

## Determinants of the Export Structure of Countries in Central and Eastern Europe

Bernard Hoekman and Simeon Djankov

---

*The growth in exports from Central and Eastern Europe to Western markets suggests that entrepreneurs have responded to changed incentives by restructuring their production to capture new markets. The absence of change in the structure of exports, however, suggests that these restructuring efforts have not been significant. This article analyzes the magnitude of the change in export structure across the Central and Eastern European countries in 1990-95, focusing in particular on trade with the European Union. It finds that imports of intermediate inputs and machinery are an important determinant of the changes in export structure. Sourcing of inputs from abroad is a major factor underlying the expansion of exports to the European Union. Outward processing (subcontracting) arrangements and foreign direct investment have a smaller impact. Except for Poland, inflows of foreign direct investment are statistically insignificant or negatively associated with measures of revealed comparative advantage. This suggests that foreign investors have chosen sectors in which the Central and Eastern European countries were not relatively specialized under central planning.*

---

Following the demise of central planning, Central and Eastern European countries experienced severe economic shocks. The Council of Mutual Economic Assistance (CMEA), which had governed the international trade relations of member countries, collapsed in 1989. Since then, analysts have done a significant amount of work investigating developments in the trade of the countries in Central and Eastern Europe. This literature presents several stylized facts (see, for example, Drabek and Smith 1995; Kaminski, Wang, and Winters 1996; and World Bank 1996). First, exports from countries in Central and Eastern Europe to Western Europe have grown very rapidly. Second, the composition of these exports has changed relatively little (Halpern 1995). Third, an increasing share of the trade between many Central and Eastern European countries and the European Union is intra-industry, that is, it involves exchanges of similar prod-

Bernard Hoekman is with the Development Research Group, and Simeon Djankov is with the Private Sector and Finance Department of the Europe and Central Asia Region, both at the World Bank. The authors are indebted to Ying Lin for his excellent research assistance in compiling and extracting the data used in this article. They are also grateful to Alan Winters and two anonymous referees for insightful and constructive comments and to Alan Deardorff, Zdenek Drabek, Simon Evenett, Bart Kaminski, Will Martin, Gerhard Pohl, Maurice Schiff, Matthew Tharakan, and Zhen Kun Wang for helpful suggestions and discussions.

© 1997 The International Bank for Reconstruction and Development / THE WORLD BANK

ucts (Neven 1995). Fourth, inflows of foreign direct investment (FDI) are heavily concentrated in specific sectors and countries. The Visegrad countries (Hungary, Poland, and the Czech and Slovak Republics) have attracted more than 80 percent of all FDI into the region (European Bank for Reconstruction and Development 1996). Much of this FDI has gone into services, food processing, and the motor vehicle industries.

The growth in exports to Western markets suggests that entrepreneurs are responding to the changed incentives by engaging in restructuring to capture new markets. The increase in intra-industry trade and the industry concentration of FDI also may indicate that firms are adjusting by specializing in narrower production lines. The absence of change in export structure, however, suggests a lack of significant restructuring. Much of the increase in exports may simply be due to the redirection of goods to Western countries. We cannot determine *ex ante* the extent to which Central and Eastern European countries must realign their historical production structures according to their comparative advantage. This depends on the divergence between initial conditions (the pattern of specialization under the CMEA) and the allocation of resources in conformance with market-determined prices. Some of the countries may need to improve the efficiency of existing industries; others may need to improve the allocation of resources across industries. Baldwin (1994) surveys the literature in an attempt to determine the extent to which the volume and direction of trade will change once the transition to a market economy has been completed. Such analysis is often based on historical data on trade patterns before World War II or on gravity models of trade.

The change in the composition of exports that occurred during 1990–95 provides information on how much the pattern of specialization under central planning diverged from what would have emerged under a market system. The period is long enough for the countries to have undertaken sufficient reform. Absence of change in the structure of exports in the last six years suggests that the initial structure of production may have been appropriate; a lot of change would suggest the opposite. However, even if we observe little change, this does not necessarily imply that little restructuring occurred. Even relatively efficient firms would be likely to have improved productivity following the opening and liberalization of the economy. The greater the difference between best-practice production techniques in the global economy and best practices in the context of a largely closed planned economy, the greater the scope for enhancing efficiency. In practice such improvement might be reflected in a rise in imports of technology, components, and machinery.

In this article we analyze the magnitude of change in the export structure in Central and Eastern European countries. We investigate the relative importance of processing (subcontracting) trade, imports of inputs, and FDI as determinants of the countries' export performance in European Union markets. We undertake a statistical analysis of the extent to which these variables are associated with the countries' export composition during 1990–95.

Section I briefly summarizes the stylized facts of the trade performance of countries in Central and Eastern Europe since 1990, including the extent of change in export composition. Section II discusses the possible relationships among subcontracting or processing trade, imports of inputs more generally, and FDI and examines the change in export structure across these countries. Section III reports the estimation results. Section IV concludes.

## I. REORIENTATION AND CHANGE IN EXPORTS

It is very difficult to obtain accurate data on trade flows prior to 1990 because of highly distorted cross-exchange rates and the prevalence of barter trade. For this reason the analysis in this article starts in 1990. Although this may miss part of the adjustment process, the data difficulties make it much more problematical to interpret any observed changes starting from an earlier date. In principle, data after 1990 should not be subject to the valuation and measurement problems that affect data under central planning.

Until the end of the 1980s, most of the countries in Central and Eastern Europe traded extensively with one another and with the Soviet Union. As of 1990 these countries shipped 30–45 percent of total exports to former members of the CMEA (table 1). After 1990 the share of total exports going to Western Europe increased significantly for all the countries in Central and Eastern Europe. As of 1996 exports to Western Europe accounted for 50–80 percent of total exports (table 1). A similar phenomenon occurred on the import side. For most of the countries, some 70 to 80 percent of total imports originated in Western Europe (International Monetary Fund, Direction of Trade Statistics).

How much of the shift in the direction of trade is associated with a change in the composition of exports? Revealed comparative advantage (RCA) is an easily interpretable measure of the change in the structure of exports. The RCA is the share of a commodity in a country's total exports relative to the average share for the world.<sup>1</sup> We measure the change in the composition of exports by calculating the simple correlation between RCAs for each country in 1990 and 1995, the most recent year for which disaggregated data are available. A higher correlation indicates that less change has occurred. Because the Czech and Slovak Republics became separate countries in 1993, we calculate the RCA correlations for exports between 1990 and 1992 and between 1993 and 1995. We calculate the RCAs at both the two- and four-

1. This measure is due to Balassa and is defined as:

$$\left( \frac{x_{ij}}{X_i} \right) / \left( \frac{\sum_{j=1}^N x_{ij}}{\sum_{j=1}^N X_j} \right) \text{ where } x_{ij} \text{ are exports of commodity } i \text{ by country } j, X_j \text{ are country } j\text{'s total}$$

exports, and  $N$  is the number of countries. In what follows, RCAs in exports to the European Union are defined as the European Union's reported imports of a commodity from a Central and Eastern European country divided by total reported imports relative to total imports by the European Union of that commodity divided by total European Union imports.

Table 1. *Share of Exports to Former Centrally Planned Economies and Western Europe, 1990–96*

Country	Total exports, 1996 (billions of U.S. dollars)	Export growth (average annual percent)		Share of exports to former centrally planned economies (percent) <sup>a</sup>			Share of exports to Western Europe (percent)		
		1990–96	1993–96	1990	1993	1996	1990	1993	1996
Albania	0.3	3.9	30.6	31	3	6	49	70	82
Bulgaria	4.8	13.4	22.3	30	16	19	40	46	51
Czech Republic	18.8	—	21.2	—	31	38	—	61	60
Czechoslovakia <sup>b</sup>	—	—	—	44	—	—	40	—	—
Hungary	15.7	7.1	14.3	34	14	21	50	56	71
Poland	22.8	5.9	16.2	33	11	21	51	70	69
Romania	8.5	6.2	16.7	35	11	10	36	40	54
Slovak Republic	9.3	—	34.0	—	57	56	—	42	47

— Not available.

a. Includes Bulgaria, Czech Republic, Slovak Republic, Hungary, Poland, Romania, and the former Yugoslavia and Soviet Union.

b. Excludes intra-Czech-Slovak trade.

Source: Data from the International Monetary Fund, Direction of Trade Statistics.

digit levels of disaggregation for trade with the world and for trade with the European Union.<sup>2</sup>

Between 1990 and 1992 little change occurred in the composition of exports at the two-digit level. The correlation coefficients are 0.80 or higher for Bulgaria, Hungary, Poland, and Romania (table 2). For exports to the world (total exports), Albania has the lowest correlation (0.62), and Poland has the highest (0.88). For most of the countries exports to the European Union changed even less; correlation coefficients are above 0.9 for all of the countries except Czechoslovakia (0.73) and Albania (0.54). Between 1993 and 1995 greater changes occurred for most countries, and greater differences emerged across countries. The Czech Republic, Hungary, and Poland continued to experience very little change in the structure of exports at the two-digit level (correlation coefficients are higher than 0.9). Conversely, Albania and Bulgaria experienced a substantial change in their export structure (coefficients of 0.44 and 0.69, respectively). Comparator countries such as Indonesia, Mexico, Morocco, Spain, and Turkey have correlation coefficients in the 0.7–0.8 range over an analogous period (U.N. COMTRADE data base). The Slovak Republic also changed its export mix more than average. Most of the Central and Eastern European countries experienced more change in their exports toward the European Union than toward the rest of world during 1993–95.

Based on the absence of change at the two-digit level of disaggregation, most of the Central and Eastern European countries exported the same products in the early 1990s as in the late 1980s (see, for example, Halpern 1995 and Drabek and Smith 1995). However, enterprises may change their export mix *within* two-digit categories. For example, a paint factory may continue to produce and export paint, but switch from selling oil-based paints to a wholesaler in large drums to selling water-soluble paints that are packaged for retail sale. Such changes will not show up at the two-digit level. When we analyze the correlation at the four-digit level (1,238 commodities) for exports to the European Union, we obtain similar conclusions as in the two-digit analysis, with one significant exception. Although Hungary and Poland continued to show little change in export composition, the Czech Republic experienced a substantial amount of change *within* the two-digit product categories (table 2). In principle, we must use more disaggregated data to track the extent to which enterprises managed to differentiate their output from that produced under central planning. Unfortunately, the available data are not very reliable. (For many commodities beyond the four-digit level no trade is reported for either 1990 or 1995. It is often not clear whether this reflects reality—there really was no trade—or simply a reporting or measurement problem.)

2. There are 99 commodity groups at the two-digit level of the Combined Nomenclature, the classification of trade statistics used by the European Union. Excluding so-called special codes, there are 63 two-digit categories in the Standard International Trade Classification, which we use to report statistics on world trade. There are therefore 99 and 63 sectors, respectively, in the RCA correlations for trade with the European Union and with the world. There are 1,238 four-digit items in the Combined Nomenclature.

Table 2. *Change in the Composition of Exports, 1990–95*

<i>Measure and period</i>	<i>Destination of exports</i>	<i>Albania</i>	<i>Bulgaria</i>	<i>Czech Republic</i>	<i>Czechoslovakia</i>	<i>Hungary</i>	<i>Poland</i>	<i>Romania</i>	<i>Slovak Republic</i>
<i>Correlation coefficients of RCAs at the two-digit level<sup>a</sup></i>									
1990–92	World	0.62	0.83	—	0.78	0.85	0.88	0.82	—
1990–92	European Union	0.54	0.92	—	0.73	0.95	0.90	0.94	—
1993–95	World	0.44	0.69	0.91	—	0.90	0.96	0.84	0.77
1993–95	European Union	0.36	0.61	0.95	—	0.96	0.91	0.81	0.71
<i>Correlation coefficients of RCAs at the four-digit level<sup>b</sup></i>									
1990–92	European Union	0.77	0.28	—	0.66	0.88	0.83	0.35	—
1993–95	European Union	0.69	0.41	0.58	—	0.89	0.80	0.32	0.68
<i>Herfindahl index of concentration of exports<sup>c</sup></i>									
1990	European Union	0.073	0.044	—	—	0.042	0.043	0.139	—
1993	European Union	0.114	0.043	0.042	—	0.051	0.051	0.122	0.054
1995	European Union	0.123	0.062	0.064	—	0.074	0.051	0.096	0.072

— Not available.

*Note:* RCA is revealed comparative advantage. It is the share of a commodity in a country's total exports relative to the average share for the world or, in trade with the European Union, relative to the share for the European Union.

a. 63 and 99 categories for the world and European Union, respectively.

b. 1,238 categories.

c. The index is calculated for commodities at the two-digit level. The Herfindahl index is defined as  $\sum_i (s_i)^2$  where  $s$  is the share of sector  $i$  ( $i = 1 \dots 99$ ) in total exports to the European Union.

*Source:* Authors' calculations based on the European Union COMEXT and U.N. COMTRADE data bases.

Although a high correlation between RCAs across time suggests that little change occurred in the broad structure of trade, there may have been significant changes in the relative importance of individual items. Even at the two-digit level, substantial changes in the value of RCAs occurred for most of the countries. In part this reflects changes in the volume of exports, with some commodities registering large increases in exports and others registering decreases. One effect of these changes was an increase in the concentration of exports to the European Union. The Herfindahl measure of concentration suggests that the export composition of most of the countries became more specialized during 1990–95 (table 2). The exception, Romania, is largely explained by the collapse of exports of oil products.

Here we are interested in the determinants of changes in export structure. Because the European Union is by far the largest trade partner of—and direct investor in—the Central and Eastern European countries and because detailed data on trade are available, the analysis that follows focuses on the export performance of these countries with the European Union. The high correlation between changes in export structure to the European Union and changes in export composition to the world (which in large part reflects the large share of total exports going to the European Union) suggests that little will be lost by limiting the analysis to trade with the European Union.

## II. POSSIBLE FACTORS UNDERLYING CHANGES IN EXPORT COMPOSITION

An increase in intra-industry trade accompanied the changes in both the direction and composition of exports.<sup>3</sup> Although still below the levels registered for advanced industrial countries in the region, the level of intra-industry trade grew rapidly for the Central and Eastern European countries. Slovenia, the Czech Republic, and Hungary currently have indexes of intra-industry trade that exceed those of Portugal and Greece. Two major dimensions may underlie such exchange. First, the textbook explanation maintains that intra-industry exchange results when firms specialize in similar but differentiated products, driven by the need to realize economies of scale or scope. Second, in the early stages of the transition to a market economy, firms are likely to have incentives to source inputs from the rest of the world, thereby obtaining access to know-how and technologies. Such exchanges may be arm's-length, or they may occur in the context of joint ventures or other contractual relationships.

Such vertical intra-industry trade may well be more important than exchanges involving similar but differentiated products, especially in the early stages of

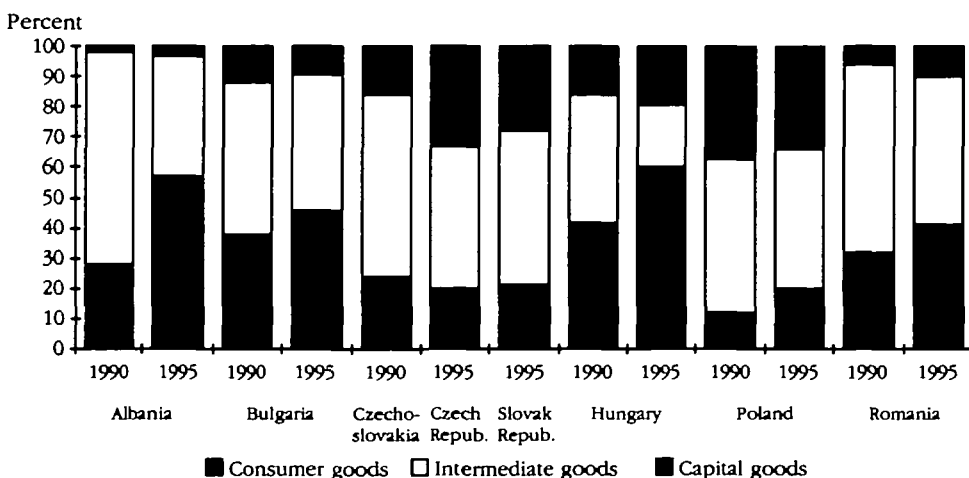
3. Analysts often use the Grubel-Lloyd index of intra-industry trade. It is defined as:  $1 - (\sum_i |X_i - M_i|) / (\sum_i (X_i + M_i))$  where  $X_i$  and  $M_i$  are a country's exports to and imports from, respectively, a trading partner of commodity  $i$ . See Helpman (1987) for a theoretical analysis of such trade and Faini and Portes (1995) and Drabek and Smith (1995) for a discussion of intra-industry trade developments between the Central and Eastern European countries and the European Union.

transition. As in the literature on industrial organization and FDI, we use the term vertical to refer to the geographic fragmenting of the production process by stage of production (see, for example, Markusen 1995). The trade literature uses the term vertical intra-industry trade to describe intra-industry bilateral exchanges of very similar goods where the unit values of exports and imports exceed a particular threshold. The term horizontal intra-industry trade describes bilateral trade flows in the same commodity classification where unit values are below this threshold (Greenaway, Hine, and Milner 1995). For Central and Eastern European enterprises seeking to export to Western Europe, European Union firms (be they potential partners or customers) are an obvious source of information on quality standards, packaging requirements, tastes (design of goods), and production techniques as well as suppliers of machinery and high-quality intermediate goods. Intra-industry trade is a mechanism for the transfer of technology.

The share of intermediate inputs and capital goods in total imports from the European Union is in the 55 to 65 percent range for Bulgaria, Hungary, Poland, and Romania. For the Czech and Slovak Republics the figure is 80 percent (figure 1). In Hungary and Poland the growth in imports of capital goods is particularly strong, rising from 12 and 16 percent of total imports from the European Union in 1990 to 20 and 30 percent, respectively, in 1995. Capital goods account for some 30 percent of total Czech and Slovak imports from the European Union. Albania stands out for its very low share of capital goods in total imports.

Enterprises may use inward FDI or nonequity-based relationships with European Union suppliers or customers (including contracts and joint ventures) to obtain intermediate inputs and capital goods. Alternatively, this may be the re-

Figure 1. *Composition of Imports from the European Union, 1990 and 1995*



Source: Authors' calculations.



Table 3. *Foreign Direct Investment in Central and Eastern Europe, 1995*

Country	Billions of dollars	Industry share (percent)	Ratio to GDP
Albania	0.2	64	3.5
Bulgaria	0.3	51	0.8
Czech Republic	5.5	56	5.6
Czechoslovakia	1.1	49	—
Hungary	11.5	44	10.2
Poland	2.4	38	0.7
Romania	0.9	46	1.0
Slovak Republic	0.6	41	1.1

— Not available.

Note: Foreign direct investment includes inflows of goods and services. GDP is gross domestic product. Data are cumulative flows giving a 1995 stock figure.

Source: European Union COMEXT; International Monetary Fund, Direction of Trade Statistics; and European Bank for Reconstruction and Development (1996).

sult of the independent decisions of managers to upgrade production processes. FDI may in part be driven by relative cost considerations that make it attractive to produce in a host country but will also have other motivations related to ownership and knowledge. Without such advantages it is usually assumed that a foreign investor does not have a competitive advantage over local incumbent firms. Trade barriers that raise the cost of direct exports, the perception that consumers prefer locally produced goods, or incentive policies of the host government might also drive FDI. Empirical work on the motivations of foreign investors in the Central and Eastern European countries suggests that production costs are not a significant factor (Meyer 1995).

FDI flows into Eastern Europe after 1989 were heavily concentrated in specific countries and sectors. Hungary alone accounted for more than 50 percent of the total stock of inward FDI in the region in 1995 (table 3). Much of the FDI went into services (distribution, tourism), but between two-fifths and three-fifths of the total went into industry.

Joint ventures are an alternative to FDI. The key difference is that joint ventures imply no controlling equity stake by the foreign partner. From the perspective of an enterprise in Central and Eastern Europe, joint ventures with Western firms may result in the provision of intermediate inputs, know-how, equipment, or a variety of services ranging from design, to production and management techniques, to distribution and marketing. FDI implies a longer-term commitment to the domestic firm and may give rise to greater transfer of (proprietary) technology as well as capital. Although numerous joint ventures have been established between firms in Central and Eastern Europe and the West, comprehensive data on this are not available.

Imports of intermediate inputs and capital goods may also occur through outward processing trade (OPT). Independent trade involves no cooperative relationship and less communication between domestic and foreign firms. Instead,

domestic enterprises find sources for inputs and equipment and seek to obtain export contracts independently.

OPT, or subcontracting arrangements, involve greater communication with foreign firms and may be an important avenue for the transfer of technology, especially soft technology. OPT is a customs regime under which enterprises based in the European Union may ship components abroad for processing and reimport the processed commodities free of duty or quantitative restrictions, if applicable. Corado (1995) and Naujoks and Schmidt (1994) describe and discuss OPT and European Union rules on OPT. Helleiner (1973) and Keesing and Lall (1992) discuss the potential benefits associated with subcontracting. For example, the foreign partner will require that production meet specifications (both with respect to design and maximum defect rates), and this may require the implementation of quality control systems. The partner will also require timely delivery of production and will therefore need to be convinced that management can deal with possible disruptions in the supply of inputs from local suppliers. Interviews with Central and Eastern European enterprises that have subcontracting agreements with European Union firms reveal that foreign buyers frequently provide information on possible sources of equipment and inputs and make strong recommendations to source from a limited number of possible suppliers.

The European Union collects statistics on OPT, which consists mostly of subcontracting (European Union, COMEXT data base). In 1994, goods entering the European Union under outward processing customs regimes accounted for about 17 percent of total Central and Eastern European exports to the European Union, up from 10 percent in 1989. Similarly, imports from the European Union for processing grew from 7 to 12 percent of the total. Processing activities generated almost one-third of Romania's exports to the European Union in 1995, up from 13 percent in 1989. OPT for the other Central and Eastern European countries accounted for 10–20 percent of total exports. Most of the processing occurs in leather and footwear (20–30 percent of total exports) and in textiles and clothing (60–80 percent), both of which are sensitive to pressures for protection by European Union industries. Other industries with significant OPT include electrical machinery (10–16 percent), precision instruments (16–18 percent), and furniture (15–20 percent). Most of the furniture processing is concentrated in the Visegrad countries. OPT also occurs for agricultural goods. In 1993 almost 5 percent of Poland's agricultural exports to the European Union entered under the OPT regime. This was due in part to the processing of raw crustaceans and other fish in Poland (Naujoks and Schmidt 1994).

The European Union tariff provides the incentive to use the OPT customs regime. For many industrial products, tariffs are zero or negligible for Central and Eastern European exporters as a result of the Europe Agreements. Thus OPT measures only part of the more general phenomenon of two-way trade in goods that make up an industry's production chain. Unfortunately, data are not available with which to estimate the importance of such intra-industry trade. In prin-

principle, we could use input-output tables if data are reported on the origin of imported intermediate inputs that are used in production. Unfortunately, the input-output tables of the Central and Eastern European countries do not do so, making it impossible to relate imports of intermediates from and exports of goods to the European Union. However, the available input-output tables do report information on total imports of intermediates used by industries. This allows us to calculate the ratio of imported to total intermediate consumption. We regard this ratio as a measure of integration into the world economy and as a reflection of the upgrading process. Producers use the imported inputs in production for both the home and foreign markets.

In section III we analyze the relative importance of three variables—OPT, imports of inputs more generally, and FDI—as determinants of the observed export structure. FDI, joint ventures, and subcontracting may all be associated to a greater or lesser extent with an increase in imports of inputs. Although we control for FDI, this is not possible for joint ventures and subcontracting, although to some extent subcontracting is captured by OPT. Thus the import variable is not limited to arm's-length, independent exchanges. Whether we should expect the three variables to have a positive or negative association with changes in export structure is unclear. For example, firms may use OPT to keep existing facilities in operation by engaging in subcontracting activities, or they might use OPT to diversify production and penetrate new export markets. In the first case OPT would not be associated with a change in export composition; in the latter it would. The same ambiguity pertains to integration through more general sourcing of inputs from foreign providers. Even established sectors that entrepreneurs consider viable most likely will require substantial efforts to upgrade quality and improve productivity.

In principle, the same ambiguity arises with respect to FDI, because foreign investors should invest in those sectors where positive returns are expected, which may or may not be traditional activities. If foreign investors are risk averse, they may target sectors where export capacity and associated human capital already exist. Even if the existing capital stock has little value, the availability of a qualified and experienced labor force may provide an incentive for investors to prefer such sectors over others. Governments may have an interest in encouraging FDI in existing facilities so as to maintain employment. In a related vein, countries may attract FDI by offering policy-based incentives such as tax concessions or guaranteeing some margin of protection against import competition. For example, a number of Central and Eastern European governments have granted such incentives to investors in the automotive industry. These incentives may be in sectors in which the country does not have a comparative advantage.

### III. ESTIMATION RESULTS

In this section we investigate the association between changes in export structure and OPT, imports of inputs more generally, and FDI. The dependent variable

is the level of RCAs in trade with the European Union for 23 industries in 1990–95. We use RCAs rather than the shares of commodities in total exports for each country because RCAs control for changes in both demand by the European Union for that commodity and supply by the rest of the world. Because none of the Central and Eastern European countries is a major supplier of a particular good in the European Union, their export performance will not affect the denominator of the RCA. If we use export shares as the dependent variable, we obtain results that are very similar to those obtained with RCAs.

We define industries at the two-digit level of the International Standard Industrial Classification (ISIC). The 23 sectors are those distinguished in chapter D of the ISIC, rev 3, that is, food; tobacco; textiles; clothing; leather; wood products; paper; publishing; coke and petroleum products; chemicals; rubber and plastics; other nonmetallic products; basic metals; metal products; other machinery; office and computing machinery; electrical machinery; radio, television, and communications equipment; medical and precision instruments; motor vehicles; other transport equipment; other manufacturing; and recycling. The European Union reports detailed statistics on the value of imports that enter under the OPT regime. We categorize these data at the industry level using a mapping developed by Eurostat. (We use the concordance included in the software accompanying the European Union's trade data base, COMEXT.) We also categorize detailed annual data on the value of FDI by sector collected by the national authorities of the Central and Eastern European countries for the 23 ISIC sectors. The FDI data reflect actual investment, not planned, approved, or committed flows.<sup>4</sup> We obtain data on the share of imports in total intermediate consumption (IMP) for each of the 23 sectors from national input-output tables, as reported in the statistical yearbooks of the countries (Slovenia Statistical Office 1996; Bulgarian Statistical Office 1996; Kozponti Statisztikai Hivatal 1996; Główny Urząd Statystyczny 1996; Český Spisovatel 1996; Comisia Nationala Pentru Statistica 1996; Slovenska Spisovatel 1996). Unfortunately, only Bulgaria, the Czech Republic, Hungary, Poland, and Romania report this information. The latest year for which Albania and the Slovak Republic report such data is 1993; they are therefore excluded in what follows.

FDI and IMP are not specific to the European Union in the sense that FDI or imports of intermediates are restricted to being of European Union origin. In an earlier paper, Hoekman and Djankov (1996), we attempt to map trade data on imports of intermediates into exports by Central and Eastern European industries to the European Union, which requires strong assumptions regarding the share of European Union inputs in total imports, as well as the European Union import content of exports to the European Union. The ratio of imported to total

4. Sources for FDI data are as follows: Albania, Bulgaria, Poland, and the Czech and Slovak Republics: national foreign investment agencies; Hungary: Ministry of Finance; and Romania: Romanian Development Agency. Data are available upon request from the authors. Aggregate data on FDI are reported in European Bank for Reconstruction and Development (1996).

intermediate consumption has the advantage of being transparent and not requiring such assumptions.

OPT is by definition a subset of the IMP measure (the simple correlation coefficient between the two variables is 0.43). (Simple correlations between OPT and FDI and between IMP and FDI suggest that these variables are uncorrelated.) In order to reduce standard errors of the parameter coefficient estimates, we first regress the IMP variable on OPT. We then use the residual resulting from this procedure,  $IMP^*$  (the part of IMP not explained by OPT) as the integration variable in the analysis of the change in export structure. (If we use IMP instead of  $IMP^*$ , the fit of the estimating equation is very similar, but standard errors increase.) Our data set is a so-called panel, that is, it contains observations across industries for a relatively short period of time. Using ordinary least squares on the pooled data is only appropriate if parameter values are common to all industries at all times. An *F*-test rejects the hypothesis of such a common intercept. We therefore follow the standard panel approach, using generalized least squares to estimate a random effects model.

This approach assumes that industry-specific effects vary over time and across industries; it treats these effects as random variables in the sense that they are assumed to be drawn from a given distribution for each year. An alternative is to use a fixed effects model, where it is assumed that the industry-specific effects are fixed parameters over time. The choice between fixed and random effects models in the current situation is unclear. A Hausman specification test suggests that either a fixed or random effects model could be used. Fixed effects models are costly in terms of degrees of freedom. In the absence of more information, we consider it appropriate to treat industry-specific effects as random variables. Hsiao (1986) provides a detailed discussion of the econometric issues and tradeoffs.

There are 23 sectoral observations for six years (1990–95) for Bulgaria, Hungary, Poland, and Romania and for three years (1993–95) for the Czech Republic. In addition to OPT, FDI, and  $IMP^*$ , we include annual dummies to control for macroeconomic and external shocks that are common to all the countries in the sample. For the sample as a whole, including annual dummies but not sector dummies, both  $IMP^*$  and OPT are statistically significant, while FDI is not. Including sector dummies improves the fit of the equation somewhat, but given that by definition the inclusion of an additional 23 variables will increase the  $R^2$ , the small rise suggests that sector-specific forces are not that important (table 4). However, the significance level of the FDI variable drops substantially, suggesting that FDI is correlated with specific sectors. Of the 23 sector dummies, only five are statistically significant at the 0.99 level. Two are positive (basic metals and office and computing machinery); the other three are negative (electrical machinery; motor vehicles; and radio, television, and communications equipment). In the first two there is very little FDI, while the last three generally attract a substantial share of total manufacturing FDI. The magnitude and significance of the coefficients on OPT and  $IMP^*$  are not affected by the inclusion of sector dummies, suggesting that they are not driven by sector-specific forces.

Table 4. *The Determinants of Export Structure in Central and Eastern Europe, 1990–95*

Variable	Model without sector dummies	Model with sector dummies
Outward processing trade, OPT	1.21 (2.72)	1.40 (2.91)
Foreign direct investment, FDI	-0.36 (1.57)	-0.18 (0.84)
Imports in intermediate consumption, <sup>a</sup> IMP <sup>*</sup>	8.02 (11.1)	6.71 (9.79)
R <sup>2</sup>	0.21	0.31

Note: The dependent variable is revealed comparative advantage (RCA) in trade with the European Union. RCA is the share of a commodity in a country's total exports relative to the average share of that commodity in total European Union imports. The sample includes annual data for 23 sectors for 1990–95 for Bulgaria, Hungary, Poland, and Romania and for 1993–95 for the Czech Republic, giving 621 observations. Both models include annual dummies. *t*-statistics are in parentheses.

a. The part of the share of imports in intermediate consumption that is not explained by outward processing trade. See text for details.

Source: Authors' calculations.

Regression results across individual countries reveal substantial differences in the relative importance of OPT, FDI, and IMP<sup>\*</sup> (table 5). The country regressions again include annual dummies to control for shocks that affect all sectors in the economy but do not include sector dummies because there are insufficient degrees of freedom. At the country level, OPT is significant only for the Czech Republic and Romania. FDI is statistically significant and negative in sign for Bulgaria and Hungary, insignificant in the Czech Republic and Romania, and significant and positive in Poland. A significant negative coefficient

Table 5. *The Determinants of Export Structure in Five Countries in Central and Eastern Europe, 1990–95*

Variable	Bulgaria	Hungary	Czech Republic	Poland	Romania
Outward processing trade, OPT	-0.96 (0.85)	0.60 (1.16)	0.69 (1.92)	0.36 (0.60)	2.63 (3.15)
Foreign direct investment, FDI	-0.10 (2.59)	-0.69 (6.50)	-0.24 (1.12)	0.77 (2.26)	0.69 (1.03)
Imports in intermediate consumption, <sup>a</sup> IMP <sup>*</sup>	7.36 (7.20)	4.94 (7.66)	6.98 (4.56)	4.78 (3.15)	36.95 (11.10)
Number of observations	138	138	69	138	138
R <sup>2</sup>	0.34	0.49	0.48	0.27	0.55

Note: The dependent variable is revealed comparative advantage (RCA) in trade with the European Union. RCA is the share of a commodity in a country's total exports relative to the average share of that commodity in total European Union imports. The sample includes annual data for 23 sectors for 1990–95 for Bulgaria, Hungary, Poland, and Romania and for 1993–95 for the Czech Republic, giving 621 observations. The model includes annual dummies. *t*-statistics are in parentheses.

a. The part of the share of imports in intermediate consumption that is not explained by outward processing trade. See text for details.

Source: Authors' calculations.

on the FDI variable indicates that investment is going into industries where host countries do not have a revealed comparative advantage. Only in Poland does FDI appear to be associated with traditional export activities.  $IMP^*$ , or integration, is by far the most important explanatory variable for all four countries. The coefficient estimate is particularly large for Romania.  $OPT$ ,  $FDI$ , and  $IMP^*$  explain some 50 percent of the variation in the dependent variable for Hungary and Romania. In a panel setting of the type used here, the explanatory power is quite high.

#### IV. CONCLUSIONS

Although on average relatively little change occurred in the composition of Central and Eastern European exports between 1990 and 1995, there were significant differences across countries. Hungary apparently exported very much the same products, while others such as Bulgaria and Romania changed significantly the composition of their exports, especially to the European Union.

In this article we analyze the impact of  $FDI$ ,  $OPT$ , and imports of inputs on  $RCAs$  in five countries—Bulgaria, the Czech Republic, Hungary, Poland, and Romania. We find that imports of inputs are highly correlated with the composition of exports. With only one exception (Poland),  $FDI$  is either negatively correlated with the host country's  $RCA$  in an industry or statistically insignificant. In Hungary in particular, foreign investors apparently took equity stakes in sectors that do not have a comparative advantage in European Union markets. And, with the exception of Romania, we find that outward processing activities—under which firms in Central and Eastern Europe process components received from European Union partner firms and reexport these back to the European Union—are not a significant factor.

Our analysis suggests that in most countries imports of intermediate goods and machinery drove the changes in export structure. Local enterprises apparently exploited the opportunity to acquire foreign inputs and know-how in order to improve production quality, thereby expanding their export market share in the European Union.

$FDI$  did not play a large role in this upgrading process. In this respect our results are consistent with those of Tharakan and Kerstens (1995), who in a case study of intra-industry trade find a negative relationship between such trade and  $FDI$ . Indeed,  $FDI$  was concentrated in sectors where the Central and Eastern European countries do not have a revealed comparative advantage (that is, they are not relatively specialized in terms of their export share in European Union markets): this is the case for Bulgaria, the Czech Republic, and Hungary. Of the five countries for which data are available, Poland is the only one with a significant positive association between  $FDI$  and  $RCAs$ . The negative relationship between  $RCAs$  and  $FDI$  for many of the countries implies that  $FDI$  could be a force for change. Foreign investors must perceive the industries concerned to be viable in the medium term, and over time this  $FDI$  may lead to greater changes in the

countries' export composition. Thus, FDI complements efforts by domestic industries to restructure and upgrade production facilities.

#### REFERENCES

The word "processed" describes informally reproduced works that may not be commonly available through library systems.

Baldwin, Richard. 1994. *Towards an Integrated Europe*. London: Centre for Economic Policy Research.

Bulgarian Statistical Office. 1996. *Statisticheski Godishnik 1996, Izdanie 86*. Sofia.

Cesky Spisovatel. 1996. *Statisticka Rocenka Ceske Republiky 1995*. Prague.

Comisia Nationala Pentru Statistica. 1996. *Anuarul Statistic al Romaniei 1995*. Bucharest.

Corado, Cristina. 1995. "The Textiles and Clothing Trade with Central and Eastern Europe." In Riccardo Faini and Richard Portes, eds., *EU Trade with Eastern Europe: Adjustment and Opportunities*. London: Centre for Economic Policy Research.

Drabek, Zdenek, and Alasdair Smith. 1995. "Trade Performance and Trade Policy in Central and Eastern Europe." CEPR Discussion Paper 1182. Centre for Economic Policy Research, London. Processed.

European Bank for Reconstruction and Development. 1996. *Transition Report*. London.

Faini, Riccardo, and Richard Portes, eds. 1995. *EU Trade with Eastern Europe: Adjustment and Opportunities*. London: Centre for Economic Policy Research.

Główny Urząd Statystyczny. 1996. *Rocznik Statystyczny 1996, Rok LVI*. Warsaw.

Greenaway, David, Robert Hine, and Chris Milner. 1995. "Vertical and Horizontal Intra-Industry Trade: A Cross-Industry Analysis for the United Kingdom." *Economic Journal* 105(433):1505-18.

Halpern, Laszlo. 1995. "Comparative Advantage and the Likely Trade Pattern of the CEECs." In Riccardo Faini and Richard Portes, eds., *EU Trade with Eastern Europe: Adjustment and Opportunities*. London: Centre for Economic Policy Research.

Helleiner, Gerald. 1973. "Manufactured Exports from Less Developed Countries and Multinational Firms." *Economic Journal* 83(329):21-47.

Helpman, Elhanan. 1987. "Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries." *Journal of the Japanese and International Economies* 1(1):62-81.

Hoekman, Bernard, and Simeon Djankov. 1996. "Intra-Industry Trade, Foreign Direct Investment, and the Reorientation of Eastern European Exports." Policy Research Working Paper 1652. Policy Research Department, World Bank, Washington, D.C. Processed.

Hsiao, Cheng. 1986. *Analysis of Panel Data*. Cambridge, U.K.: Cambridge University Press.

Kaminski, Bart, Zhen Kun Wang, and Alan Winters. 1996. "Export Performance in Transition Economies." *Economic Policy* 23(3):423-42.

Keesing, Don, and Sanjay Lall. 1992. "Marketing Manufactured Exports from Developing Countries: Learning Sequences and Public Support." In Gerald Helleiner, ed.,



- Trade Policy, Industrialization, and Development: New Perspectives*. Oxford: Clarendon Press.
- Kozponti Statisztikai Hivatal. 1996. *Magyar Statisztikai Evkonyv 1995*. Budapest.
- Markusen, James. 1995. "The Boundaries of the Multinational Enterprise and the Theory of International Trade." *Journal of Economic Perspectives* 9(2):169–89.
- Meyer, Klaus. 1995. "Direct Foreign Investment in Eastern Europe: The Role of Labor Costs." *Comparative Economic Studies* 37(4):69–88.
- Naujoks, Petra, and Klaus-Dieter Schmidt. 1994. "Outward Processing in Central and East European Transition Countries." Kiel Working Paper 631. Institut für Weltwirtschaft, Kiel. Processed.
- Neven, Damien. 1995. "Trade Liberalization with Eastern Nations: How Sensitive?" In Riccardo Faini and Richard Portes, eds., *EU Trade with Eastern Europe: Adjustment and Opportunities*. London: Centre for Economic Policy Research.
- Slovenian Statistical Office. 1996. *Statisticni Letopis 1996*. Letnik XXXV. Ljubljana.
- Slovenska Spisovatel. 1996. *Statisticka Rocenka Slovenska Republiky 1995*. Bratislava.
- Tharakan, P. K. M, and Birgit Kerstens. 1995. "Does North-South Intra-Industry Trade Really Exist? An Analysis of the Toy Industry." *Weltwirtschaftliches Archiv* 131(1):86–105.
- World Bank. 1996. *World Development Report 1996: From Plan to Market*. New York: Oxford University Press.