International Trade, Technology and Changing Comparative Advantage: A Comparative Study of Transition Economies (1988-1998).

Oleksandr Movshuk
Research Assistant Professor, ICSEAD

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Oleksandr Movshuk
International Centre for the Study of East Asian Development
11-4 Otemachi, Kokurakita, Kitakyushu, 803-0814, Japan
Tel. (81-93) 583-6202, Fax. (81-93) 583-4602
Email: movshuk@icsead.or.jp

ABSTRACT.

This paper analyses recent changes in the technological intensity of foreign trade in East-European and Asian transitional economies. The paper deals with 14 transitional economies, including economies whose trade patterns have not been extensively analysed previously (such as constituent parts of the former Soviet Union). To evaluate the trade performance of transitional economies, the paper uses as a benchmark the technological intensity of Asian Newly Industrialized Economies. The primary conclusion of the paper is that in almost every transitional economy the share of technologically-intensive manufacturing products still remains very low, exceeding 10 per cent in only 3 economies (Hungary, China, and Estonia). After identifying manufacturing sectors in which transitional economies most significantly expanded their comparative advantages, I found that instead of the much-needed technological restructuring, several transitional economies even further deepened their original specialization in technologically unsophisticated industries. The paper considers possible explanations for the failure of most transitional economies to upgrade the technological intensity of their exports.

Keywords: international trade, technological intensity, revealed comparative advantages, transitional economies.

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Introduction.

This paper analyses recent changes in trade performance of transitional economies of the Central and Eastern Europe, drawing parallels with the experience of transitional economies of the East Asia. In particular, I consider the ability of transitional economies in Europe and Asia to expand the share of high-tech products in total exports, emulating the trade performance of Asian Newly Industrialized Economies (ANIEs).

Evaluation of transitional economies with respect to the experience of ANIEs has been suggested in a number of recent studies. For example, Drabek and Smith (1995) drew parallels with ANIEs to evaluate the trade performance of Poland, Czechoslovakia and Hungary. They concluded that, unlike Singapore, South Korea, and Taiwan, the trade specialization of transitional economies was not concentrated in high-tech industries. Their study, however, dealt with trade patterns in 1988 and 1993, when liberal reforms in former socialist economies had just started, with hardly enough time for substantial changes to be realized.

Guerrieri (1998) analyzed more recent data (up to 1995), and observed that Hungary (and to less extend – Czech Republic) had started to make some progress in expanding the share of science-based industries. In contrast, most Central European economies still relied on exporting traditional or labor-intensive industries. Guerrieri also made comparison with the trade pattern in ANIEs (Hong Kong, Taiwan, Singapore, and South Korea), and demonstrated that in all Central European economies their revealed comparative advantages (RCA) in science-based industries were still far below the level of ANIEs.

This paper extends previous studies on trade performance of transitional economies in three aspects. First, it analyzes a larger number of transitional economies, including the constituent parts of the former Soviet Union (Estonia, Latvia, Lithuania, Russia, and Ukraine), as well as transitional economies in East Asia (China and Vietnam). Second, to make an

objective identification of high-tech industries, I applied a recent classification of manufacturing sectors by technological intensity, which was jointly developed by OECD and Eurostat (Hatzichronoglou, 1997).[1] Third, the present study evaluates trade patters of transitional economies during 1988-1998, thus making possible to identify the most recent trends in their trade specialization.

Despite the extended time span in the present study, it would be premature to use its results for projection the comparative advantages of transitional economies in the long run. For example, it is conceivable that transitional economies, specializing up to now in low-tech industries, may become powerhouses of high-tech products in the long run. After all, the trade pattern of ANIEs has being constantly changing, and at present bears little resemblance to its original composition.[2] Due to this long evolution, a better benchmark for transitional economies may be ANIEs in earlier stages of their development.

Unfortunately, due to data constraints this study remains essentially a cross-sectional comparison with little attention paid to historical developments.[3] This includes ANIEs, for which I could collect comparable data only starting from 1988. On the other hand, cross-sectional comparisons among transitional economies themselves are nevertheless informative even in the short run, indicating, for example, if transitional economies make any progress in technologically upgrading their exports. While it is unlikely that transitional economies cope

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[1]This new taxonomy distinguishes the following major high-tech manufacturing industries: 1) aerospace; 2) office and computing equipment; 3) drugs and medicines; 4) radio, TV, and communication equipment. The rest of manufacturing is allocated among industries with medium-high technology, medium-low technology, and low technology.

[2] In the 1960s ANIEs started from specialization in low-tech sectors (textiles, apparel, footwear and the like), and only in the 1970-80s did they shift to more technologically-intensive industries like iron and steel, precision instruments, transport equipment (James et al, 1989, p. 38), culminating in eventual shift to high-tech industries only in the 1990s.

[3] Historical developments in technological intensity of transition economies are analyzed in Movshuk (2001), using statistical tests for the presence of trend that were introduced by James, Movshuk (2000).

with the task faster than many decades, spend by ANIEs, it is still instructive to examine whether transitional economies follows the footsteps of ANIEs, and the extent of the remaining gap in technological intensity.

The plan of the paper is the following. Section 1 outlines the OECD-Eurostat ranking of manufacturing industries by their technological contents, and compares the classification with alternative approaches to identify trade in high-tech products. Section 2 describes data sources. Section 3 reports major findings, focusing on the share of high-tech industries in the total exports of transitional economies. This section also identified specific industries in which transitional economies had comparative advantages with respect to developed market economies. Some of these industries turned out to be technologically-intensive. The most remarkable cases were Hungarian and Chinese exports during the late 1990s, when their export shares of computers and TV (ISIC 3825 and 3832) surpassed the average level of developed countries and approached the level of some Asian NIEs. While the increasingly high-tech Chinese trade pattern has already been discussed in the literature, to the best of my knowledge, the appearance of 'Hungarian tiger' has largely overlooked. Section 4 concludes the paper.

Section 1. Classification of manufacturing industries by their technological intensity.

The definition and measurement of technology has been one of the most challenging tasks in economics, and the identification of manufacturing products with a relatively high technological content has been a difficult task, with mostly *ad hoc* solutions.

Most frequently, high-tech industries still remain combined with industries with much lower technological content. For example, Drabek and Smith (1995) distinguished five clusters of manufacturing industries by different composition of three factors – unskilled labor, human capital, and physical capital. They defined clusters with relatively more

intensive use of human capital as technologically intensive ones. However, their classification was not sufficiently disaggregated. For example, Drabek and Smith defined chemicals as a high-tech industry, failing to differentiate between its constituent parts with very different technological intensity (namely, medicines and other chemicals).

Due to this emphasis on the broad aggregates, Drabek and Smith could not capture changes *within* these broad aggregates, especially when comparative advantage for constituent parts are very different. For example, Drabek and Smith reported that in 1993 Singapore had revealed comparative advantage in cluster 1 (in their classification, they were industries that utilized very high human capital). Does this mean that *each* industry in this cluster had comparative advantage, or only some of them? The broad taxonomy in Drabek and Smith (1995) leaves the question open.[4]

More recently, Guerrieri (1998) proposed an alternative sectoral taxonomy, which are based on three vaguely-defined criteria: technology sources, technology user requirements and means of technology appropriation. This classification has a finer level of aggregation (3-digit SITC categories). However, in many cases it is unclear why some very similar industries were classified to different clusters. For example, Guerrieri classified 'antibiotics and other pharmaceutical products' as science-based industries, while 'medicinal and pharmaceutical products' were relegated to a different category, with no explanation why these arguably similar industries were separated. Similarly, 'TV, radio, other sound and image recorders and reproducers' and 'telecommunications equipment' are conventionally considered as a joint industry (ISIC 3832), but in Guerrieri's taxonomy they are classified as science-based and scale-intensive industries, respectively.

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[4]Brenton and Di Mauro (1998) also criticized the reliance on too broad categories of industries in studies transitional economies, pointing that "adjustments *within* sectors may be of greater importance than adjustments *between* sectors… [since] international specialization is increasingly being defined more narrowly than on broad industrial sectors" (p. 288).

A more explicit classification of manufacturing sectors by technological intensity was developed by OECD and Eurostat. The new taxonomy measured technological intensity by two indicators: direct R&D intensity (the ratio of R&D expenditures value added) and indirect R&D intensity (measured by technology, embodied in purchases of intermediate and capital goods). Hatzichronoglou (1997) describes in details this alternative classification.[5] The taxonomy distinguished four groups of industries with different level of technology, shown in table 1. The highest technological intensity was found in four industries: aerospace (ISIC 3845), office & computing equipment (ISIC 3825), drugs and medicines (ISIC 3522), radio, TV, and communication equipment (ISIC 3832). These manufacturing sectors had technological intensity (both direct and indirect ones) far in excess of manufacturing sectors in the second group of industries with 'medium-high-technology'. For example, technological intensity of ISIC 3522 exceeded other chemicals by about three times.

In addition to explicit criteria to differentiate high-tech industries, the OECD-Eurostat classification provides a useful ranking of industries from the highest to lowest technological intensity, with the lowest ranks occupied by paper products and printing (ISIC 34), textiles, apparel, and leather (ISIC 32), food, beverages, and tobacco (ISIC 31), and wood products and furniture (ISIC 33).

Using the OECD classification in its original form, I came across two problems. First, the definition of some industries still remained too broad. This is especially evident for low-technology indexes, all of which belong to 2-digit ISIC level, in contrast to 4-digit level of high-tech industries. Second, the OECD classification is based on manufacturing *industries*, whereas international trade data are available in terms of traded *products*. The concordance

[5]The indexes of direct and indirect R&D intensity are still imperfect, since they take into account only the input side (expenditures that are related to technology), and neglect the output side (such as the number of patents). However, international data on patents are not yet sufficiently detailed at present. Besides, unlike data on R&D expenditures, patent statistics is not comparable across countries.

between industrial and product classifications (such as ISIC and SITS, respectively) is not straightforward, especially in the case of 4-digit ISIC industries with high technological intensity. Next section describes how these complications were solved.

Section 2. Data and methods.

Trade performance of transitional economies was examined in their trade with 21 OECD members, using OECD's CD-ROM "International Trade by Commodity Statistics" for 1988-1997 and a more recent edition for 1990-1998. Trade data were classified according to SITC (revision 2). In order to convert the original SITC trade data to ISIC manufacturing sectors, I used OECD's concordance between SITC (revision 2) and ISIC (revision 2) classifications, which is available at Jon Haveman's 'Empirical Investigations in International Trade' homepage.[6]

Table 2 reproduces a fraction of this concordance for high-tech industries. It is worth mentioning that in each industry the concordance requires using SITC data from as fine as 5-digit levels of aggregation. In contrast, the vast majority of previous studies (including studies, discussed in the previous section) relied on SITC data at 3-ditit, and even 2-digit level of aggregation, thus failing to differentiate high-tech industries with sufficient accuracy.

I considered the following groups of transitional economies: East and Central Europe (Hungary, Poland, Czech Republic, Slovakia, Slovenia, Bulgaria, Romania), the former Soviet Union (Estonia, Latvia, Lithuania, Russia, Ukraine), and Asia (China, Vietnam). The trade performance of transitional economies was evaluated in comparison with Asian NIEs (Hong Kong, Taiwan, Singapore, and South Korea). The group of OECD countries included Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland,

[6]The concordance is located at: www.eiit.org/Trade.Resources/Concordances/FromSITC/sitc2.isic2.txt

Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

The trade performance of transitional economies was evaluated by several measures. For each transitional economy, I computed the share of high-tech industries[7] in its total exports to OECD markets. However, it turned out that in almost all economies the share was less than 10% (with notable exceptions of Hungary and China). In order to make differences across transitional economies more pronounced, I also calculated their export shares for a more comprehensive definition of high-tech industries in table 1, including not only high-high technology, but also medium-high technology.

In addition to these aggregate measures, I also computed RCA indexes for specific industries of transitional economies and ANIEs. This allowed me to distinguish industries where transitional economies and ANIEs had the most significant comparative advantage in their trade with developed economies.

Originally, Balassa (1965) defined the RCA index as a national export share of some i^{th} industry, normalized by the world export share of the same industry. However, the OECD trade database excludes trade flows outside OECD countries, so that the normalization had to be done by corresponding export shares of *OECD countries*, rather than of the whole world economy. As a result, RSA index for i^{th} industry in s^{th} transitional economy was defined by

$$RCA_{is} = \log\left\{ \frac{X_{is}}{\sum_{i=1}^{n} X_{is}} \Big/ \frac{\sum_{j=1}^{k} X_{ij}}{\sum_{i=1}^{k}\sum_{j=1}^{n} X_{ij}} \right\} \qquad (1)$$

where X_{is} is the total export of i^{th} industry in s^{th} transitional economy to OECD markets, while X_{ij} is the total export of i^{th} industry in j^{th} OECD economy to OECD markets. Positive

[7]In table 1 they are classified as 'high-high-technology industries'.

(negative) values of the index indicate revealed comparative advantage (disadvantage) of s^{th} transitional economy with respect to trade pattern of OECD countries.

Preliminary calculations of RCA indexes for industries, listed in table 1, indicated that the level of aggregation for some industries was too high, in particular for 2-digit ISIC industries, such as food, beverage, and tobacco (ISIC 31). For example, I found that Russia consistently had positive RCA in food, beverage, and tobacco (as shown in table 3), even though it is well known that Russia is not rich in fertile soil, while in general the efficiency of Russian agriculture remains low. The decomposition of Russian ISIC 31 into its constituent parts (ISIC 311/311, 313, 314) did not explain the result, though it revealed that it was food products (rather than beverages or tobacco) that had positive RCA. The culprit became evident only at 4-digit ISIC level, showing a substantial Russian advantage in exporting fish, while all other 4-digit industries (such as meat products, dairy products, fruits, vegetables) had negative RCAs.[8]

To avoid such unwarranted conclusions about other broadly defined industries, I further subdivided the original list of industries in table 3. For example, scientific instruments were partitioned into: a) professional and scientific equipment; b) photographic and optical goods; c) watches and clocks. Similarly, I separated armaments from general machinery (due to frequent specialization of some transitional economies in arms trade).

Section 3. Results.

Before examining trade patterns of transitional economies with developed economies, it is

[8]The extend how export of fish affected the aggregate Russian RCA index for food products is evident from the following decomposition: in 1994, the total Russian export of 'food products' (ISIC 311/312) was 1,583,852 dollars, accounting for 94.8% of 'food, beverages, tobacco' (ISIC 31). Furthermore, the export of fish (ISIC 3114) was 1,167,438 dollars, or 73.7% of the total 'food products'. In particular, Russian export of fish to Japan was 709,863 dollars or 60.8% of the total fish exports, far above the second country (USA) with Russian exports of just 92,464 dollars).

instructive to check whether this portion of trade was significant for transitional economies in the first place. The geographical distribution[9] is illustrated in Table 4. With few exceptions, the share of OECD countries was above 60%, while the share of Russia dropped in most transitional economies to less than 5%. In a number of cases, there was a substantial diversity across trading partners of transitional economies. For example, trade with Finland, Denmark, Sweden had a disproportional share in the trade of Estonia and Latvia. In fact, with these 3 OECD members excluded, the OECD share of Estonia and Latvia dropped from 80.5 to 40.5% and 60.8 to 44.9%, respectively.

The dynamics of trade specialization has been no less remarkable. With few exceptions, the share OECD countries increased in essentially all transitional economies, most significantly (by 10-20%) in Romania, Bulgaria, and Slovakia. These countries also registered largest gains in the share of exports to European community. The share of Eastern Europe remained basically constant, with two exceptions: a sharp drop in Slovakia by 12.7% (mostly – due to decrease in its trade with Czech Republic), and an increase in Ukraine by 7.5%. The share of trade with Russia declined in almost all transitional economy, especially in Ukraine (by 17.1%), Estonia (by 12.1%), and Bulgaria (by 5.9%).

Has the expansion of trade with OECD economies been accompanied with upgrading the composition of trade towards a greater share of high-tech industries? Table 5 demonstrates that this positive tendency has been pronounced in only few transitional economies, in sharp contrast to trade composition of ANIEs. For example, during 1995-1998 the median share of high-tech industries reached 77.6% in Singapore, 44.3% in Taiwan, 39.5% in Korea, and 23.5% in Hong Kong, (however, the lower share for Hong Kong is most

[9]Note that before 1994, many transitional economies were either not independent, or their trade mostly consisted of barter with ambiguous valuation, especially in the former Soviet Union.

likely a sign of inaccurate trade statistics[10]). On the other hand, the median share in transitional economies remained much lower, with only Hungary and China surpassing 10%.

However, a few transitional economies have managed to increase the share of high-tech industries quite substantially since early 1990s, especially Hungary (from 6.1% in 1993 to 25.6% in 1998), China (from 10.1% to 17.1%) and Estonia (from as low as 1.2% to 15.3%). On the other hand, in many transitional economies the share increased only slightly (Poland, Czech and Slovakia, Lithuania, Ukraine, Vietnam), or stagnated (Slovenia, Romania, Latvia, Russia), and even declined (Bulgaria). By and large, the proportion of high-tech industries in transition economies has been moving in a narrow band less than 5%, making their ordering in a given year highly susceptible to the influence of transitory effects.

To make cross-country differences more discernible, I included in the list of high-tech industries also industries with medium-high technology (as listed in table 1), and recalculated the corresponding export shares (see table 6). The extension does not affected the ordering of top three countries (Singapore, Taiwan, Korea), but the rank of Hong Kong slipped from 4 to 5, while the rank of China dropped from 6 to 9. On the other hand, Hungary jumped to number four, and was followed by Czech Republic and Slovenia. In contrast, Russia, Latvia and Vietnam remained among laggards.

The ranking of countries appears to support the concept of 'Dutch disease', when a narrow trade specialization, based on rich endowments with natural resources, leads to the appreciation of domestic currency, eventually hindering any deep restructuring of high-tech industries due to worsened terms of trade. Previously, the effect was mentioned with respect to Russia and other research-rich Central Asian economies (European Bank for Reconstruction and Development, 1999, p. 180), but it appears that the scope for the effect is

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[10]Hong Kong has been a major entrepot center for Chinese trade, and often trade statistics for Hong Kong includes not only genuine trade of Hong Kong, but also exports that actually originated in China. Feenstra,

wider. I checked the presence of the 'Dutch disease' in transitional economies during 1995-1999. The diversity of trade structure (in other words, the immunity to the Dutch disease) was measured by the standard deviation of RCA,[11] while the extend of technological restructuring was taken from table 6.

As shown in table 7, while trade composition in Slovenia, Latvia, Ukraine, and Vietnam has become more diversified, changes in other transitional economies were less pronounced. More telling is the close cross-country correspondence between the share of high-tech industries (last column in table 6) and the diversity of RCA (last column in table 7). Chart 1 reveals a clear-cut negative relationship, which means that countries with diversified structure of their exports (such as Hungary) exported a high proportion of high-tech products, in other words, they were immune to the Dutch disease.

Given that so many transitional economies were not so successful in expanding their high-tech industries, in which other industries did transitional economies reveal their comparative advantages? More specifically, have transitional economies continued to specialize in low-tech industries like ANIEs in the 1960s, so that the analogy with the ANIEs of the 1990s was in fact too far-fetching for them? To answer these questions, consider RCA indexes for specific manufacturing industries. To save the space, table 8 reports only 6 industries per country that experienced the most significant, in my opinion, transformations of comparative advantages.[12]

The largest comparative advantage in *Hong Kong* was in watches and clocks, as well as in textile and clothing, reflecting, most likely, previously mentioned inclusions of exports from the mainland China. On the other hand, high RCA indexes for 'office and computing

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Lipsey, Bowen (1997, pp. 11-14) made a similar observation.

[11]The same measure was used by Lee (1986), who found a substantial diversification of export structure in Japan (before the 1960s), Taiwan (in the late 1960s), and Korea (in the early 1970s).

[12]Results for all industries are available upon request.

machinery' and 'radio, TV and communication equipment' appear to reflect mostly genuine comparative advantages of Hong Kong.

A more clear-cut picture is evident in exports from *Taiwan*, *Singapore*, and *Korea*. In general, their RCAs in high-tech industries have been increasing (especially in 'office and computing machinery' and 'radio, TV, and communication equipment'), while their RCAs in low-tech industries became less pronounced, or even turned negative (see, for example, 'textiles and clothing' in Taiwan and Korea, 'pottery and china' in Taiwan, and, finally, 'petroleum refineries' and 'coal and petroleum products' in Singapore, which used to be called the "Houston" of Asia).

The dynamics of RSA in *Hungary* has been one of the most remarkable. First, Hungary started to look as if it was another NIEs, with RCA indexes in 'office and computing machinery' and 'radio, TV, and communication equipment' rapidly becoming positive and large in magnitude.[13] Comparative advantage in electrical machinery was also rising. On the other hand, after a brief specialization in armaments, Hungary eventually switched to more technologically intensive industries (in contrast to a large number of other transitional economies that continue the specialization up to the present). It is also noteworthy that lately Hungary essentially abandoned its specialization in petroleum refining and food products, though it had comparative advantage in these industries even in the early 1990s.

On the other hand, Poland, Czech and Slovakia, and Slovenia have largely failed to achieve comparative advantages in high-tech industries, even though these countries are often included among the successful transitional economies. For example, positive RCAs in *Poland* were concentrated mostly in traditional industries, such as non-ferrous metals, coal

[13] The rapid technological upgrading of Hungarian industry was also identified in a recent study of the Vienna Institute of International Economic Studies, which estimated an astonishing 71% surge in industrial productivity between 1989 and 1998 (reported by *the Economist*, February 26, 2000, p. 76).

and petroleum products (reflecting, in part, rich coal deposits in Poland), and textiles and clothing.

The latter specialization is especially noteworthy, since it apparently reflects a recent surge in so-called 'outward-processing trade' (hereafter – OPT) between Poland and the EU. In contrast to direct exports to EU, OPT agreements subject to much stringent trade duties and other restrictions **(**Eichengreen and Kohl, 1998). Not surprisingly, OPT was primarily concentrated in so-called 'sensitive' industries (most of which are labor-intensive, but are not technology-intensive), such as apparel and textile, clothing, footwear, and furniture. According to Eichengreen and Kohl, during the initial stage of transition it was Hungary that was the leader of OPT, accounting for 34.5% of the total OPT in Central Europe in 1988. However, in 1996 the Hungarian share dropped by half (as OPT was replaced by FDI), while the corresponding Polish share increased from 26.1 to 35.3%, turning Poland into the geographical center of OPT among European transitional economies.

Though recently OPT has shifted from traditional labor-intensive to high-tech industries,[14] the dynamics of RCA indexes for Hungary and Poland in table 8 indicates that the Hungarian replacement of OPT by FDI was accompanied a positive shift in its comparative advantage in high-tech industries, while the continued emphasis on OPT in Poland reduced Polish specialization in traditional industries to much less degree (if at all). It remains an open question whether these trends were, in fact, causal ones.

With a few exceptions, *Czech Republic* and *Slovakia* resembled each other in the pattern of their comparative advantage. For example, in both countries RCA index in motor vehicles became positive in the late 1990s, evidently reflecting increased exports to Western Europe from Czech and Slovak subsidiaries of foreign carmakers. Besides, both countries

[14]For example, Eichengreen and Kohl (ibid.) mentioned more recent agreements in electrical machinery and telecommunication equipment

preserved their comparative advantages in electrical machinery, and in more traditional glass products and textiles and clothing.

Simultaneously, Czech Republic and Slovakia have been increasing their share in the total OPT in Eastern Europe,[15] and, like in the case of Poland, the OPT expansion appears to benefit mostly traditional industries, failing to bring about a substantial growth in export shares of high-tech industries (as table 5 shows, in both Czech Republic and Slovakia the share has never exceeded even 5%, placing these countries right next to Poland, which itself managed to surpass 5% only in 1998).

Despite these wide-ranging similarities, there was one noteworthy difference between Czech Republic and Slovakia, which appears to differentiate other transitional economies in Europe as well. It was trade in armaments. In ISIC classification 'armaments' is hidden in ISIC 383 (general machinery). Even though many of transitional economies were actively engaged in arms trade, this kind of trade has hardly been comprehensively discussed in the literature. Table 8 shows that Czech Republic consistently had comparative advantage in arms trade, whereas Slovakia never has a positive RCA index.[16]

Slovenia turned out to have a surprisingly similar trade pattern to Czech Republic and Slovakia. In all these countries RCA index for motor vehicles has turned into positive since mid-1990s, and by and large was also positive in electrical machinery. In the same way, Slovenia revealed comparative advantages in such traditional industries as textiles and clothing and wood and furniture (especially in furniture, which, incidentally, is often subject

[15]Separate data for these countries are unavailable before 1993, but for the whole Czechoslovakia Eichengreen and Kohl (ibid.) report an increase from 9.6 to 23.7 during 1988-1996.

[16]It is noteworthy that in the early 1990s Hungary also had unusually large share of arms trade, but since the mid-1990s Hungarian RCA index for armaments has been always negative. Polish RCA index for arms trade (not shown in table 11) has always been negative, by and large – well below zero.

to OPT agreements). On the other hand, the share of high-tech industries in Slovenia failed to exceed even 2% of its total exports to OECD countries.

Comparative advantages of *Bulgaria* and *Romania* were most pronounced in ferrous metals, in textile and clothing, and in armaments (but only since the mid-1990s). Until the early 1990s Bulgaria had positive RCA index for food products, but more recently Bulgaria lost its comparative advantage in the industry. RCA indexes for food industry. At less aggregate level Bulgaria still retained a significant comparative advantage, primarily in exports of fruits and vegetables, while meat products and fish also remained above zero, but only marginally. However, since the late 1980s there have been pronounced downward trends even in these relatively more successful sectors of Bulgarian food industry, further jeopardizing the revival of the Bulgarian food exports in the future.

On the other hand, Romanian specialization in wood and especially furniture has been largely unchallenged, evidently due to support from a great number of OPT agreements in the latter industry.

Estonia, *Latvia*, and *Lithuania* also revealed strong comparative advantage in wood and furniture, but, in contrast to Romania, this was primarily due to expanded exports of wood products rather than furniture. Even though Baltic states do not have any significant petroleum deposits, they all had positive RCA in petroleum refining, due to transporting and reprocessing significant amounts of crude Russian oil. Baltic states have also achieved comparative advantage in textile products, with the most pronounced shift in Latvia and Lithuania. Finally, Estonia and Lithuania were successful in exporting their diary products. Unlike Bulgaria and Romania, no Baltic state has registered a positive RCA in arms exports.

Comparative advantages of *Russia* were concentrated in resource-based industries, often masking comparative advantages at more disaggregated level, as already illustrated in table 3. Likewise, significant Russian RCA in jewelry was predominantly due to exports of

unprocessed diamonds. Russian abundance in natural resources contributed to comparative advantages in non-ferrous metals (with corresponding RCA index at the highest level among transitional economies), in petroleum and coal products, and in wood products. Similarly to its north-east neighbor, *Ukraine* from time to time had positive RCA in exporting armaments (rapidly turning into a major competitor of Russia in arms trade), as well as in non-ferrous metals (due to exporting largely aluminum, whereas Russia had positive RCA also in platinum, copper, nickel, uranium and other non-ferrous metals). The primary Ukrainian comparative advantage has remained in ferrous metals, though more recently positive RCA indexes appeared in textiles and clothing and in food products (reflecting expanding exports of meat, diary products, oils, and sugar products), as one can expect from the former bread-basket of Europe.

Finally, two Asian transitional economies revealed very dissimilar patterns of their comparative advantages. Starting from late 1980s, *China* had positive RCA in radio, TV, and communication equipment, and since the mid-1980s – also in office and computing machinery. At the same time China continued to preserve its competitiveness in more traditional industries, predominantly, in watches and clocks, in pottery and china, in textile and clothing. On the other hand, China lost its comparative advantage in food products (though at less disaggregated level it still had positive RCA in fruits, vegetables and in fish). In contrast, *Vietnam* specialized in more limited number of industries, primarily in apparel, in leather products, in footwear, and in fish. Unlike China, Vietnam still had a minuscule proportion of technologically-advanced industries in its total exports.[17]

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[17] *The Economist* (January 8, 2000) gives a telling example of Vietnamese car industry. At present, as many as 11 car companies operate in Vietnam, most of them are joint ventures with foreign producers. Nevertheless, their total output in 1998 was a paltry 5,000 vehicles. In particular, "Mercedes Benz Vietnam has sold only 500 cars since it started in 1996" (p. 64).

Section 4. Conclusions.

While many papers on transition still focus on macroeconomic stabilization and privatization (for which many transitional economies have been lavishly praised for their achievements), this paper focused on yet another task of transition, which is especially important in the long run – technological restructuring. This goal is especially important for transitional economies, since all of them inherited large chunks of largely inefficient traditional industries that proliferated during the heyday of socialist industrialization in the former communist block.

The paper demonstrated that in most transitional economies the technological restructuring continues to be basically insignificant. The only exceptions were Hungary, China and (with some reservations) Estonia, whose international specialization increasingly resembles the trade pattern of four NIEs, which were also considered in this paper.

Reasons for less spectacular results in other transitional economies remain unclear, though on several occasions I mentioned excessive specialization in OPT, which has provided transitional economies with an easier access to Western markets, but at the same time apparently preserved their specialization in labor-intensive industries instead of replacing them with high-tech ones. Incidentally, Hungarian switch from OPT to FDI from early 1990s led to a substantial expansion of high-tech industries in its exports to developed countries, quite similarly to China which always relied of FDI as the primary source of technological restructuring. Evidently, more research is still required to understand the *causes* of poor technological restructuring in the majority of transitional economies.

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Table 1. Classification of industries based on technology intensity

	ISIC Rev. 2
High-high-technology industries	
Aerospace	3845
Office & computing equipment	3825
Drugs & medicines	3522
Radio, TV & communication equipment	3832
Medium-high-technology industries	
Scientific instruments	385
Motor vehicles	3843
Electrical machines, excluding radio, TV & communication equipment	383-3832
Chemicals, excluding drugs & medicines	351+352-3522
Other transportation equipment	3842+3844+3849
Non-electrical machinery, except office & computing equipment	382-3825
Medium-low-technology industries	
Shipbuilding & repairing	3841
Other manufacturing	39
Non-ferrous metals	372
Non-metallic mineral products	36
Metal products	381
Petroleum refineries & products	353+354
Ferrous metals	371
Low-technology industries	
Paper, products & printing	34
Textiles, apparel & leather	32
Food, beverages & tobacco	31
Wood products & furniture	33

Source: Hatzichronoglou (1997).

Table 2. OECD's concordance between ISIC (rev. 2) and SITC (rev. 2) for high-tech sectors.

Aerospace	3845	❑ 7131 (internal combustion piston engines for aircraft), except 50% of 71319 (parts of aircraft engines); ❑ 714 (engines and motors, non-electric), except 71488 (other gas turbines, n.e.s.) and 71499 (parts of engines and motors); ❑ 792 (aircraft and associated equipment and parts), except 79283 (catapults and similar aircraft launching gear).
Office and computing equipment	3825	❑ 74525 (weighing machinery including weight-operated counting); ❑ 74526 (weighing machine, weights of all kinds and parts); ❑ 75 (office machines and automatic data processing equipment), except 75182 (photocopying apparatus) and 75919 (parts of and accessories suitable for photocopying apparatus).
Drugs and medicines	3522	❑ 30% of 29291 (vegetable saps and extracts); ❑ 541 (medicinal and pharmaceutical products), except 5419 (pharmaceutical goods, other than medicaments); ❑ 59224 (protein substances and their derivatives); ❑ 59893 (preparations culture media for development of microorganisms).
Radio, TV and communication equipment	3832	❑ 76 (telecommunications and sound recording apparatus); ❑ 7722 (printed circuits and parts thereof); ❑ 774 (electric apparatus for medical purposes, radiology); ❑ 776 (thermionic, cold and photo-cathode valves, tubes, parts), except 77681 (piezoelectric crystals, mounted); ❑ 77882 (electric traffic control equipment for railways, roads etc.); ❑ 77883 (electric sound and visual signaling apparatus); ❑ 79283 (catapults and similar aircraft launching gear); ❑ 89832 (gramophone records, recorded tapes, etc.).

Source: http://www.eiit.org/Trade.Resources/Concordances/FromSITC/sitc2.isic2.txt

Table 3. Russian RCAs at various levels of aggregation.

ISIC		1992	1993	1994	1995	1996	1997	1998
31	Food, beverages, and tobacco	0.28	0.04	0.06	-0.03	0.13	0.03	0.14
311/312	Food products	0.37	0.21	0.22	0.15	0.33	0.26	0.38
313	Beverages	-0.76	-0.88	-0.91	-1.15	-1.07	-1.05	-1.04
314	Tobacco	-5.89	-7.05	-6.00	-7.23	-6.98	-4.78	-4.69
3111	- Meat products	-0.75	-0.32	0.07	-0.02	0.10	0.00	-0.11
3112	- Dairy products	-0.36	-0.56	-0.49	-0.73	-0.74	-0.93	-1.14
3113	- Fruits, vegetables	-0.89	-1.00	-1.21	-1.30	-1.22	-1.49	-2.02
3114	- Fish	2.98	2.87	2.85	2.85	3.01	2.90	3.01
3115	- Oils	0.44	-0.80	-0.43	-1.30	-1.26	-1.67	-1.73
3116	- Grain products	-1.90	-5.18	-2.52	-4.27	-5.06	-5.26	-2.93
3117	- Bakery	-6.41	-7.29	-9.40	-8.00	-7.32	-5.90	-5.26
3118	- Sugar products	-0.65	-1.96	-1.07	-1.86	-0.95	-1.18	-5.08
3119	- Cocoa, chocolate, confectionery	-4.72	-5.38	-4.28	-5.61	-3.97	-3.86	-3.60

Note: RCA index was computed by formula (1), using imports of OECD countries from Russia.

Table 4. Geographical distribution of exports in transitional economies in 1994 and 1998.

	1994					1998				
	OECD21	EU15	CE7	Russia	Other	OECD21	EU15	CE7	Russia	Other
Hungary	0.770	0.683	0.083	0.070	0.077	0.824	0.717	0.089	0.026	0.061
Poland	0.760	0.692	0.050	0.054	0.137	0.776	0.714	0.077	0.039	0.108
Czech Republic	0.652	0.596	0.225	0.031	0.092	0.750	0.688	0.207	0.021	0.022
Slovakia	0.469	0.431	0.449	0.034	0.048	0.641	0.598	0.322	0.019	0.019
Bulgaria	0.605	0.466	0.042	0.094	0.260	0.734	0.580	0.043	0.035	0.189
Romania	0.562	0.475	0.041	0.021	0.377	0.762	0.649	0.052	0.010	0.176
Slovenia	0.772	0.702	0.047	0.036	0.146	0.723	0.662	0.071	0.025	0.180
Estonia	0.712	0.634	0.014	0.170	0.104	0.805	0.710	0.010	0.049	0.136
Lithuania	0.745	0.686	0.065	0.108	0.083	0.774	0.703	0.061	0.119	0.046
Latvia	0.614	0.566	0.009	0.147	0.230	0.608	0.528	0.014	0.101	0.278
Russia	0.543	0.397	0.113		0.344	0.525	0.349	0.111		0.364
Ukraine	0.255	0.157	0.088	0.419	0.237	0.329	0.192	0.163	0.248	0.260
China	0.545	0.144	0.004	0.005	0.447	0.584	0.152	0.009	0.004	0.403
Vietnam	0.597	0.231	0.015	0.011	0.377	0.685	0.293	0.017	0.006	0.292

Source: 1998 Direction of Trade Statistics Yearbook, IMF, 1999; and *Direction of Trade Statistics Quarterly*, IMF, December 1999.
Composition of groups:
OECD21 – Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, UK, USA;
EU15 – Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, UK.
CE7- Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia.

Table 5. Share of industries with 'high-high-technology' in exports of transitional economies to OECD countries.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Median (1995-98)	Rank
Hong Kong	0.175	0.176	0.176	0.173	0.175	0.177	0.186	0.229	0.229	0.242	0.250	0.235	4
Taiwan	0.223	0.235	0.260	0.268	0.296	0.325	0.355	0.401	0.431	0.455	0.467	0.443	2
Singapore	0.580	0.583	0.598	0.614	0.651	0.703	0.746	0.768	0.774	0.792	0.779	0.776	1
Korea	0.217	0.232	0.231	0.236	0.257	0.302	0.343	0.404	0.396	0.393	0.364	0.395	3
Hungary	0.029	0.028	0.031	0.039	0.048	0.061	0.065	0.073	0.117	0.207	0.256	0.162	5
Poland	0.010	0.012	0.011	0.011	0.010	0.016	0.020	0.027	0.036	0.047	0.057	0.041	9
Czech Republic						0.024	0.024	0.030	0.029	0.030	0.038	0.030	10
Slovakia						0.016	0.022	0.015	0.015	0.025	0.030	0.020	11
Slovenia					0.013	0.018	0.020	0.018	0.019	0.017	0.020	0.018	12
Bulgaria	0.033	0.034	0.023	0.025	0.017	0.028	0.038	0.011	0.016	0.011	0.016	0.014	13
Romania	0.006	0.003	0.004	0.006	0.006	0.010	0.008	0.007	0.007	0.006	0.009	0.007	16
Estonia					0.005	0.012	0.048	0.090	0.073	0.101	0.153	0.095	7
Latvia					0.008	0.002	0.003	0.003	0.003	0.007	0.006	0.005	18
Lithuania					0.012	0.009	0.019	0.058	0.061	0.054	0.052	0.056	8
Russia					0.005	0.006	0.005	0.007	0.006	0.006	0.005	0.006	17
Ukraine					0.002	0.004	0.002	0.003	0.012	0.027	0.014	0.013	14
China	0.060	0.079	0.088	0.085	0.088	0.101	0.124	0.137	0.143	0.152	0.171	0.147	6
Vietnam	0.001	0.001	0.010	0.001	0.001	0.001	0.002	0.002	0.004	0.011	0.015	0.008	15

Note: industries with 'high-high technology' are listed in table 1.

Table 6. Share of industries with 'high-high-technology' and 'medium-high-technology' in exports of transitional economies to OECD countries.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Median (1995-98)	Rank
Hong Kong	0.361	0.339	0.341	0.339	0.336	0.340	0.350	0.398	0.403	0.413	0.418	0.408	8
Taiwan	0.411	0.435	0.474	0.484	0.509	0.540	0.571	0.616	0.645	0.676	0.688	0.660	2
Singapore	0.727	0.730	0.748	0.781	0.814	0.845	0.879	0.889	0.890	0.920	0.919	0.904	1
Korea	0.400	0.400	0.402	0.412	0.449	0.506	0.580	0.655	0.658	0.670	0.651	0.656	3
Hungary	0.267	0.274	0.287	0.319	0.347	0.378	0.424	0.499	0.539	0.636	0.689	0.587	4
Poland	0.230	0.235	0.258	0.243	0.240	0.259	0.253	0.284	0.317	0.336	0.360	0.327	10
Czech Republic						0.374	0.379	0.410	0.455	0.492	0.539	0.474	5
Slovakia						0.263	0.314	0.388	0.422	0.467	0.579	0.444	7
Slovenia					0.369	0.378	0.407	0.427	0.443	0.450	0.490	0.447	6
Bulgaria	0.310	0.311	0.257	0.276	0.242	0.256	0.265	0.265	0.272	0.242	0.218	0.254	12
Romania	0.152	0.133	0.135	0.184	0.187	0.169	0.158	0.183	0.189	0.167	0.170	0.176	15
Estonia					0.183	0.136	0.191	0.234	0.219	0.215	0.271	0.227	14
Latvia					0.119	0.077	0.089	0.140	0.090	0.082	0.083	0.087	17
Lithuania					0.147	0.124	0.149	0.267	0.274	0.248	0.272	0.270	11
Russia					0.174	0.178	0.174	0.174	0.164	0.140	0.149	0.157	16
Ukraine					0.196	0.235	0.241	0.232	0.277	0.247	0.232	0.240	13
China	0.176	0.203	0.216	0.215	0.218	0.237	0.266	0.301	0.319	0.338	0.362	0.328	9
Vietnam	0.037	0.031	0.026	0.015	0.025	0.041	0.021	0.018	0.025	0.047	0.068	0.036	18

Note: see notes to table 5.

Table 7. Standard deviations of RCA indexes.

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hong Kong	2.12	2.18	2.37	2.10	2.04	2.11	2.08	2.14	2.09
Taiwan	1.87	1.84	1.89	1.97	1.91	1.88	1.80	1.79	1.89
Singapore	1.61	1.58	1.76	1.79	1.78	1.85	1.85	1.79	1.68
Korea	1.61	1.60	1.57	1.66	1.68	1.79	1.64	1.69	1.48
Hungary	1.35	1.23	1.26	1.27	1.23	1.34	1.34	1.56	1.42
Poland	1.66	1.61	1.65	1.59	1.58	1.53	1.49	1.57	1.66
Czech Republic				1.52	1.54	1.56	1.48	1.45	1.59
Slovakia				1.83	1.87	2.08	1.99	1.81	1.77
Slovenia				1.63	1.74	1.68	1.65	1.64	1.54
Bulgaria	1.94	1.95	1.83	1.68	1.74	1.92	2.06	1.71	1.94
Romania	2.18	1.94	2.26	1.80	2.22	2.60	2.23	2.34	2.07
Estonia			2.29	1.98	2.20	2.36	1.97	2.29	2.35
Latvia			2.26	2.81	2.51	2.46	2.41	1.89	2.10
Lithuania			2.25	2.61	2.27	2.60	2.28	2.50	2.31
Russia			2.35	2.55	2.58	2.59	2.54	2.47	2.45
Ukraine			2.59	2.06	2.50	2.26	2.00	1.70	1.75
China	1.66	1.74	1.73	1.74	1.63	1.68	1.79	1.67	1.64
Vietnam	2.73	3.00	2.87	2.90	2.78	2.74	2.90	2.57	2.64

Chart 1. Relationship between trade diversity and the share of high-tech industries.

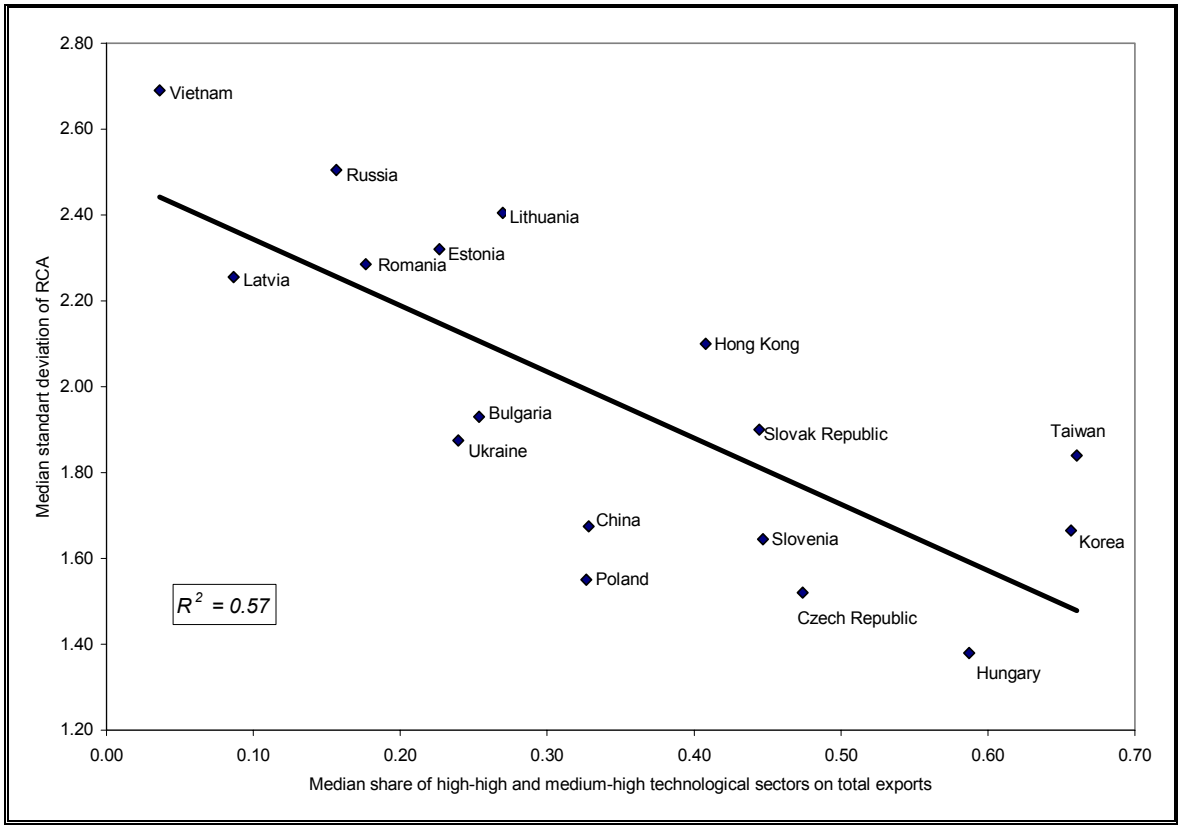

Table 8a. Industries with most significant comparative advantage in NIEs.

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hong Kong												
3825	Office and computing machinery	0.40	0.53	0.58	0.57	0.63	0.47	0.38	0.49	0.42	0.35	0.43
3832	Radio, TV and communication equipment	0.66	0.63	0.63	0.51	0.54	0.65	0.70	0.91	0.96	1.08	0.94
3852	Photographic and optical goods	0.75	0.93	0.89	0.87	0.99	1.01	1.21	1.34	1.28	1.36	1.35
3853	Watches and clocks	3.24	3.03	3.15	3.26	3.12	3.12	3.08	3.06	3.16	3.13	3.08
383-3832	Electrical machinery	0.38	0.19	0.01	-0.01	-0.15	-0.15	-0.05	0.03	0.15	0.06	0.08
32	Textiles and clothing	1.75	1.86	1.85	1.87	1.92	1.98	2.04	2.08	2.04	1.99	2.07
Taiwan												
3825	Office and computing machinery	0.79	0.97	1.21	1.31	1.49	1.52	1.57	1.67	1.80	1.82	1.79
3832	Radio, TV and communication equipment	0.80	0.80	0.77	0.61	0.66	0.77	0.80	0.90	0.92	1.00	0.89
3852	Photographic and optical goods	0.30	0.43	0.37	0.38	0.38	0.34	0.42	0.47	0.47	0.54	0.57
3842+3844+3849	Other transport equipment	1.44	1.71	1.94	1.86	1.76	1.73	1.57	1.63	1.49	1.44	1.52
361	Pottery, china	1.75	1.60	1.40	1.29	1.39	1.22	0.97	0.68	0.45	0.26	0.16
32	Textiles and clothing	0.97	0.97	0.84	0.80	0.69	0.62	0.60	0.57	0.48	0.50	0.53
Singapore												
3825	Office and computing machinery	1.83	1.93	2.03	2.10	2.26	2.33	2.39	2.43	2.49	2.50	2.41
3832	Radio, TV and communication equipment	1.61	1.59	1.60	1.48	1.47	1.43	1.37	1.31	1.24	1.21	1.09
3841	Shipbuilding	1.66	2.01	0.83	1.50	0.51	1.78	-0.38	0.86	1.71	-0.46	1.42
353	Petroleum refineries	1.78	1.72	1.73	1.50	1.27	0.81	0.81	0.85	0.83	0.49	0.21
354	Coal and petroleum products	1.57	1.74	1.59	0.54	0.34	0.08	0.60	0.42	-0.09	0.25	-0.04
342	Printing	-0.20	-0.16	-0.02	0.06	0.13	0.12	0.18	0.27	0.25	0.10	0.21
Korea												
3825	Office and computing machinery	0.14	0.26	0.29	0.24	0.42	0.62	0.62	0.81	1.00	1.04	0.91
3832	Radio, TV and communication equipment	1.10	1.19	1.19	1.15	1.25	1.39	1.48	1.60	1.50	1.47	1.26
383-3832	Electrical machinery	0.03	-0.04	-0.11	-0.09	-0.05	0.07	0.27	0.30	0.13	-0.08	-0.08
3841	Shipbuilding	1.05	1.01	1.01	1.49	0.73	2.04	1.70	1.13	1.70	1.89	1.92
371	Ferrous metals	0.31	0.21	0.31	0.46	0.62	0.49	0.29	0.07	0.16	0.16	0.58
32	Textiles and clothing	1.54	1.61	1.57	1.51	1.46	1.36	1.20	1.00	0.86	0.79	0.87

Table 8b. Industries with most significant comparative advantage in transitional economies of Central and Eastern Europe.

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Hungary												
3825	Office and computing machinery	-2.91	-3.01	-2.82	-2.57	-2.05	-1.77	-1.88	-1.17	-0.02	0.85	1.11
3832	Radio, TV and communication equipment	-1.73	-1.56	-1.10	-0.88	-0.59	-0.22	-0.17	-0.18	0.08	0.44	0.39
383-3832	Electrical machinery	0.11	0.13	0.19	0.39	0.54	0.65	0.86	0.88	1.05	1.00	0.94
	Armaments	-1.53	-1.45	-1.65	-0.07	0.60	0.44	1.42	-0.49	-0.01	-0.35	-1.24
353+354	Petroleum refining, coal and petroleum products	1.34	1.38	1.16	1.19	0.83	0.72	0.66	0.65	0.31	0.00	-0.22
311+312	Food products	1.25	1.31	1.13	1.15	0.90	0.66	0.52	0.28	0.27	-0.04	-0.28
Poland												
3832	Radio, TV and communication equipment	-2.08	-1.79	-1.89	-2.33	-2.30	-1.54	-1.35	-0.97	-0.75	-0.33	-0.26
383-3832	Electrical machinery	-0.30	-0.12	0.02	-0.05	-0.15	-0.16	-0.15	-0.05	0.15	0.26	0.42
372	Non-ferrous metals	1.33	1.24	1.17	1.37	1.31	1.07	1.35	1.14	0.93	0.94	0.83
354	Coal and petroleum products	1.59	1.85	1.89	2.27	2.23	2.22	2.43	2.35	1.97	1.99	2.22
32	Textiles and clothing	0.85	0.83	0.86	1.00	1.13	1.32	1.31	1.32	1.30	1.19	1.24
311+312	Food products	1.17	1.23	1.05	0.86	0.62	0.34	0.18	0.02	0.05	0.11	0.09
Czech Republic												
3843	Motor vehicles						-0.44	-0.67	-0.56	-0.33	0.04	0.27
383-3832	Electrical machinery						0.21	0.42	0.54	0.72	0.78	0.87
	Armaments						0.86	1.85	1.36	1.05	1.67	0.19
362	Glass products						1.74	1.57	1.54	1.56	1.46	1.46
32	Textiles and clothing						0.97	0.98	0.96	0.81	0.73	0.65
33	Wood and furniture						1.20	1.32	1.44	1.47	1.39	1.30
Slovakia												
3843	Motor vehicles						-1.40	-0.97	-0.13	0.09	0.30	0.88
383-3832	Electrical machinery						-0.45	-0.03	0.17	0.49	0.66	0.64
372	Non-ferrous metals						0.02	0.11	-0.04	0.70	0.62	0.33
362	Glass products						1.34	1.08	1.07	1.19	1.03	0.85
371	Ferrous metals						1.59	1.60	1.33	1.20	1.17	1.02
32	Textiles and clothing						1.19	1.10	1.05	1.09	1.05	0.93
Slovenia												
3843	Motor vehicles					-0.04	-0.13	0.01	0.01	0.07	0.16	0.33
383-3832	Electrical machinery					0.74	0.74	0.77	0.81	0.89	0.90	0.95
372	Non-ferrous metals					0.36	0.39	0.57	0.47	0.53	0.66	0.67
36	Non-metallic mineral products					0.50	0.62	0.63	0.65	0.64	0.62	0.64
32	Textiles and clothing					1.26	1.31	1.22	1.21	1.13	1.09	1.01
33	Wood and furniture					1.65	1.74	1.73	1.85	1.87	1.90	1.92

Table 8c. Industries with most significant comparative advantage in transitional economies of Central and Eastern Europe and Baltic States.

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Bulgaria												
	Armaments	-0.88	-0.17	-0.23	-1.07	-0.56	-1.36	1.49	-0.02	1.75	1.21	0.93
372	Non-ferrous metals	0.25	0.11	0.03	0.92	1.44	1.65	1.86	1.86	1.72	1.70	1.69
353+354	Petroleum refining, coal and petroleum products	2.00	1.82	1.40	0.95	-0.63	1.14	0.54	0.17	0.80	0.27	-1.39
371	Ferrous metals	0.88	0.93	1.27	1.17	1.10	0.13	1.16	1.32	1.13	1.33	1.47
32	Textile and clothing	0.64	0.76	0.89	0.96	1.40	1.52	1.43	1.44	1.61	1.71	1.90
311+312	Food products	0.84	0.92	0.78	0.69	0.54	0.27	0.07	-0.13	-0.14	-0.18	-0.18
Romania												
	Armaments	-8.07	-5.54	-2.70	-1.35	-2.43	-1.72	-1.43	-1.12	1.09	1.52	0.47
372	Non-ferrous metals	1.06	0.73	0.36	0.40	0.24	0.17	1.10	1.21	0.68	0.82	0.58
353	Petroleum refineries	3.00	2.99	2.72	2.01	0.91	0.39	1.21	0.34	0.78	1.06	0.02
371	Ferrous metals	0.78	1.12	0.91	1.02	1.17	1.00	1.06	1.06	1.07	1.11	1.21
32	Textile and clothing	0.98	0.96	1.23	1.34	1.65	1.91	1.91	2.00	2.09	2.13	2.28
33	Wood and furniture	1.89	1.85	1.96	2.05	2.12	2.04	1.78	1.77	1.73	1.60	1.59
Estonia												
372	Non-ferrous metals					1.69	1.14	0.49	0.13	-0.53	-1.25	-0.92
353+354	Petroleum refining, coal and petroleum products					1.74	1.96	1.57	2.28	2.52	2.83	2.67
32	Textile and clothing					1.37	1.55	1.62	1.52	1.41	1.32	1.36
3112	Dairy products					1.84	1.45	1.51	0.62	0.81	0.94	0.58
3113	Fruits, vegetables					0.29	0.80	1.17	-0.24	-0.01	0.07	-0.34
33	Wood and furniture					1.67	1.80	2.10	2.19	2.29	2.25	2.25
Latvia												
372	Non-ferrous metals					0.86	1.45	0.83	0.00	-1.54	-1.74	-0.75
353+354	Petroleum refining, coal and petroleum products					3.51	3.35	3.22	3.20	3.29	3.14	2.83
371	Ferrous metals					-0.69	-0.07	0.09	0.68	-0.52	0.26	0.78
321	Textiles					0.15	-0.03	0.59	0.82	0.80	0.81	1.16
322	Apparel					0.36	0.85	1.32	1.54	1.59	1.79	1.93
33	22. Wood and furniture					1.05	1.54	2.31	2.47	2.62	2.93	3.05
Lithuania												
351	Industrial chemicals					0.31	0.03	0.12	0.58	0.61	0.34	0.51
3842+3844+3849	Other transport equipment					-3.65	0.27	0.16	0.32	0.43	0.46	0.25
353+354	Petroleum refining, coal and petroleum products					3.33	3.20	2.96	2.27	1.86	1.98	1.52
32	Textile and clothing					-0.02	0.64	1.30	1.58	1.69	1.84	1.99
3112	Dairy products					2.17	2.65	2.59	2.36	2.08	1.92	1.84
33	Wood and furniture					0.40	0.66	1.29	1.90	2.16	2.08	1.93

Table 8d. Industries with most significant comparative advantage in transitional economies of former Soviet Union and Asia.

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Russia												
	Armaments					-0.99	0.96	1.80	0.62	-0.14	1.52	0.11
3901	Jewelry					2.77	2.71	2.75	2.48	2.66	2.75	2.74
372	Non-ferrous metals					2.33	2.62	2.80	2.78	2.73	2.80	2.90
353	Petroleum refineries					2.97	2.48	2.23	2.13	2.50	2.54	2.27
371	Ferrous metals					0.93	1.01	1.18	1.16	1.15	1.33	1.54
331	Wood products					1.29	1.39	1.33	1.16	1.30	1.32	1.33
Ukraine												
	Armaments					na	0.13	0.68	0.77	-0.27	-0.62	0.86
372	Non-ferrous metals					1.09	0.91	1.06	0.68	0.36	0.43	0.74
353+354	Petroleum refining, coal and petroleum products					3.15	2.31	1.53	1.30	1.19	1.08	0.73
371	Ferrous metals					1.56	2.48	2.35	2.37	2.32	2.46	2.59
32	Textile and clothing					-0.18	0.28	0.69	0.84	1.04	1.10	1.17
311+312	Food products					-0.33	-0.68	-0.03	0.11	0.25	0.16	-0.15
China												
3825	Office and computing machinery	-2.52	-2.00	-1.70	-1.31	-0.98	-0.64	-0.36	-0.03	0.13	0.26	0.35
3832	Radio, TV and communication equipment	-0.14	0.22	0.36	0.17	0.20	0.29	0.39	0.34	0.34	0.37	0.34
3853	Watches and clocks	1.23	1.25	1.34	1.48	1.40	1.34	1.47	1.46	1.57	1.55	1.55
361	Pottery, china	1.42	1.33	1.26	1.32	1.45	1.47	1.37	1.46	1.49	1.44	1.60
32	Textile and clothing	1.84	1.85	1.78	1.78	1.82	1.89	1.88	1.90	1.84	1.78	1.75
311+312	Food products	0.49	0.28	0.00	-0.11	-0.25	-0.43	-0.43	-0.38	-0.40	-0.44	-0.48
Vietnam												
361	Pottery, china	1.58	1.65	1.60	1.76	1.87	2.14	2.18	2.23	2.14	2.06	2.30
321	Textiles	0.88	0.95	1.02	0.89	0.80	1.01	1.13	1.16	1.08	0.93	0.93
322	Apparel	1.35	2.02	2.62	3.10	3.20	3.23	2.97	3.07	3.02	2.96	2.86
323	Leather products	-1.69	-1.20	1.45	1.94	2.34	2.79	2.83	2.97	2.86	2.81	2.97
324	Footwear	-4.49	-0.59	-0.11	1.05	1.85	2.74	3.11	3.53	3.60	3.75	3.90
3114	Fish	4.95	4.83	4.61	4.04	3.72	3.44	3.43	3.30	3.04	2.96	2.90