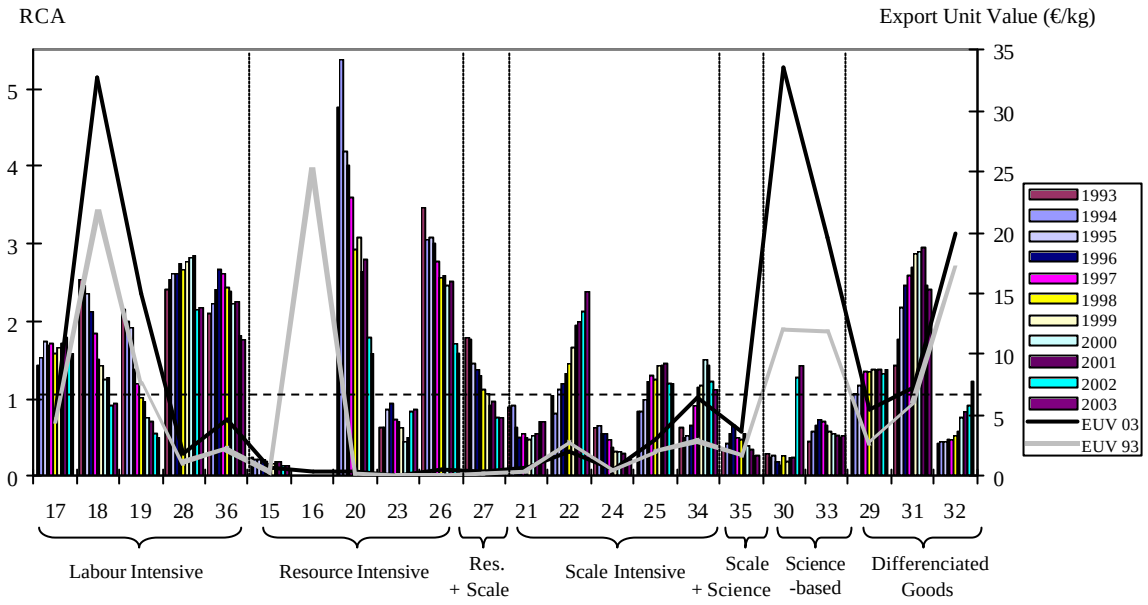
Figure 7: Poland – RCA of exports 1993-2003 and Export Unit Values 1993 and 2003



Source: Borbély, 2006

Figure 7 shows the respective picture for Poland. Most industries with a relative comparative advantage compared to the EU15 belong to the labour and resource intensive sectors, meaning they are positioned rather low on the technology ladder. The highest RCAs are found in wearing apparel (18), furniture (36) and wood and its products (20). Especially for the latter two, however, export unit values are extremely low, clearly below 5 €/ kg. The value of one kg of exports in wearing apparel is considerably higher at roughly 20 Euro. In most of the scale intensive, science-based and differentiated goods' sectors, Poland still has a comparative disadvantage. However, many RCAs in these sectors seem to show a tendency toward an increase. Thus, rubber and plastic products (25), motor vehicles (34) and especially electrical machinery and apparatus (31) have reached levels of RCA exceeding unity by the year 2003. Among these categories, export unit values are the highest in the science-based sector with up to 30 €/kg in the year 2003. Nevertheless, Poland's comparative disadvantage is very distinct, especially in the science-based sector.

Figure 8: Czech Republic – RCA of exports 1993-2003 and Export Unit Values 1993 and 2003



Source: Borbély, 2006

A similar tendency is visible in the Czech Republic (figure 8) as is seen in Hungary. Many of the RCAs in the lower technology sectors have been declining and many in the higher technology intensive sectors have been rising in the course of the time period considered in the analysis. At the same time, rather strong comparative advantages can be found all along the technology ladder. Export unit values are similar to the other two countries analysed so far, especially to Poland. Comparative advantages can be found mainly in the labour intensive, in the resource intensive and also in the differentiated goods' sectors. Within the labour intensive category, wearing apparel (18) with an export unit value of more than 30 €/kg is losing comparative advantage, as is leather products (19) which have an export unit value of less than 15 Euro per kg. There was a very sharp decline of RCAs as well as of export unit values within the resource intensive category, where export unit values were extremely low in 2003. Similar to the other accession countries, the Czech Republic also has a relative comparative disadvantage in science-based product groups, although export unit values grew considerably from 12 Euro/kg in 1993 to almost 35 Euro per kg in 2003.[3]

[3] For a more detailed and extended analysis including a convergence analysis see Borbély (2006). Moreover, see appendix 3 for some more selected countries.

3.2 Determinants of Trade Specialization in the New EU Member States: Empirical Findings in a Dynamic Panel Setting

Several factors play a major role in explaining export specialization patterns. Mainly, they depend on the production structure of an economy, which again is dependent on factor endowments (e.g., labour and capital) and factor prices according to the Traditional Trade Theory. Other theoretical models, such as the New Trade Theory models stress the importance of distance and explain why intra-industry trade exists. Furthermore interregional demand differences and trade costs are emphasized by the New Economic Geography. In addition, other theories show the major role played by investments, especially foreign direct investments, innovation and technological development. In this section, we will analyze the impact of different variables on the sectoral modified RCAs, as shown in detail in the previous sections. Unfortunately, such a sectoral analysis is strongly restricted by data unavailability for Eastern European countries. Even if data is available from different sources, one has to control for unmatched data. To minimize such measurement and incomparability problems, it is advisable to use not too many different data sources.

Underlying Data

The choice of the exogenous variables for explaining the modified RCAs is unfortunately strongly influenced by the restrictions that the data availability imposes. Since the main idea of this analysis is to stick to industry levels, some severe data availability restrictions appear.

The endogenous variable is the modified RCAs as explained previously, which can also be called the relative export share of industries on the EU15 market (data source: European Commission, 2004). The choice of the exogenous variables for explaining the modified RCAs is unfortunately strongly influenced by the restrictions that the data availability imposes.

Sectoral industrial production as a % of GDP indicated by the size of a sector is expected to be one of the most robust explanatory variables. It is reasonable to assume that an increase in the sectoral industrial production will lead to a rise in the relative export position. Hence the expected value of the coefficient is positive. In this analysis, we use nominal industrial production for 22 NACE 2-digit level manufacturing industries in Eastern European EU countries, provided from the WIIW Industrial Database Eastern Europe (2004) and nominal GDP from Eurostat.

Wage differentials are one of the main driving forces for the European division of labour, thus enhancing export specialization patterns in Eastern European countries. Especially for labour intensive industries, high wages countries from Western Europe see the possibilities to adjust. They can either relocate the labour intensive part of the production to a lower wage country (e.g., in Eastern Europe), which is called offshoring and which mechanisms would be included in the FDI variable, or such a company can buy parts or intermediate products from a lower wage country and import it. This mechanism is called outsourcing, and it enhances the exports of the respective lower wage country (e.g.,

in Eastern Europe). From a European perspective, the greater the wage differential between West and East, the greater the incentives for outsourcing and the stronger the enhancing effect for Eastern European exports towards Western Europe. In this analysis, we use relative wages to capture wage differentials. More precisely we use average nominal monthly wages in Euro per employee for Eastern European countries, provided by the WIIW (2004) and relate it to average nominal monthly wages in Euro in the aggregate of 12 Euroland countries. The wages for the individual Euroland countries are published in the OECD Stan Industrial Database (2005), whereas the aggregate of the 12 countries is calculated by the author using nominal GDP weights from the year 2000. By definition, a rise in the Eastern European country's wage lowers the wage differential; more precisely, it raises our variable, the relative wage share, which hampers relative export shares of Eastern European countries. Thus, we expect the value of this variable to be negative.

Furthermore in the basic specification of our regression, we expect the impact of export unit values (source: European Commission, 2004) to appear as a positive value. Export unit values are measured – as in the beginning of this chapter - as the value measured in Euro of one unit exports; thus, we use Euro/kg. If successful at raising the value of one unit of exports, for most products this tends to be a sign for an increase in quality. For some products, however, such as high quality clothing as a down jacket, a decline in the weight implies a rise in quality. Also for products with a very fast technological development, such as the computer industry, there is a general tendency toward lowering prices while increasing quality at the same time. Although these effects are not captured by the export unit value variable, for the total of 22 industries we expect to see a positive correlation between EUV and modified RCAs.

Last but not least imports are expected to have a significant impact on export shares as measured by the modified RCA. Due to knowledge and technology spillover, export shares are expected to increase when import shares rise, especially in industries with a rather high share of intermediate imports. Imports as an explanatory variable are measured according to the endogenous variable, namely as the share of sectoral imports on total imports in a country c relative to the same share in intra-EU 15 trade.

So far we have introduced all the variables that are used in the baseline specification of the panel setting. As indicated before, our panel is comprised of 8 countries c, 22 industries j, and 11 years t, from 1993 to 2003. Since data on industrial production and wages is not available for the Czech Republic and Slovakia at the two digit level, these two countries drop out of the panel, which gives the number of potential maximum observations of 6*22*11=1452. Besides data problems, the choice of estimation method is also challenging and will be therefore dealt with in the next part.

Methodology

Since we are interested in explaining the dynamics of specialization patterns, one should include the lagged endogenous variable as an explanatory variable in the regression. Such a dynamic panel data model can be estimated with a Least Square Dummy Variables (LSDV) estimator, which is however only consistent if the time dimension t is very large. Since this is not the case for our data set, another alternative is the use of a Generalized

Method of Moments (GMM) estimation, which is advisable for smaller *t* dimensions, although it is also biased in a dynamic panel model setting.

We will use the so called “system GMM” estimator developed by Blundell and Bond (1998), which effectively combines two related dynamic panel data models. The first is the Arellano-Bond (1991) estimator, which is often called the "difference GMM". While first differencing the equation, the individual fixed effects are removed, thereby eliminating a potential source of omitted variable bias in the estimation. At the same time, predetermined variables become endogenous. The authors develop a GMM estimator, which treats the model as a system of equations, one for each time period. The only difference between the equations is the use of their set of instruments. The endogenous and predetermined variables in first differences are instrumented with lags in their own levels. However, the literature reveals that lagged levels are often bad instruments for first differences. Exogenous variables enter the instrument matrix in first differences with one column per instrument.

Here, the second model, which is extended version of a model by Arellano and Bover (1995) further developed by Blundell and Bond (1998), comes into play and is called the "system GMM" estimator. Arellano and Bover show that efficiency of the estimator can be raised by adding the original equations in levels to the system, thus having additional moment conditions. In these equations in levels, predetermined and endogenous variables are instrumented with lags of their own first differences. Bludell and Bond develop the necessary assumptions for this model augmentation and test it with Monte Carlo simulations.

Furthermore, the "system GMM" is available as a one- and a two-step estimator. The two-step estimator is asymptotically more efficient, but at the same time its standard errors are often downward biased (Arellano and Bond, 1991, Blundell and Bond, 1998). However, this is controlled for in the used two-step "system GMM" estimation. A finite-sample correction is available for the two-step covariance matrix, as described by Windmeijer (2000), which dramatically improves the accuracy as shown in Monte Carlo simulations. Therefore the two-step estimator used here is more efficient than the one-step estimator in the "system GMM".

Thus the estimated model has the following form:

$$\Delta y_{i,t} = a\Delta y_{i,t-1} + b\Delta X_{i,t} + \Delta e_{i,t}$$

where y stands for the RCAs, X is the vector of the above-mentioned exogenous variables, and there is finally the error term. *i* indicates the cross-section dimension, which is a combination of country *c*, and industry *j*.

Estimation Results

The basic specification of the model includes those variables which have been explained in greater detail above. Dummy variables for the different groups of industries as described by the OECD - such as labour, resource, scale intensive, science based and differentiated

goods - are also included in the basic specification. However, the only dummy with a significant impact is the one for labour intensive industries. Table 3 shows the results for total manufacturing.

Due to already mentioned data unavailabilities, only 935 observations could be realized from the potentially available 1,452 in the basic specification. However, the results are significant. As expected, the lagged endogenous variable is highly significant with a positive sign. This indicates that a one percent increase (decline) in the modified RCA of the previous period leads to an increase (decline) of the RCA in the current period by 0.72 percent. Thus, there is an adjustment process of RCAs in the time dimension. Also the sectoral industrial production has a positive impact on RCAs. This impact is the most distinctive considering the one year lagged industrial output. Accordingly, a one percent rise in output results in 0.12 percent increase in the RCA one year later. The expected positive influence of the export unit value as an indicator for the quality of exports could also been proved with an error probability of 10 percent. A one percent increase in the export unit value brings about a 0.04 percent rise in the relative export share. Since this coefficient is rather low, however, one can also see from table 3 that the 95 percent confidence interval includes negative values for the coefficient of the export unit value. Surprisingly, relative wages in Eastern Europe do not turn out to be significant in determining comparative export advantages. A one percent rise in the relative wage of Eastern European EU countries, which corresponds to a decline in the wage differential, leads to a 0.08 percent decline in the sectoral revealed comparative advantage considering all 22 industrial sectors only if one would allow for an error probability of 17%. Unfortunately, this is not empirically relevant for the wide-spread expectation that comparative advantages of the new EU member states result to some extent from the fact that they have sufficiently lower wages then the Western European EU countries.

On the contrary, the import RCA, which is calculated analogously to the dependent variable (the export RCA), has an expectedly strong positive and significant impact. As indicated before, dummy variables for the five OECD industry groups are also included. The only dummy variable which proves significant is the one for the labour intensive industries; the relative export shares in the labour intensive industries are still significantly higher than the RCAs in the other industries. Although RCAs are clearly on the decline in labour intensive industries in some Eastern European countries such as Hungary, a strong specialization in those industries is still present. This result remains robust even if one runs the regression without Poland, which shows one of the highest RCAs in the labour intensive industries among the six countries under consideration.

Table 3: Dynamic Panel Regression Results for RCAs - Basic Specification for Total Manufacturing

Arellano-Bond Dynamic Panel-Data Estimation, Two-Step System GMM Results

Group variable: cross			Number of obs = 935			
Time variable: time			Number of groups = 122			
Number of instruments: 35			Obs per group: min = 3			
F(6,121) = 191.73			avg = 7.66			
Prob > F = 0.000			max = 9			
Dep.var: $lnrcamod_t$	Coef.	Corr. Std.Error	t	P>|t|	95 % Conf.	Intervall
$lnrcamod_{t-1}$	0.726	0.047	15.19	0.000	0.631	0.820
$lnip_{t-1}$	0.120	0.042	2.83	0.005	0.036	0.205
$lneuv$	0.042	0.025	1.65	0.103	-0.008	0.092
$lnwagerel$	-0.088	0.065	-1.35	0.179	-0.217	0.041
$lnimportrca$	0.159	0.078	2.02	0.046	0.002	0.315
$dlab$	0.233	0.069	3.36	0.001	0.095	0.370
$constant$	0.179	0.172	1.04	0.298	-0.160	0.520
Hansen test of overid. restrictions: chi2(28)=36.56 Prob >chi2=0.129						
Arellano-Bond test for AR(1) in first differences: z = -2.09 pr>z =0.036						
Arellano-Bond test for AR(2) in first differences: z = 1.36 pr>z =0.174						

Source: Borbély, 2006

At the end of the table, some tests are included to assess the validity of the specification. The Hansen test rejects the hypothesis of over-identifying restrictions. This means that the instruments as a group appear as exogenous. Furthermore the Arellano-Bond test for autocorrelation of first and second order delivers the expected results. As construction dictates, we should find first order autocorrelation in the regression. However, second order autocorrelation should be avoided, since this would imply that the instruments for the lagged endogenous variable are not exogenous. Both autocorrelation tests deliver the correct and expected results for our basic specification.

It is worth testing the robustness of our results for subsamples by excluding some countries, industries or years. Since the number of years and also of countries is already very limited, the most reasonable – and from an economic point of view, the most interesting – appears to be a regression for specific industries or groups of industries. Specifically, the impact of relative wages and of export unit values as well may differ among industries. Therefore, we now run the basic regression just for the five labour intensive industries according to the OECD classification, including: the manufacture of textiles; of wearing apparel and dressing; of leather, luggage, handbags and footwear; of fabricated metal products; and the manufacture of furniture. The results are shown in table 4.

Table 4: Dynamic Panel Regression Results for RCAs - Basic Specification for Labour Intensive Manufacturing Industries

Arellano-Bond Dynamic Panel-Data Estimation, Two-Step System GMM Results

Group variable: cross			Number of obs = 221			
Time variable: time			Number of groups = 29			
Number of instruments: 28			Obs per group: min = 5			
F(5,28) = 537.21			avg = 7.62			
Prob > F = 0.000			max = 9			
Dep.var: $lnrcamod_t$	Coef.	Corr. Std.Error	t	P>|t|	95 % Conf.	Intervall
$lnrcamod_{t-1}$	0.899	0.120	7.47	0.000	0.652	1.145
$lnip_{t-1}$	0.117	0.081	1.45	0.158	-0.048	0.284
$lneuv$	0.018	0.055	0.33	0.744	-0.095	0.131
$lnwagerel$	-0.177	0.038	-4.58	0.000	-0.256	-0.098
$lnimportrca$	0.079	0.050	1.57	0.128	-0.024	0.183
$constant$	0.191	0.359	0.53	0.597	-0.543	0.927
Hansen test of overid. restrictions: chi2(22)=25.99 Prob >chi2=0.252						
Arellano-Bond test for AR(1) in first differences: z = -2.54 pr>z =0.011						
Arellano-Bond test for AR(2) in first differences: z = -1.23 pr>z =0.217						

Source: Borbély, 2006

First of all, it is striking that the number of observations declines to 221 if one excludes all non-labour-intensive manufacturing industries. Still, all tests on the validity of the specification indicate no problem. Note that the number of instruments has also been reduced. The lagged endogenous variable is still highly significant; the coefficient is even higher than in the respective estimation for all industries. At the same time, the impact of the lagged industrial production – though displaying roughly the same coefficient – is only significant with an error probability of 15 percent. Interestingly, the coefficient for the export unit variable has turned out to be insignificant. This indicates that competition on the EU15 market in labour intensive products is not influenced by quality competition to a great extent. Importantly, the impact of relative wages on comparative advantages in labour intensive industries is significant with an error probability of less than one percent. Moreover, the coefficient is clearly higher than in the estimation for total manufacturing. For labour intensive industries, a one percent increase in relative wages results in a 0.17 percent decrease in comparative advantages. Surely, this is perfectly in line with the Heckscher-Ohlin theorem, which focuses on the importance of relative endowments in shaping foreign trade patterns. Finally, the importance of imports is much lower for the labour intensive industries than for total manufacturing; the coefficient is lower and the error probability is higher. This underscores the fact that (intermediate) imports do not play such an important role for labour intensive industries.

In the next step, we only consider the upper end of the technology ladder and do the basic regression just for science-based and differentiated goods. According to the OECD classification, these include manufacture of office machinery and computers; of medical precision and optical instruments; of machinery and equipment; of electrical machinery

and apparatus; and the manufacture of radio, television and communication equipment and apparatus. The results are displayed in table 5.

Table 5: Dynamic Panel Regression Results for RCAs - Basic Specification for High-Technology Manufacturing Industries

Arellano-Bond Dynamic Panel-Data Estimation, Two-Step System GMM Results

Group variable: cross			Number of obs = 258			
Time variable: time			Number of groups = 34			
Number of instruments: 28			Obs per group: min = 3			
F(5,33) = 119.04			avg = 7.59			
Prob > F = 0.000			max = 9			
Dep.var: $lnrcamod_t$	Coef.	Corr. Std.Error	z	P>|z|	95 % Conf.Intervall	
$lnrcamod_{t-1}$	0.381	0.064	5.92	0.000	0.250	0.512
$lnip_{t-1}$	0.372	0.083	4.44	0.000	0.201	0.543
$lneuv$	0.173	0.066	2.59	0.014	0.037	0.309
$lnwagerel$	0.147	0.137	1.07	0.291	-0.132	0.428
$lnimportrca$	0.372	0.185	2.01	0.053	-0.004	0.749
$constant$	1.204	0.421	2.86	0.007	0.346	2.062
Hansen test of overid. restrictions: chi2(22)=21.61 Prob >chi2=0.483						
Arellano-Bond test for AR(1) in first differences: z = -1.81 pr>z =0.070						
Arellano-Bond test for AR(2) in first differences: z = 0.24 pr>z =0.812						

Source: Borbély, 2006

The number of observations (258) in the high technology groups is very similar to the labour intensive industries regressed before. Also here, the Hansen test for overidentifying restrictions as well as both Arellano-Bond tests for AR(1) and AR(2) indicate no problem in the estimation. The results clearly correspond to the prior expectations. The lagged endogenous variable and the lagged industrial production show a highly significant positive value. Thus a one percent increase in the RCA in the previous period results in a 0.38 percent higher RCA in the current period, and a one percent increase in the industry output in the previous year brings about a 0.37 percent higher RCA in the current period. For high technology industries, export unit values as indicators for quality matter a lot. This is shown in the highly significant and positive coefficient for the EUV. A rise in the EUV by one percent improves the revealed comparative advantage in high technology industries by 0.17 percent. It seems that in these industries, competitiveness is much more influenced by quality differences, than in lower technology industries. Advancing comparative advantages in science-based and differentiated goods apparently depend to a great extent on the ability to upgrade quality. Considering fast technological change and tough competition in these industries, this finding is reasonable. So are the findings on the impact of relative wages on comparative advantages in high technology industries, which is basically non-existent. The coefficient is not significant, indicating that wages do not play an important role for export advantages in these industries. Finally, a rise in the relative import share by one percent yields a rise in the relative export share by 0.37 percent, which clearly demonstrates that success and competitiveness of high-technology industries largely depend on imports. The impact is significant with an error probability of

5 percent, and is roughly as strong as the influence of industrial production and of the lagged endogenous variable. This is a strong indicator for a bazaar kind of activity as explained before or for assembly-type production. Still, this does not hinder the competitiveness of high-tech export industries.

In the next step, we will modify the basic specification by adding other exogenous variables which are expected to have an impact. The results are briefly summarized below.

Labour Productivity

First of all, one must take a look at labour productivity, which is measured as sectoral industrial output in million Euro per employee in Eastern European countries in relation to the same measure in Euroland. Output for Eastern European countries is provided by the WIIW (2004) in national currency and has been converted to Euro using annual average exchange rates to the Euro published by Eurostat. The number of employees on a sectoral level is also provided by WIIW (2004). Output for Euroland, such as the number of employees, is taken from the OECD STAN Industry Database (2005). Again, Euroland is calculated using GDP shares of 2000. Using this measure, one might at first sight expect a positive coefficient in explaining revealed comparative advantages. If labour productivity in Eastern Europe rises, relative productivity rises if we assume that Euroland productivity remains stable; this is therefore expected to enhance comparative advantages. However, we find that labour productivity is strongly correlated with wages. If productivity rises, wages rise, having a negative effect on RCA. Therefore the expected value of labour productivity on RCA is negative. As a matter of course, we drop wages from the equations. The results show that labour productivity has a negative effect on RCA for total manufacturing only with an error probability of 12%. For high-tech industries, this impact is not significant. However, for labour intensive industries a rise in productivity by 1 % results in a decline of RCA by 0.15% at a 99% significance level.

Unit Labour Costs

It is not only wages and labour productivity that might play an important role in explaining comparative advantages, but also relative unit labour costs. They are calculated as the ratio of wages to productivity. On the one hand, the intuitive impact of relative unit labour costs would be negative, since a rise would deteriorate competitiveness, especially in labour intensive industries. On the other hand, since wages and productivity are strongly correlated in our sample, one could expect that in the combination of these two variables there is no movement with no explanatory power left in the data. Indeed, the regression results including relative unit labour costs show no significant impact in any of the three samples. The other coefficients remain robust, but since there is no additional information provided by the estimations, the results are not reported.

Foreign Direct Investment

It seems clear that foreign direct investment is an important factor driving economic development in Eastern European countries. FDI stock in million Euro is provided from

the WIIW FDI Database (2005). GDP in million Euro is taken from Eurostat. Before running the estimation, however, several problems appear. Sectoral FDI data in percent of GDP as described above is not only correlated with RCAs, the endogenous variable of the panel, but also with several exogenous variables of the basic specification such as relative wages, export unit values and even with industrial output. In order to bring some clarity into the situation, we prefer to run the dynamic panel regression strictly for RCAs and FDI. The results show contemporary significant correlation only for the labour intensive subsample. The one-year lagged FDI has a small but significant impact on high technology industries as well. For labour intensive industries, however, the boosting effect of FDI on RCA is highly significant, with coefficients of 0.019-0.026 for both the one-year and two-year lagged influence.[4]

Research and Development

Finally, we analyse the impact of R&D expenditure on RCA. R&D expenditure aggregated at the firm level for NACE 2-digit level industries is available for the Eastern European countries from Eurostat with data given in million Euro. The explanatory variable in our model additionally controls for the size of the sector by relating R&D expenditures to GDP. Also, the R&D variable shows a strong and significant correlation with industrial production. We therefore drop industrial production as an explanatory variable. The dynamic panel estimation with the R&D-extended basic specification reveals no significant influence of the simultaneous R&D variable on either the total sample or the two subsamples. Concerning the first lag of R&D as an explanatory variable, we find no significant correlation for the total manufacturing or the labour intensive industries. We do, however, find a significant coefficient for the high technology industries. A one percent increase in the R&D to GDP ratio results in a 0.035 percent higher RCA one year later. This seems to underline the importance of research and development for higher technology industries, which one would expect from theoretical and practical considerations. It also seems reasonable that research and development expenditure materializes with some time lag.

To conclude, we find that the size of an industry as measured by industrial production as a percent of GDP, imports, export unit values, FDI and wages are the most important factors driving comparative advantages in exports. However, their impact and significance depends much on whether we consider labour intensive industries, high technology industries or total manufacturing.

[4] At the same time it is interesting to test whether RCA has an influence on FDI. Borbély (2006) analysis this in detail and finds that RCA follows FDI to some extent mainly in labour intensive industries, where investors expect in Eastern Europe more profitability than in high technology industries. To a much greater extent, however, FDI follows RCA in high-technology industries, where some of the Eastern European countries have begun to strongly increase their competitiveness.

4. Policy Implications and Conclusions

Although, the new EU member states from Eastern Europe witnessed a relatively favourable economic development over the past decade, among others Poland, Hungary, and the Czech Republic still show rather high, partially stubborn unemployment rates. At first it seems that labour markets in the new EU member states will benefit from outsourcing and offshoring from Western European companies, which is most certainly undeniable. As European integration proceeds, however, firms in new EU member states themselves face considerable pressure for outsourcing internationally, especially from Asian countries such as China. Given high sustained unemployment rates in many new EU member states, one must be worried about unemployment problems. Jobless growth could be one of the new problems in the new EU member states. To the extent that the mass unemployment problem contributes to social and political conflicts as well as political radicalization, high long term unemployment could contribute to political destabilization, in turn leading to a rise in the political risk premium and a weakening in growth over the long run. Therefore, four main policy conclusions should be drawn:

First, policymakers have to place emphasis on upgrading human capital formation by increasing the quality and quantity of education and training activities, which will be important to enhance productivity and to encourage the creation of new firms which often not only create new jobs but contribute to overall flexibility and innovativeness.

Second, it is inevitable that policymakers stimulate innovations and thus enhancing the quality of products to gain competitiveness on international markets. Underlying econometric analysis shows positive influence of export unit values on revealed comparative advantage, which on the one hand suggests that raising profitability through higher export unit value stimulates production and relative export in the respective sector. On the other hand, a higher quality product obviously faces more favourable market condititions on international (especially European) markets than low quality products do. Therefore quality upgrading by enforcing innovativeness is one of the main ingredients of a successful economic policy in Eastern European countries.

Third, the importance of an investor-friendly economic environment should be emphasized. Policymakers should clearly focus on attracting foreign direct investment in diversified industries. This can be achieved through political stability and legal security as well as an adequate tax system. The positive impact of foreign direct investment on the development of foreign trade specialization has clearly been empirically corroborated.

Finally, the positive impact of research and development expenditure on comparative advantages in foreign trade were shown empirically. From a theoretical and a political perspective, it is also clear however that national R&D programs are likely to generate positive effects on economic development and on the competitiveness of countries and industries. Despite this, high budget deficits in some transition countries and the fear of international technology leakage effects might weaken the willingness of governments in transition countries to raise public R&D expenditures. Compensating for this through higher R&D funds from the supranational policy layer in Brussels is doubtful, as EU innovation policy has been rather inefficient in the past.

The research presented suggests that a major driver in technological catching-up is primarily increased production in fields with a comparative advantage. Rising profitable exports normally should be the starting point to attract more FDI inflows. Over time, one may expect a technological graduation process where suppliers of intermediate inputs raises the share of value-added and ultimately produce a considerable share of final products which in some sectors should go along with increased R&D activities. In sectors with a close link between R&D activities and optimum organization of production, one should certainly not expect a long term geographical (international) decoupling of R&D and production. As the latter aspect concerns particularly technology intensive goods, one may anticipate that sustained economic growth coupled with improved human capital formation will nurture this type of Schumpeterian catching-up processes. In this context, foreign direct investment will certainly continue to play an important role. While in the long run there will be both FDI inflows and FDI outflows, one should not overlook that FDI in general makes it necessary to draw a distinction between GDP and GNP, a topic also relevant for full catching-up.

At the bottom line, the analysis suggests that explaining regional integration and catching-up dynamics can be understood in a broader analytical manner which links changes in RCAs, export unit values and FDI flows consistently. The adjustment patterns found in the context of EU eastern enlargement might also hold in other regions of the world economy. This clearly suggests an interesting future research agenda. This necessarily will include the topic of how globalization dynamics and regional economic integration overlap, in particular the growing competitiveness of China which certainly is not a small open economy (so opening up will affect relative prices, especially in fields with a positive long-term RCA; see appendix). The research agenda also concerns the search for an integrated model with trade and FDI in a Schumpeterian world economy.

Appendix 1

Statistical Measures of Structural Change

According to STAMER (1999), the degree of structural change between the time points or time periods, 1 and 2, can be measured by the following indicators (for output X) if we distinguish sectors i = 1 ... n,

$$\sum_{i=1}^{n} X_i = X \tag{1}$$

$$\text{and } (x_i = \frac{X_i}{X})$$

$$\sum_{i=1}^{n} x_i = 1 \tag{2}$$

1. Norm of absolute values (*NAV*):

$$NAV_{1,2} = \sum_{i=1}^{n} \left| x_{i2} - x_{i1} \right| \tag{3}$$

2. Euclidean norm (*EuN*):

$$EuN_{1,2} = \sqrt{\sum_{i=1}^{n} \left(x_{i2} - x_{i1} \right)^2} \tag{4}$$

3. Sum of relative differences' absolute values (*SRD*):

$$SRD_{1,2} = \sum_{i=1}^{n} \left| \frac{x_{i2} - x_{i1}}{x_{i1}} \right|, \quad x_{i1} > 0 \tag{5}$$

4. Information gain (*IG*):

$$IG_{1,2} = \sum_{i=1}^{n} x_{i2} \, \mathrm{ld} \left| \frac{x_{i2}}{x_{i1}} \right|, \quad x_{i1} > 0, \quad x_{i2} > 0 \tag{6}$$

5. Growth rate parameter (*GRP*):

$$GRP_{1,2} = \sum_{i=1}^{n} x_{i1} \left| g_{i2} - g_2 \right|,$$

$$\text{that is with} \quad g_{i2} = \ln X_{i2} - \ln X_{i1}, \quad g_2 = \ln X_2 - \ln X_1 \qquad (7)$$

$$GRP_{1,2} = \sum_{i=1}^{n} x_{i1} \left| \ln \frac{x_{i2}}{x_{i1}} \right|, \quad x_{i1} > 0, \quad x_{i2} > 0.$$

6. LILIEN Index (*LI*) (see LILIEN, 1982a, b):

$$LI_{1,2} = \sqrt{\sum_{I=1}^{n} x_{i2} \left(\ln \frac{x_{i2}}{x_{i1}} \right)^2}, \quad x_{i1} > 0, \quad x_{i2} > 0. \qquad (8)$$

7. The modified LILIEN Index (*MLI*) (see STAMER, 1999, p. 42-44):

$$MLI_{1,2} = \sqrt{\sum_{I=1}^{n} x_{i1} x_{i2} \left(\ln \frac{x_{i2}}{x_{i1}} \right)^2}, \quad x_{i1} > 0, \quad x_{i2} > 0. \qquad (9)$$

Some important features of these indicators of structural change are summarized in Table 1. Note that the first three properties are necessary (and sufficient) conditions for an indicator to be a metric space.

Table 6: Features of structural change indicators

	Zero distance in case of identity	Symmetry in respect of time direction	Fulfillment of triangular inequality	Measure of dispersion	Consider-ation of sector's weights
Norm of absolute values	yes	Yes	Yes	no	yes
Euclidean norm	yes	Yes	Yes	no	yes
Sum of relative differences' absolute values	yes	No	No	yes	no
Information gain	yes	No	No	no	yes
Growth rate parameter	yes	No	No	yes	yes
LILIEN Index	yes	No	No	yes	yes
Modified LILIEN Index	yes	Yes	Yes	yes	yes

Source: STAMER (1999), p. 53

All indicators mentioned above have both advantages and drawbacks. The choice of an indicator has to be made on the basis of the goals of the respective research. For many purposes, the norm of absolute values and/or the Euclidean norm are frequently used measures. A useful indicator as a measure of diversification is the index proposed by LILIEN (1982a). Some drawbacks of this indicator are remedied by the Modified LILIEN Index of STAMER (1999). This, however, comes at the cost of a more complex interpretation.

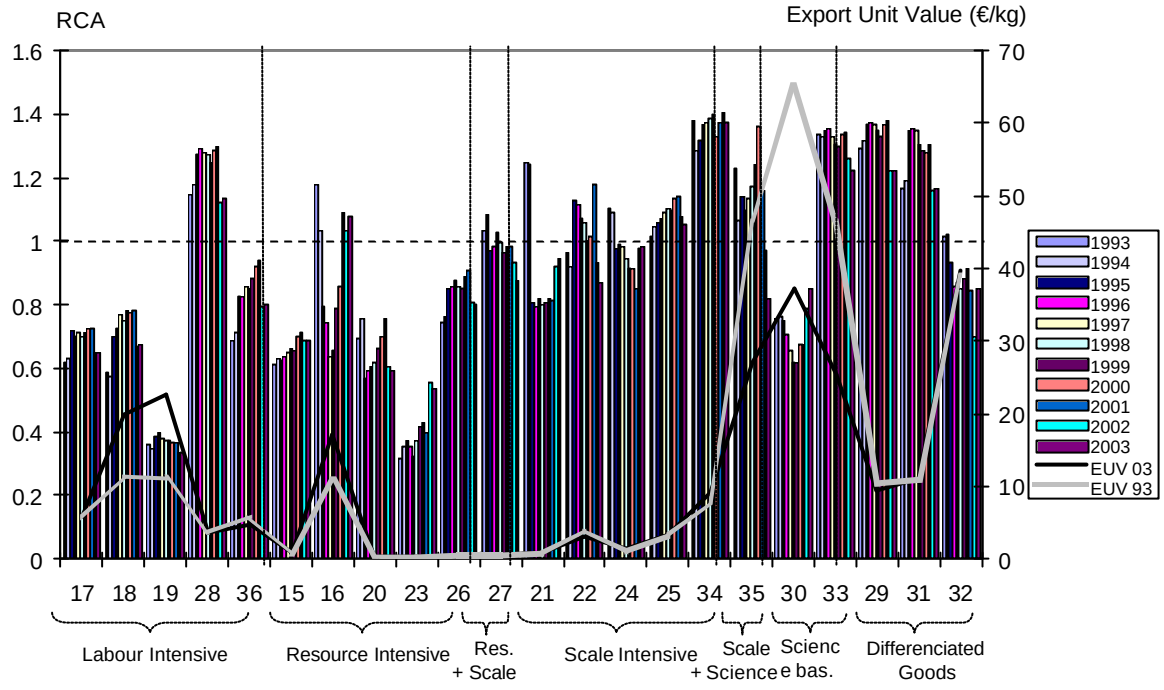
Appendix 2

NACE rev. 1.1. Classification (in parts)

D	Manufacturing
15	Manufacture of food products and beverages
16	Manufacture of tobacco products
17	Manufacture of textiles
18	Manufacture of wearing apparel; dressing and dyeing of fur
19	Tanning and dressing of leather, manufacture of luggage, handbags, saddlery, harness and footwear
20	Manufacture of wood and of products of wood and cork, except furniture;
21	Manufacture of pulp, paper and paper products
22	Publishing, printing and reproduction of recorded media
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
25	Manufacture of rubber and plastic products
26	Manufacture of other non-metallic mineral products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products, except machinery and equipment
29	Manufacture of machinery and equipment n.e.c.
30	Manufacture of office machinery and computers
31	Manufacture of electrical machinery and apparatus n.e.c.
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment
36	Manufacture of furniture, manufacturing n.e.c.

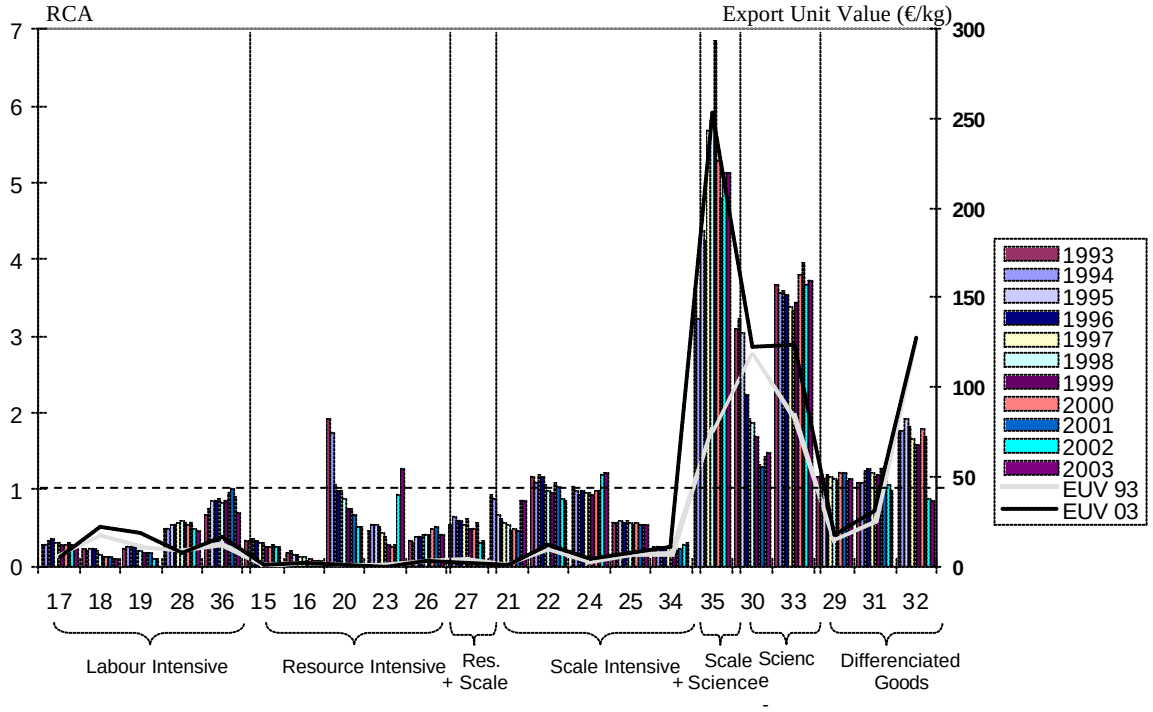
Appendix 3

Figure 9: Germany – RCA of exports 1993-2003 and Export Unit Values 1993 and 2003



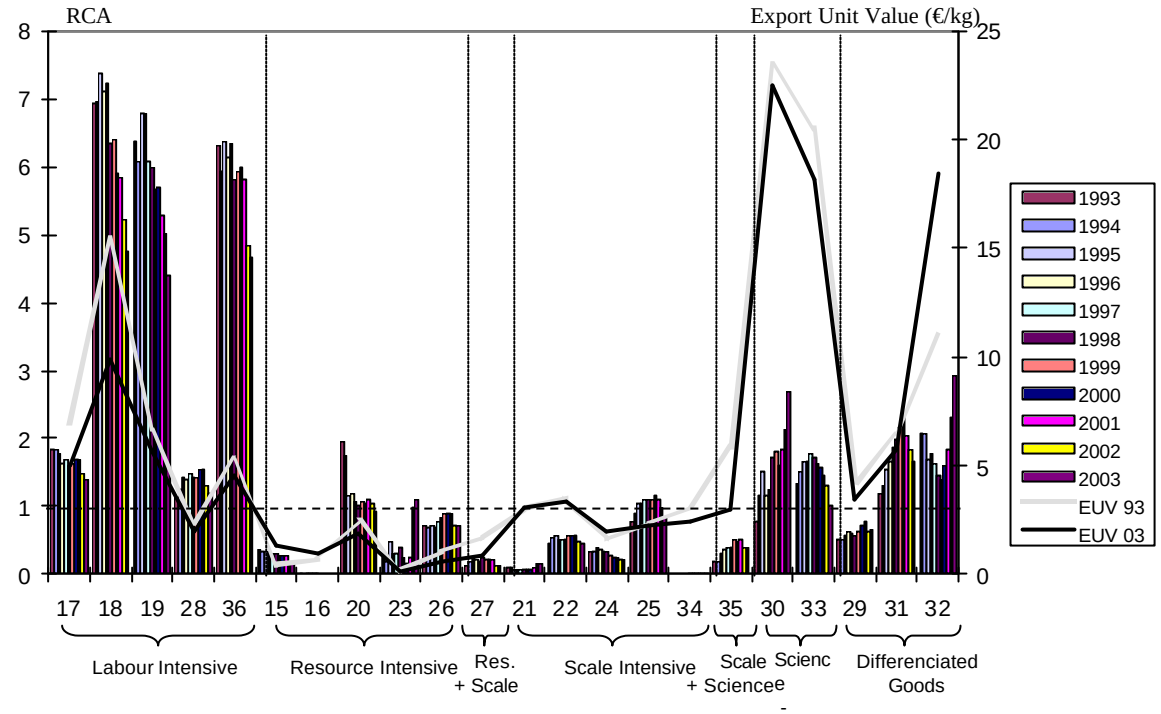
Source: EC (2004), own calculations

Figure 10: USA – RCA of exports 1993-2003 and Export Unit Values 1993 and 2003



Source: EC (2004), own calculations

Figure 11: China – RCA of exports 1993-2003 and Export Unit Values 1993 and 2003



Source: EC (2004), own calculations

Appendix 4

Figure 12: Triangular Perspective on Trade, Structural Change and Efficiency Gains

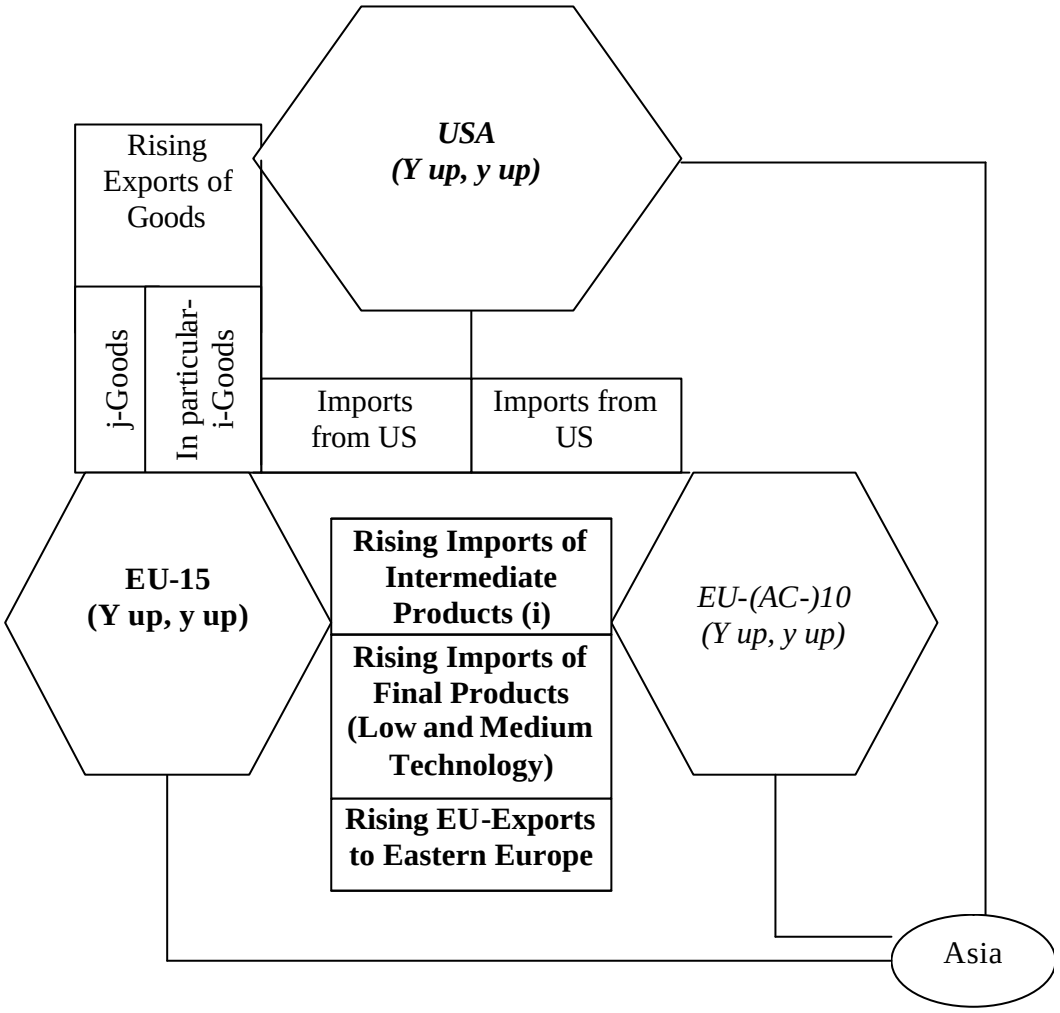
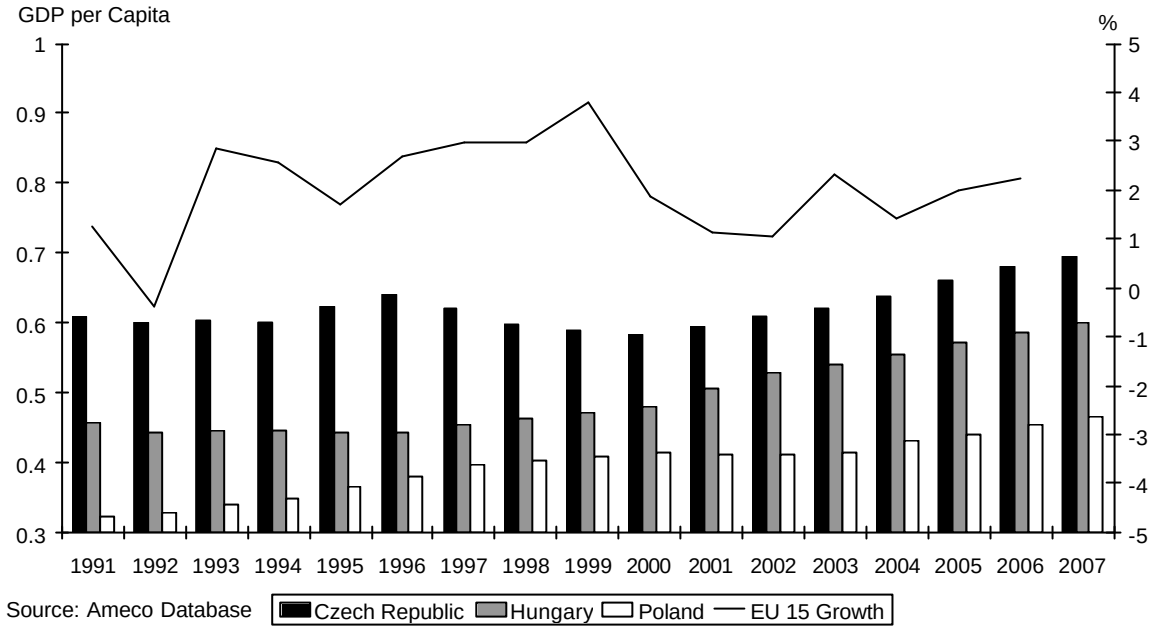


Figure 13: GDP per Capita PPP (Ratio relative to EU 15) and annual GDP Growth EU 15 (1995 constant prices)



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