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STRUCTURAL UPGRADING OF MANUFACTURING IN TRANSITION COUNTRIES
Evidence from foreign trade indicators

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Abstract

This paper aims to reveal and compare the trends in qualitative development of manufacturing industry of selected transition countries over the transition period, and to find out the most important institutional and economic factors that determined these trends. The research is largely based on the prerequisite that performance of a country in the world markets reflects the state of development (i.e. competitiveness) of national industry. The authors use indicators of intra-industry trade, intensity of trade in technological goods, the proportion between

exports and imports of high-tech products, export specialization, and relative export and import unit values as proxy variables to assess the technological advancement and quality of manufacturing exports from selected CEE and FSU transition countries to the countries of the European Union. The data used is yearly for 1993-2000 from Eurostat trade database. The results show that different groups of transition countries follow different patterns of trade development with the EU countries. The authors use the aforecited indicators to construct by means of principal components method a synthetic indicator, which assures intertemporal and cross-sectional comparability of countries' performance. Further regression analysis is applied to find the possible determinants of faster/slower upgrading. The estimates show that the most important factors, which influence patterns of industrial upgrading (and, respectively, trade development), are the development of banking system, investment activity, financial integration into the global economy, lower level of protectionism and institutional stability.

KEYWORDS: Manufacturing, transition countries, foreign trade indicators

JEL classification: *F14 ; L60* ; *P27*

Introduction

With transition, former Communist countries' institutions resemble more and more those of the advanced industrial countries. Numerous studies are devoted to analysing the effect of institutional reforms on the economic performance of the countries - which is most often measured by the GDP levels achieved. In this paper we attempt to find out what influence institutional changes have on the structural and qualitative dimensions of economic development. We concentrate on the qualitative changes in manufacturing industry performance which took place in the selected transition countries during the last decade.

To assess the quality of the manufacturing industry we combine various approaches and indicators – namely; the intensity of intra-industry trade between transition countries and industrially developed countries, transition countries' technological level of exports and imports, their export composition compared with that of developed countries, and the export price gaps between the transition and developed world. All assessments are made on individual countries' foreign trade with the European Union data.

All the approaches mentioned above, based on various reflections of the countries' qualitative industrial advancement reflected in their foreign trade, turn out to be

closely linked to one another. When considering the qualitative development of the manufacturing industry, they lead to basically similar rankings of the countries. Using this parallelism in rankings by different indicators, we build a synthetic indicator of the qualitative advancement of manufacturing industry, aggregating the different indicators by the means of principal component analysis. This creates the basis for the cross-section and time-series analysis of the countries' qualitative manufacturing development.

During the period considered (1993-2000), we find some qualitative advancement in practically all transition countries of our sample However, both the speed of qualitative advancement over these eight years and levels achieved at the end of the period are on average much higher in Central and Eastern European countries (CEECs) than in Russia and other countries of the Commonwealth of Independent States (CIS) ; Baltic countries are at about middle level between these two groups.
In order to identify the fundamental factors that determined the different patterns of qualitative manufacturing development observed in the transition countries, we have applied a regression analysis. This analysis shows that low economic and political risk, economy openness and high banking system lending activity are amongst the most important determinants of the successful qualitative upgrading of a country. Our results also prove the great importance of progress in transition reforms (as measured by the transition indicators of the European Bank for Reconstruction and Development).

The paper is organised as follows. Section 1 provides the description of data and methodology used to assess the qualitative level of development of manufacturing industry in different countries. In section 2 the ranking of the selected transition countries according to qualitative advancement is presented, cross-country and cross-region comparisons are made. In Section 3 are presented and discussed the results of the regression analysis, while section 4 raises questions about the relationship between quantitative (GDP) growth and qualitative upgrading. Section 5 finally concludes.

The date and the quality of indicators

We analyse only the qualitative development in manufacturing field - this not in belief that qualitative advantages of developed countries are restricted to this sector. E. g., the high qualitative level of the financial and legal services sectors (also large quantitatively) belong to their crucial characteristics. However, data availability restricts our study to manufacturing. Furthermore, with respect to data reliability and comparability, our main database being Eurostat's Comext, we will

further restrict our analysis to foreign trade in manufacturing products with European Union member countries only.

Our data refer to different countries' trade with the EU-12 before the last wave of accession (1995) (and, correspondingly, trade with 11 countries in the case of pre-1995 EU members). Sectors analysed are restricted to a set labelled by us "narrow manufacturing". This means manufacturing (NACE D) excluding food processing (NACE DA), because of the latter's strong connection with agriculture, and also excluding the fuel sector (NACE DF), partly also because of its particular character and partly because of the complications caused in its data by "confidential trade" (trade not reported in full detail by EU member countries to Eurostat). Calculations have been performed on the highest possible level of disaggregation: partly in Combined Nomenclature (eight digits, 10015 sectors, practically product level), partly in NACE four digits (177 sectors), see details below.

The country quality indicators calculated and used in our work are grouped according to their basic nature as follows **(**their exact formulas can be found in Annexe 1).

Intra-industry trade and unit value (price) indicators (calculated in CN eight-digit breakdown):

1. *IITtotal ;* share of intra-industry trade in total trade;
2. *IITsuperior ;* share in total trade of vertical intra-industry trade with superior position, i.e. with unit values of exports exceeding the unit values of imports by more than 15% ;
3. *IIThoriz ;* share in total trade of horizontal intra-industry trade, i. e. with unit values of exports differing less than 15% from the unit values of imports ;
4. *RELunitval ;* deviation from the average unit values of total EU imports, of the unit values of exported products, in the respective countries - including intra-EU imports weighted by the volume of exports to the EU.

IITinferior is not numbered here because it is not included in the building up of the synthetic indicator. It is calculated by **:** *IITtotal - IIThoriz - IITsuperior.*

Indicators of technological level (calculated in NACE four digits):

5. *TECHexp ;* share of high and medium-high technology exports in total exports ;
6. *TECHexp/imp ;* share of high and medium-high technology products in **total** exports distributed by the share of such products in imports.

Other partial indicators:

7. *FRGptivity ;* growth of productivity per working hour in German manufacturing industries, weighted by the country's export composition in NACE four digits ;
8. *US/FRGexpstr,* linear correlation coefficient between the country's export structure and the average export structure of the US and Germany, calculated in CN eight digits.

The synthetic indicator :

9. *QULTYtotal ;* calculated from the eight partial indicators above mentioned by principal component analysis.

The performance of forty-six countries was analysed[1]. The entire set of indicators has been calculated for each country**,** for each of the eight years. However, in the present paper we mostly look at the implications of our analysis for transition countries. The sixteen transition countries that enter into this list are **;** Armenia, Belarus, Bulgaria, the Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Slovakia, Slovenia, Russia, and Ukraine.

The first question to be answered here is whether indicators 1-8, above listed**,** can meaningfully be summarised in a single synthetic one (N° 9 above). A synthetic indicator is a good idea if - and only if - all its components express a common substance (in our case, as we suppose, a given country's manufacturing industry's qualitative advancement level), but at the same time are all subject to various random effects. Then, synthesising the different indicators into one will tend to reduce the random effects, and the result will be a fairly reliable indicator of the common substance. However, if different indicators reflect substances different from or contrary to one another, then their synthesis might have little relevance.

The nature of intra-industry trade and its different indicators

The first studies of IIT, more than three decades ago, treated this phenomenon as a sign of industrial maturity (advancement). **T**he share of IIT in the trade volume of two given countries depends on several factors, of which the level of economic

[1] *Argentina, Armenia, Belarus, Benelux countries (as one unit), Brazil, Bulgaria, Canada, China, the Czech Republic, Egypt, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, the Republic of Korea, Latvia, Lithuania, Malaysia, Mexico, Moldova, Norway, Philippines, Poland, Portugal, Romania, Russia, Singapore, Slovakia, Slovenia, Spain, Sweden, Thailand, Turkey, Ukraine, the UK and the US.*

development achieved by both is one of its most important (with a positive sign)[2]. Consequently, the increase of the share of IIT in a country's foreign trade was regarded as a sign of development, and much of the literature still keeps to that tradition[3].

However, in the 1980s-1990s, economic knowledge of IIT deepened, and economists' point of view on it partially changed. The distinction between horizontal and vertical IIT gained importance, and even became the focus of numerous studies. Before these last two decades, IIT in general had appeared as a puzzle from the point of view of traditional theories on international trade (Ricardian or Heckscher-Ohlin), and had become the subject of unorthodox explanation (economies of scale, monopolistic competition and product differentiation, see e. g. Helpman (1981)). With the more recent and more refined approach, "unorthodoxy" has mostly been restricted to horizontal IIT, and vertical IIT has been reintegrated into the framework of traditional trade theories. Vertical IIT means that otherwise similar products of significantly different unit values (with the difference exceeding mostly 15%, sometimes 25% in empirical studies) are being traded against each other. The cheaper products are usually of worse quality, produced with less capital intensive technology and less human capital invested, and generally with higher amount of labour input. I.e., vertical IIT might be based on inter-country differences in factor endowments; consequently it might not differ much from traditional inter-industry trade. These characteristics of vertical IIT also imply that the latter might mostly emerge between more and less developed countries, rather than between more or less equally developed ones[4].

This new approach has given rise to numerous studies presenting vertical IIT as a typical phenomenon of the trade between the highly developed countries and

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2 The pioneering article on the determinants of IIT by Balassa and Bauwens found that the share of IIT in trade volumes is the highest within the developed countries, and it is higher between developed and developing countries than within the developing countries. Econometric tests showed a positive correlation between the average level of GDP of two countries and the share of IIT within their trade volume. Cf. Balassa. - Bauwens (1987).

3 Beyond that, the increase of trade in the form of IIT was also treated as less disruptive and less politically-socially conflictual than the increase of inter-industry trade because the former entailed less difficult, costly and painful reallocation of production factors. Cf. Greenaway, D. - Milner, C. (1987), "Intra-industry Trade : Current Perspectives and Unresolved Issues", Weltwirtschaftliches Archiv, vol 123, no 1, 39-57.

4 Furthermore, the new approach also underlines that if vertical rather than horizontal IIT emerges between two countries, there will be a tendency to lose the important advantage that was previously attributed to the emergence of trade in the form of IIT in general. Namely, factor contents of exports and imports differ in vertical IIT. The poorer country will export more labour-intensive goods, i.e. low-wage jobs in the richer one will be threatened. Cf. Greenaway - Hine (1991). And with time, jobs may also be threatened in the poorer country whose lower-quality products can be displaced by the higher-quality ones imported from the richer country, Cf. Motta (1992) and Shaked – Sutton (1984).

poorly developed ones, reproducing the well-known vertical distribution of labour between them within the otherwise new IIT framework.[5] In some studies the trade between the EU and Central-Eastern European countries is treated in this spirit (see e.g. Aturupane, Djankov and Hoekman (1999)). Along the same basic lines, Gabrisch and Werner (1998) paint a rather dark picture (from the CEECs' point of view) of the (increasingly intra-industry) trade between the two regions[6].

These studies simplify and exaggerate facts, sometimes themselves confusing, with beliefs. For Aturupane, Djankov and Hoekman (1999), vertical IIT between the two parts of Europe is resumed by, *a priori*; eastern countries exporting of products of lower unit values, and western countries exporting more expensive ones. It seems to them so obvious that they do not even test it. This also holds for Gabrisch and Werner's analysis.

Let us now look into these "models" of exceedingly asymmetrical east-west distribution of labour within the IIT framework to notice that their theoretical relevance is rather doubtful. The literature in this respect warns of the "demand effect" (Falvey - Kierzkowski 1985) which restrains sales opportunities of cheap, poor-quality products of poorer countries on the markets of richer ones, the low-price-low-quality product markets of richer countries being limited, slowly expanding and subject to strong competition. To be a significant supplier on these markets requires strength. It is *contradictio in adiecto* to suppose that the low level of the manufacturing industry's qualitative development would pair with particularly strong companies' existing on the difficult cheap-products markets of rich countries. On the basis of this consideration, we have to suppose that a less developed country's ability to export significant quantities of cheap products to more developed ones is a sign of increasing market strength of its producers, which in turn entails these producers' improving capacities to produce and export more expensive products. Consequently - let us resume - the emergence of exceedingly asymmetrical distribution of labour between more and less advanced countries within the IIT framework, as imagined by Aturupane, Djankov, Hoekman, Gabrisch and Werner, is unlikely.

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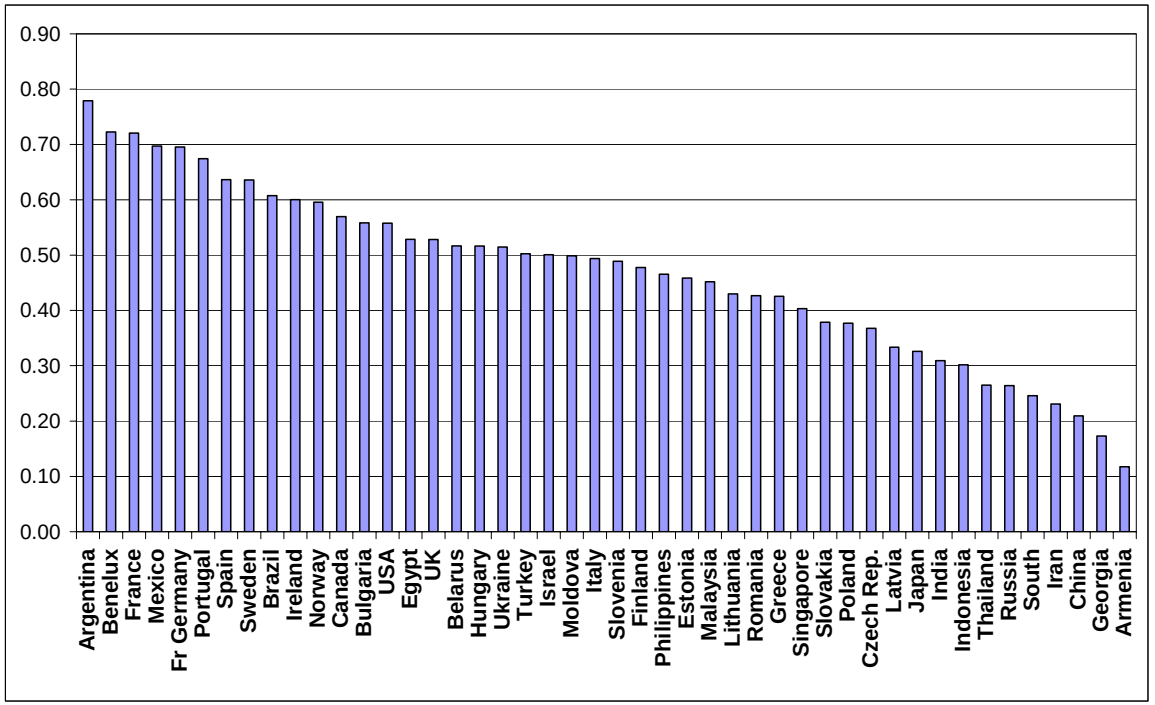
[5] *Cf. e. g. Blanes - Martin (2000).*

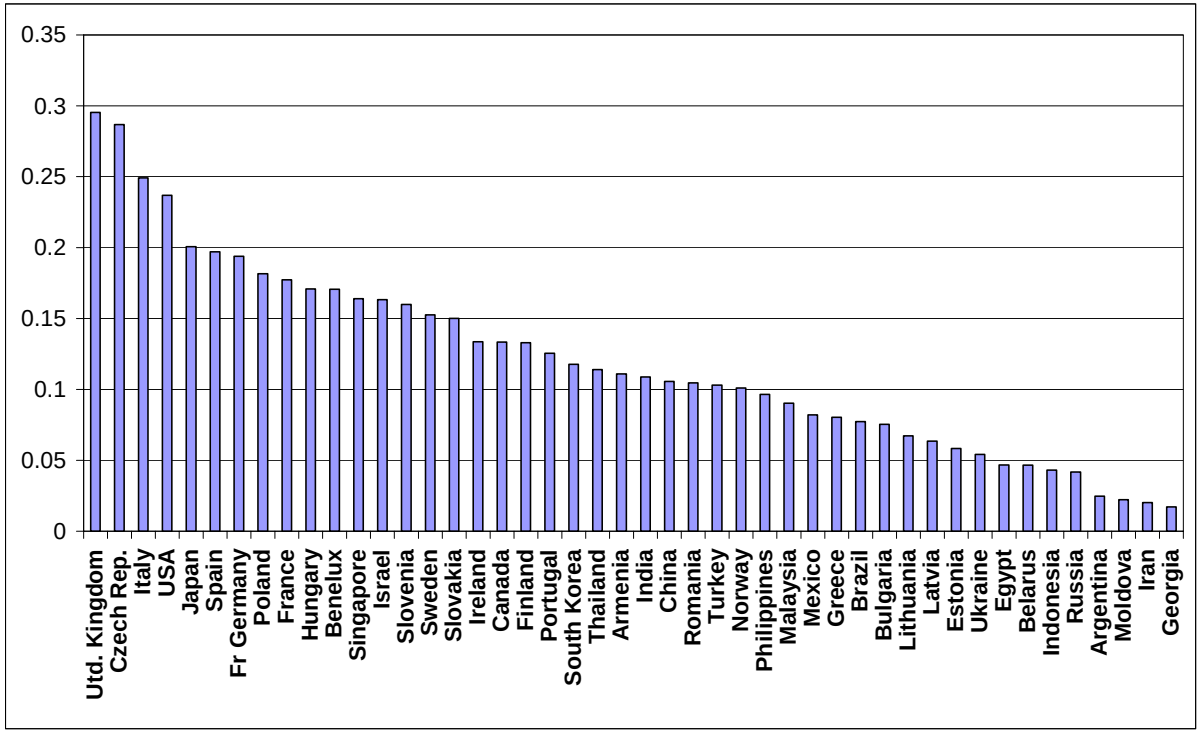
[6] *These authors write, among other things, that "the companies of a country mainly concentrate on the domestic market, the pattern of product differentiation is determined by mainstream domestic demand." And in transition economies "with comparably low per capita income the preferences can be expected to be biased toward daily needs and rather standardized products resulting from mass production rather than expensive, research intensive, or highly specialized products." Cf. Gabrisch - Werner (1998).*

Empirical data do not confirm their implausible hypothesis either. In Graph 1, we have plotted the share of *IIThoriz* plus *IITsuperior* in *IITtotal* in 2000 for our sample of countries, in diminishing order. The shares range from four-fifths **to** one-tenth, and - as can be expected - more developed countries (with more *IIThoriz* and *IITsuperior* but less *IITinferior*) tend to be on the left side, whereas less developed ones are found to be concentrated on the right side. However, these differences are gradual and exceptions are abundant. Latin American countries appear top rank (exporters of high-priced and importers of low-priced products), whereas Singapore and Japan rank lowest **;** Portugal is way ahead of the United States**;** Bulgaria (ranking first among transition countries) and Egypt show similar values to the United Kingdom **;** and Finland is outperformed by Belarus and Ukraine. Thus, more developed countries often have less advanced IIT structures with the EU/other EU countries**,** than less developed ones do. This is even more so if we measure inferior IIT not as a share of total IIT but as a share of total trade. I.e. if we simply use our *IITinferior* indicator (Graph 2), we see that in 2000 its value is significantly higher for the UK, the US, Japan, Spain and Germany than for any transition country (bar the Czech Republic). The plausible reason behind these observations is that being sellers of cheaper or more expensive products, does not require separate excellences in intra-industry trade. Even being inferior partners in this kind of trade tends to require excellence. Only those countries which are also able to be partly superior and equal partners can be inferior partners to any important extent. The class of countries imagined by the authors quoted above simply does not exist: countries with really weak manufacturing structures are basically absent from IIT, rather than subordinate partners in it. Inferior IIT is far from being **a** kind of specialty of underdeveloped countries, and *IITinferior* cannot be treated as an indicator of underdevelopment.

Graph 1. The share of *IITsuperior* plus *IIThoriz* in *IITtotal* in 2000



Graph 2. The share of *IITinferior* in total trade in 2000



On the basis of the theoretical considerations and statistical facts presented above, we have make special notice of the (not fully but) largely random distribution of a country's IIT among the horizontal and the two verticals. This is important as a theoretical foundation for the construction of our synthetic indicator. Here we must stress the fact that we are not in line with the prevalent theory that attributes radically different economic characteristics to each of the three kinds of IIT and explains each of them by different factors. In support of our approach, let us note that the econometric tests of the prevalent theory very often fail. E.g., according to the theory, the horizontal IIT of a given country with its different partners should be positively correlated with the similarity of the per capita level of GDP. In (South) Korea's case, however, it is actually (positively) correlated with the size of per capita GDP of the partner country[7]. Korea being a middle-income rather than a high-income country, this result does not support the prevalent theory. We find another similar result for (low-income) China's horizontal intra-industry trade with 45 other countries (cf. Hu - Ma 1999) even less in line with the prevalent theory (although in this case the relevant coefficient is not significant). According to it, differences in income levels should have rather**,** a positive effect on vertical IIT.

However, an analysis of Spain's IIT with 40 countries has found the exact opposite of that (cf. Blanes - Martin 2000), and so did a study of Britain's trade with its trade partners within the EU (cf. Greenaway - Milner - Elliott 1999).

Our conclusion is that *IITsuperior* and *IIThoriz* are equally important indicators of qualitative development, whereas *IITinferior*'s relevancy is somewhat vague. However, since many advanced countries display high, and less advanced ones low, *IITinferior* values, we cannot reject this indicator altogether. Our solution is to use *IITsuperior, IIThoriz* and *IITtotal*. The latter includes *IITinferior.* Keeping in mind however, that *IITsuperior* and *IIThoriz,* which appear not only as component parts of *IITtotal* but also separately, have a higher weight on the analysis than *IITinferior*.

We use yet another quality indicator, very close to the IIT indicators (as its calculation rests on unit values) **:** *RELunitval*. This indicator differs from IIT**'s**, in that it is calculated according to the unit values of total (narrow manufacturing) exports, without restriction**s** to IIT. Its other distinctive feature is that, for a given product, it compares export unit values of an individual country to the average EU import (including intra-EU import) unit values - whereas the IIT concept rests on

[7] *Cf. Chiho – Yo (2001), analysing Korea's IIT with more than 40 trading partners.*

the comparison of unit values within two-way trade flows between the trading partners (in our case the individual country and the EU).

Technological level and other indicators

The OECD-Eurostat classification of manufacturing industries – classified according to 4 technological levels ; high, medium-high, medium-low and low (see Annexe 4 for classification) - definitely helps to grasp important qualitative attributes of a given country's manufacturing industries. For the purposes of our research, we have transformed the four categories into two - high and medium-high on the one hand and medium-low and low on the other. **W**e have based them on two indicators : the share of high and medium-high technology products in exports (*TECHexp*), and the ratio between the shares of high and medium-high technology products in exports and imports (*TECHexp/imp).* Over our full sample of 368 country-years, both indicators have high correlation with each other and with the three different IIT indicators (see Table 1). This is an encouraging sign, suggesting the sensibility of trying to construct a synthetic indicator of quality of manufacturing.

Table 1. Correlation coefficients between the partial quality and the synthetic indicators

	TECH exp	TECH exp/imp	IIT Total	IIT superior	IIT horiz	US/FRG expstr	FRG Ptivity	REL unitval	QULTY total
TECHexp	1								
TECHexp/imp	0.98	1							
IITtotal	0.63	0.72	1						
IITsuperior	0.63	0.71	0.89	1					
IIThoriz	0.47	0.55	0.91	0.76	1				
US/FRGexpstr	0.70	0.73	0.86	0.76	0.82	1			
FRGptivity	0.77	0.69	0.23	0.27	0.08	0.30	1		
RELunitval	0.57	0.55	0.28	0.44	0.10	0.23	0.56	1	
QULTYtotal	0.89	0.93	0.89	0.87	0.77	0.87	0.57	0.54	1
Distance	0.27	0.11	-0.36	-0.28	-0.40	-0.09	0.47	0.18	-0.05

The strong correlation between the values of the six quality indicators treated above, has encouraged us to include others**,** without precedents in the literature. On the one hand, *FRGptivity* and *US/FRGexpstr* were included into our sample of indicators on the basis of their correlation with the first five indicators - the correlation is weaker than that between the first six indicators, but still important (see again Table 1), which gives rise to the hypothesis that they also express the same common substance - and on the other hand because of their plausibility.

Namely, to illustrate the relevancy of *FRGptivity'*s use, in Germany, a highly developed industrial country, the sectors experiencing high productivity growth should be progressive ones, belonging to those leading industrial development. Thus, a higher share of those sectors in a country's exports should be accepted as a quality indicator of its manufacturing industry. Concerning the other indicator, *US/FRGexpstr*, the similarity of a country's export structure to that of leading industrial countries**,** should again be considered a sign of industrial advancement. (Given the abundance of data, other countries' export structure could in principle also have been included into the "norm of advancement". However, including the UK would only have entailed insignificant changes in the results, whereas including Japan would have consequently reduced the correlation values of this indicator with those of the others.)

Our use of IIT indicators as indicators of qualitative industrial advancement is certainly problematic in one respect. Namely, we know since Balassa and Bauwens (1987) pioneering article, that the share of IIT in the bilateral trade of two countries depends (with a negative sign) on the distance between them (in our case, on the distance separating different countries from the EU), and this actually holds for all three of our IIT indicators, (see Table 1). However, the closeness-related bias of these indicators, and its impact on the synthetic indicator, may be compensated by opposite - distance-related - biases of other indicators, which is actually the case.

As Table 1 shows, one of our indicators positively related to distance is *RELunitval*. This is not surprising, considering that transport costs hinder long-distance trade of lower unit-value products more than that of higher unit-value products. On a similar basis, the positive correlation between distance and *TECHexp* is also comprehensible: prices of higher technology products more readily cover the costs of long-distance freight. A third case of correlation appears: a positive one, of *FRGptivity* with distance, even stronger than that of the two previous indicators. Here, however, we cannot give any economic explanation. The fact behind this phenomenon is that six South-East Asian - i.e., exceedingly distant - countries (Indonesia, Malaysia, the Philippines, Singapore, South Korea and

Thailand) have outstandingly high *FRGptivity* values. (*Nota bene;* if we repeat the calculations without these two countries the latter correlation becomes zero.)

Principal component analysis: the synthetic indicator

In order to create the basis of cross-section and time-series analysis of each country's performances, the eight qualitative performance indicators are merged into a single, synthetic one – *QULTYtotal* – for each country**,** each year (46 countries X 8 years = 368 country-years). The standard econometric solution used to summarise values of variables given in different dimensions is the principal component analysis, based on a series of correlation calculations. The principal components yielded by such a computation represent the common tendencies inherent to each variable. The first principal component explains the maximal possible share of the variance of the original variables - showing their most important common tendency. The second principal component explains as much as it can on the remaining variance, etc. In our case, the first principal component explains an outstanding 65% of the variance of the original indicators, and on this basis we can accept as the actual summary indicator of the original data (considering the remaining variance of the original indicators as noise). The weights that the initial indicators have in these linear combinations are called factor loadings. They show the extent to which each initial indicator influences the value of the principal component.

TECHexp		0.39
TECHexp/imp	0.41	
IITtotal		0.40
IITsuper		0.38
IIThoriz		0.34
US/FRGexpstr	0.38	
FRGptivity	0.25	
RELunitval	0.24	

All factor loadings are positive; this signifies that, on a normal basis, in a given observation, the higher value of an initial indicator will be accompanied by higher values of the seven other indicators, as well as of the first principal component. This again reflects the parallelism of our indicators, behind which there seems to appear a common substance - in our understanding, the level of qualitative advancement of manufacturing industry of each country.

The factor loadings of the initial indicators differ very little (except for somewhat lower figures for *FRGptivity* and *RELunitval)*, which is the evidence that they all

are significant and neither of them should be excluded from the initial characteristics system.

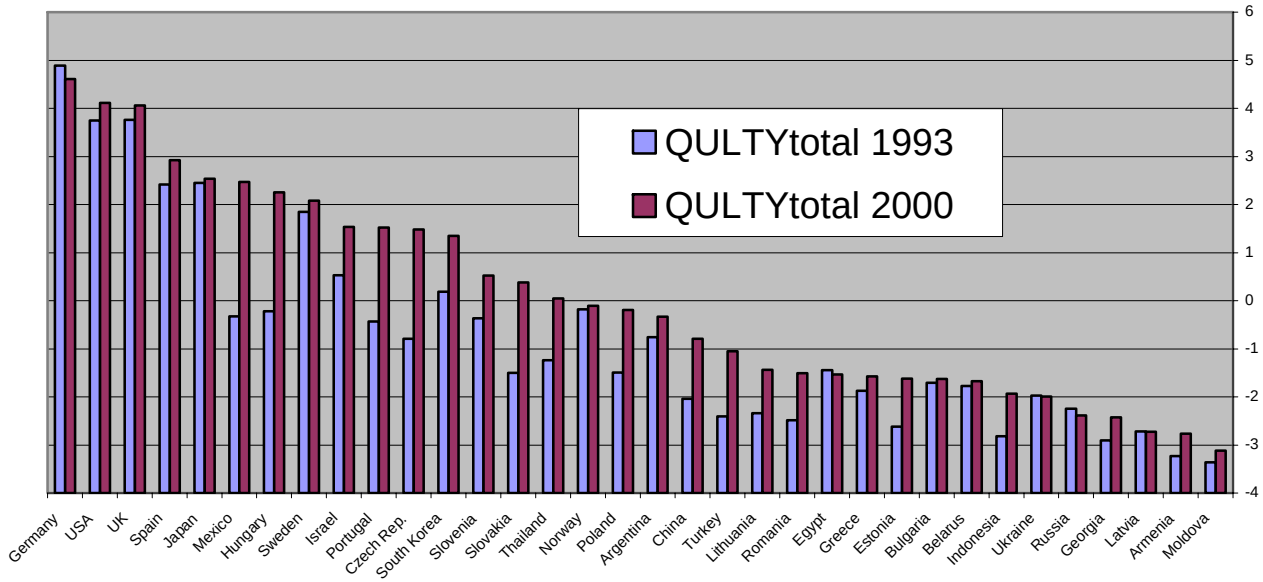
The values of the synthetic indicator have been calculated for each country, for each studied year. The individual countries' indicators for 1993 (starting levels) and 2000 (final levels) and their trend values, constructed by means of OLS on the basis of eight annual performances, will be the basis of the analysis in the following sections.

Quality–relative positions of transition countries

The level of qualitative development of transition countries and some advanced and developing countries in 1993 and in 2000 as measured by our indicator is represented in Graph 3. The countries are ranked according to their *QULTYtotal* values for 2000.

When looking at the graph, we can see that progress in qualitative development has been achieved in most of the 16 transition countries, in the observed period. Amongst them, several Central European ones have upgraded to or close to the level of advanced countries. The CEECs (except Bulgaria) are the countries displaying the fastest upgrading, while the CIS countries show a weaker growth with Baltic countries (except for very slowly advancing Latvia) performing in-between, no worse than Bulgaria or Romania. Only two countries, Ukraine and Russia, experienced (insignificant) negative growth during that period.

Graph 3. *QULTY total* in transition countries
and some advanced and developing countries in 1993 and 2000



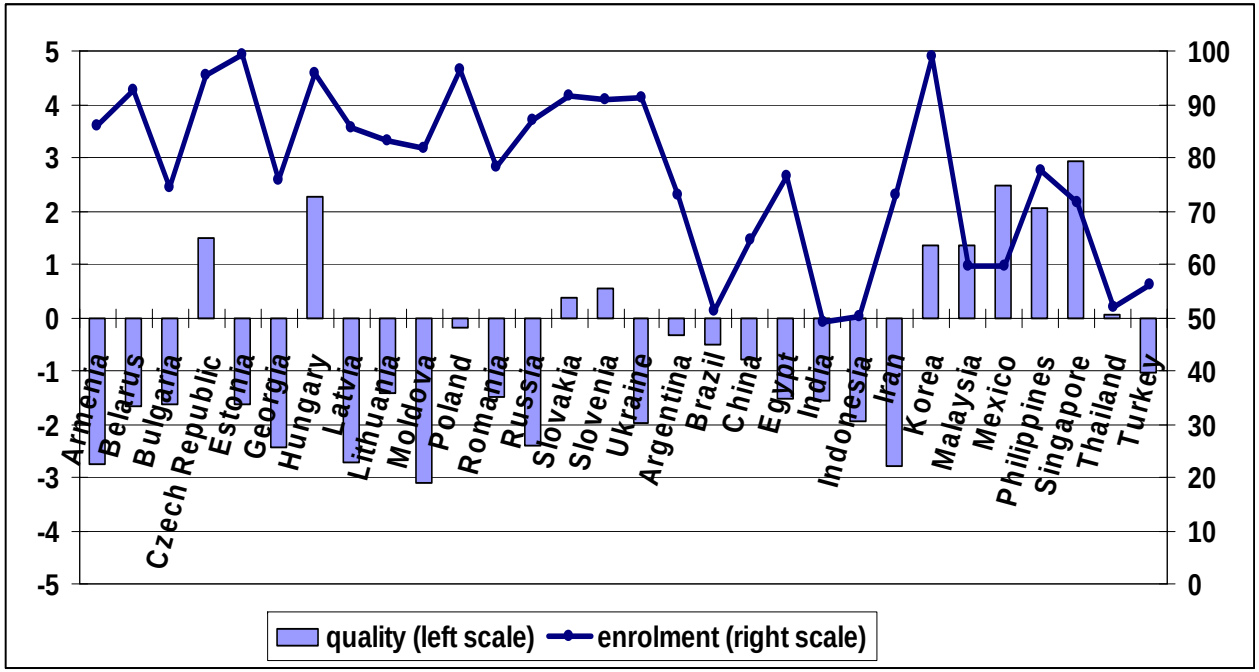
Qualitative performances, policy-influenced and other countries' characteristics – a regression analysis

Not surprisingly, the qualitative level of industrial development, as estimated by our synthetic indicator, is closely related to the individual countries' economic performance in general. On our sample of 46 countries we observe a 49% correlation between *QULTYtotal* and per capita GDP level (*GDP*). Obviously, a higher level of *QULTYtotal* tends to go in parallel with highly skilled, better paid jobs - with the latter being the particularities of richer countries.

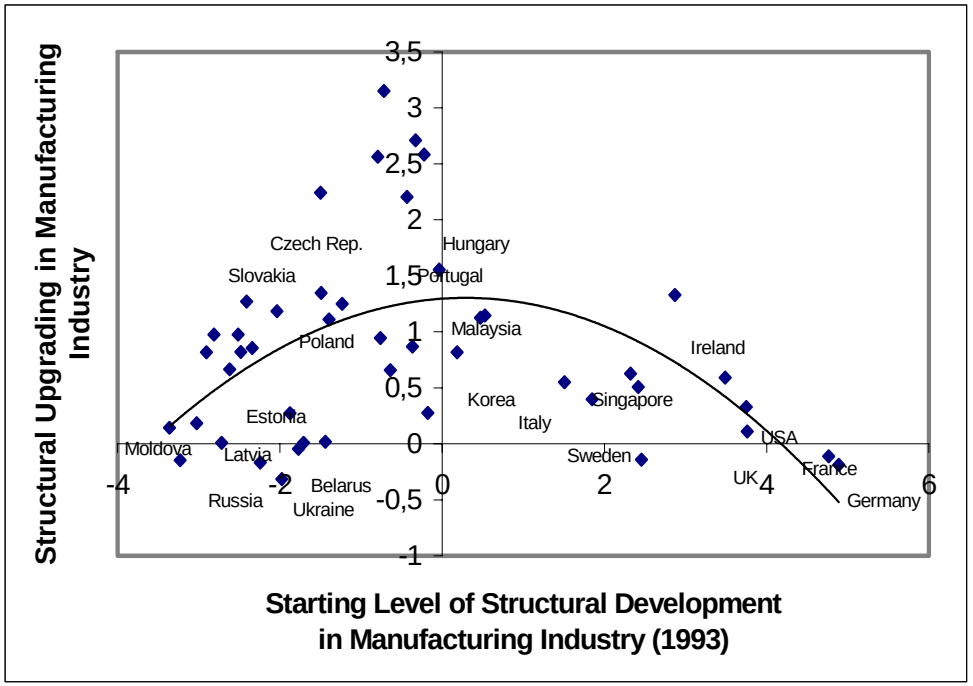
Highly skilled, better paid jobs, brings to mind education, and we could legitimately expect important correlation between our *QULTYtotal* and education indicators. However, the level of secondary education (measured by the 1993-1999 average secondary school enrolment compared to the relevant age group of the population) explains only 24% of the variance of *QULTYtotal* 2000 (with a significance level of 1%). The analogous result with higher education (tertiary school enrolment in the same years) as the independent variable is even weaker, 14%. But these figures can be increased to reasonable levels (to 47 and 33%, respectively) if a transition country dummy is added (=1 for the 16 transition countries, 0 otherwise) to our equations. This highly significant dummy seems to reflect in transition countries, a low economic efficiency of education (probably due to a rather inefficient utilisation of skills acquired during education). This is confirmed by Graph 4, where we have plotted secondary school enrolment and *QULTYtotal* 2000 for transition countries (on the left side of the graph) and other not highly developed countries (formerly labelled "third world", on the right side). The reader can see that in most transition countries a given level of school enrolment is coupled with a much lower *QULTYtotal* 2000 than found in "third world" countries. There are exceptions to this rule - mainly Hungary and the Czech Republic on the left side and Argentina, Egypt and Iran on the right -, but the general trend is rather clear.

Another observation can be made; the non-linear dependence on the starting (1993) level of qualitative advancement of the qualitative upgrading trend between 1993 and 2000. This dependence is illustrated by Graph 5.

Graph 4. Secondary school enrolment (percent of relevant age group 1993-1999)
and manufacturing quality level in 2000



Graph 5. Qualitative Development and Qualitative Upgrading Starting Levels in Manufacturing Industry in 1993-2000



The obvious explanation of this non-linearity is a saturation effect predominating in those countries who had already achieved high levels of qualitative development at the beginning of the observed period. **T**hey had consequently little headroom for further advancement. (Qualitatively most advanced countries also tend to be rich - with high levels of per capita GDP. Thus, we can say that the significant negative relationship between per capita GDP and the qualitative upgrading trend (see table 2) is just another form of the same saturation effect.) However, for countries with poor **or** intermediate starting position**s** (mainly transition and other less developed countries) the graph reflects a positive relationship between starting level and upgrading over the period observed (for the 27 countries with *QULTYtotal* 1993 below average, the correlation between the two indicators is 29%). In other words, those countries that had started from a somewhat higher level tended to improve their position faster. This important tendency is again not really surprising: individual countries faired better or worse after 1993 largely for the same reasons for which they had also performed better or worse until that year.

Of course, the latter indication does not really say anything about the circumstances (country characteristics) fostering qualitative upgrading; indeed it is rather tautological. What more we learned above about the role of education means that its explicative efficiency is not really strong, and worse than weak for transition countries, which are at the centre of our study.

Searching for factors explaining country performances, we have to make a distinction between a country's inherited conditions and those characteristics of their economies, which can in turn, be more or less, on a short- to mid-term basis, influenced by their economic policies. The classification of the possible independent variables between these two categories is not always quite obvious. Concerning the distance between countries (in our case, that with the European Union, measured as the sum of the distance separating of each country's capital from both London and Milan), it can certainly be taken for an inherited feature. It is a rather successful explanatory variable in the intra-industry trade literature, with a negative sign (see a review of that literature in Soós 2001) but, on the level of our total sample of 46 countries, it does not show (alone or in combination with other independent variables) any influence on the level of *QULTYtotal* (however, we will have to come back to it when analysing the sub-set of transition countries).

Another, mostly inherited particularity of individual countries is their level of reliance on the export of natural resources (in our indicator: the share of exports of natural resources to GDP). This is also **a** well-known explanatory variable of intra-industry trade analyses, again with a negative sign. In combination with other policy-influenced variables it is of great relevancy to our estimations (with a

negative sign), (see table 2). The obvious reason for this is the fact that natural resources-rich countries are less motivated in achieving high levels of industry qualitative development.

Besides the influence of these inherited endowments, more interesting is the question of what governments can do in order to enhance the qualitative level of their countries' manufacturing industries. In general terms, we can say that the successful variables of this are the different typical symptoms of a normally functioning market economy. *Openness* represents the level of openness of countries to foreign trade. *Investrisk* is the rating of creditworthiness of countries. *Credit* (domestic credit provided by banking sector in percentage of GDP) is a proxy of the level of development of financial intermediation (for a detailed description of regressors, see annexe 2). These indicators correlate with quality levels, with acceptable significance levels. Correlation between them and the increase of the qualitative level trend over the observed period can also be shown.

However, in the latter kind of calculations, we must control the starting level of qualitative development by introducing the antilogarithm (exponential on natural base) of *QULTYtotal* 1993 (*Qultytotal93EXP)* and the 2000 level of per capita GDP into the equations (this is yet another form of the saturation effect).

Table 2. Regressions, sample of the 46 countries

Independent variables	**QULTYtotal 2000**				**Trend in QULTYtotal 1993-2000**	
	Coefficients and (t-values)				*Coefficients and (t-values)*	
GDP	.16*** (6.6)				-.07*** (-4.3)	-.04*** (-3.5)
InvestRisk		.08*** (9.4)			.03*** 4.4	
Credit			.02*** (3.3)	.03*** (5.1)		
Openness			.02*** (3.5)			.01* (1.91)
Resources			-.12*** (-3.2)			-.04* (-1.8)
Qultytotal93EXP					-.01* (-1.9)	
Prob (F-stat)	.00	.00	.00	.00	.00	.01
Adj. R-squared	49%	66%	55%	42%	36%	20%

*- significant at 10% level, **- at 5% level, ***- at 1% level.
The independent indicators are defined in Annex 2.

On restricting now our analysis to the sub-sample of 16 transition countries, we can outline several other factors influencing the patterns of development of the manufacturing sector, in these countries during the period observed. We find that the universe of transition is a rather particular one, with its own regularities (crossroads) (see table 3 for the summary of the relevant regression results).

First, both the final level of technological development *QULTYtotal 2000* and the technological upgrading from 1993 to 2000 are highly correlated with the synthetic transition indicator (*TransitnEXP*). This indicator is based on a number of partial progress indicators of in transition, assessing the transition reform progresses in the core areas of the economic system. Namely: privatisation, enterprise restructuring, price liberalisation, trade, banking reform and interest rate liberalisation, during the period from 1994 to 2001 (see annexe 2 for a detailed description of the regressors). This synthetic transition indicator (obviously an excellent indicator of progress towards a normally functioning market economy) alone (transformed into exponentials or antilogarithms) explains 60% of the variation in *QULTYtotal*, and 65% of the variation in increase trend of *QULTYtotal*. Note that *TransitnEXP,* coupled with *Credit*, proxy already used above, for the evaluation of the financial intermediation depth, explains 74% of the trend variations of QULTYtotal in the transition countries between 1993 and 2000.

Table 3. Regressions, sample of the 16 transition countries

Independent variables	**QULTYtotal 2000**						**Trend in QULTYtotal 1993 – 2000**						
	Coefficients and (t-values)						*Coefficients and (t-values)*						
QULTYtotal93EXP	6.0*** (6.9)					4.7*** (4.6)	2.6*** (3.14)						
TransitnEXP		.57*** (4.9)			.39** (2.71			.36*** (5.41)	.21* (2.2)				
Credit									.03** (2.1)	.05*** (5.3)	.05*** (6.0)		
CapInvest			.25*** (4.1)									.15*** (3.8)	
FDI											.18** (2.5)	.	
Distance				-.16*** (-4.1)	-.86*** (-2.0)	-.68** (-2.1)							-.79** (-2.7)
Prob (F-stat)	.00	.00	.00	.00	.00	.00	.01	.00	.00	.01	.00	.00	.02
Adj. r-squared	76%	60%	51%	52%	67%	80%	37%	65%	74%	65%	74%	48%	30%

* - significant at 10% level, ** - at 5% level, *** - at 1% level.
The independent indicators are defined in Annex 2.

Our estimates also show noticeable correlation between gross capital formation (*CapInvest*) and two other dependent variables ; *QULTYtotal* 2000 (adjusted r^2 = 51%) and the qualitative upgrading trend (adjusted r^2 = 48%). However, the foreign investments' component (the share of foreign direct investments in GDP) is less related to the patterns of qualitative development : *FDI* together with the proxy for the depth of financial intermediation *Credit* explains 78% of variation in the trends of *QULTYtotal*, from which 67% is explained by *BankCredit* alone (yet these are better results than the failed attempts at finding FDI's influence on qualitative upgrading when considering the whole sample of 46 countries or in any other reasonable sub-sample).

It is also important to mention that within the sub-sample of transition countries both *QULTYtotal* 2000 and the trend of qualitative upgrading are strongly related to the individual countries' closeness to the EU. The tendency is that closer countries display better qualitative performances and faster upgrading. Distance (with a negative sign) alone explains 52% of the variance of *QULTYtotal* in 2000 (and a similar share of *QULTYtotal* 1993) and 30% of *QULTYtotal* trend. Trying to find explanations to this seems to reveal, a rather complex phenomena. For European transition countries, distance from the EU (whether measured with our proxy or any other reasonable one) means being (and also having been, before the communist period) on the closer or farther periphery of western European economic development (systemic development, technological advancement and economic growth) ; this variable determining the access to multi-dimensional economic advantages (not least of which, the prospect of and preparation to rapid EU accession, with all their consequences). A greater distance to the EU is also a "proxy indicator" of being a former member state of the Soviet Union, in which case the harmful economic features of the communist economic system tended to be more pronounced and, with the three Baltic countries' exception, lasted longer. In this respect, it is interesting to see that *Distance* is also strongly correlated with our "normally functioning market economy" indicators: investment attractiveness, banking system's lending ability, economic openness, progress in transition, and even capital investments (see the correlation table in annexe 3). (It is appropriate to remark here that, because of multicollinearity, many otherwise possible combinations of our independent variables do not give sensible results. In such cases, adding further independent variables does increase r^2 but this gain is largely lost in adjusted r^2 - consistently used in this paper -, while some variables become then, insignificant.)

Distance as a regressor amalgamates the various advantages-disadvantages in one single dimension. However, we have to note here, that this role found to *Distance* is obviously not identical with the role that it usually plays in explanations to

differences in the level of intra-industry trade between countries more or less remote from each other. As we explained above, *QULTYtotal* does not have to be, and on the level of the whole sample of 46 countries is not, sensitive to distance.

Finally, we can also observe that our regressors are mostly, more or less good performers in estimating cross-country differences of quantitative growth performance (the growth of industrial GDP between 1993-2000). An interesting question is which regressors are more efficient in estimating (as measured by the adjusted r-squared) our qualitative than the traditional quantitative indicators. This consideration leads us to *Credit*, *Transition*, and *FDI* (Table 4).

These indicators – *BankCredit*, *FDI* and *Transition – are partly policy, partly*, to an important extent, policy-influenced variables. Furthermore, our results suggest that policies touching upon these three fields may primarily promote the qualitative upgrading of manufacturing in transition countries.

Discrepancies between quantitative and qualitative development

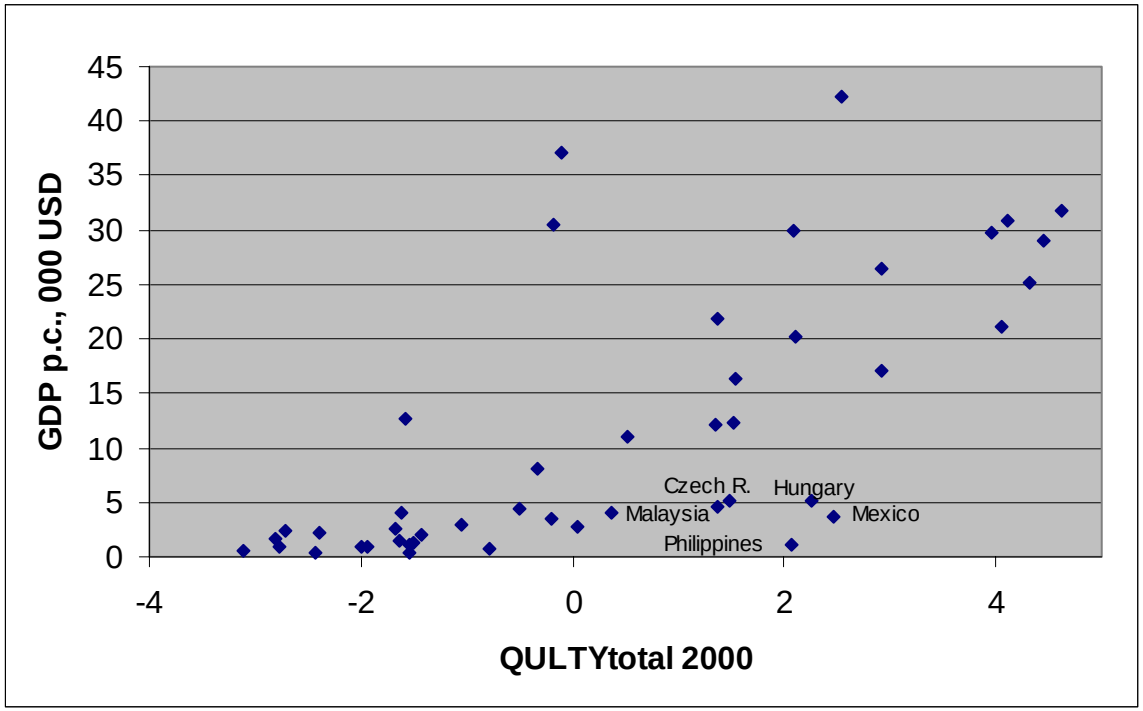
Thus arriving at the end of our paper, one question remains to be asked: what are the benefits of qualitative advancement? Economists mostly consider quantitative growth - to simplify, GDP growth - as the main public good, and we agree with them. Above, we have analysed the positive correlation between qualitative advancement and quantitative growth. But a complementary observation is here necessary, essentially displayed in Graph 6.

Table 4. Comparative estimations for qualitative advancement and qualitative growth of manufacturing industries, 16 transition countries sample

Independent variables	**QULTYtotal trend 1993-2000**				**INGDP trend 1993-2000**			
	Coefficients and (t-values)				*Coefficients and (t-values)*			
Transition	.36*** (5.4)				.02*** (3.19)			
Credit		.05*** (6.0)				.01 (1.15)		
FDI		.18** (2.5)				.02** (2.49)		
Openness			.03** (2.1)				.02*** (3.4)	
InvestRisk				.04*** (3.4)				.003*** (5.33)
Prob (F-st)	.00	.00	.05	.00	.01	.04	.01	.00
Adj. r-squared	65%	74%	20%	43%	43%	32%	45%	68%

* - significant at 10% level, ** - at 5% level, *** - at 1% level.
The independent indicators are defined in Annex 2.

Graph 6. GDP per capita and qualitative level of manufacturing exports from the 46 countries to the European Union in 2000



As we can see on this graph, in contradiction with the general tendency of strong correlation between the two variables, we find some outliers both above and below the imaginary trend. Dots above represent countries "overweight" in GDP level; dots below represent those "overweight" in qualitative advancement. We have nothing to say about the former group. The latter group though, is more interesting because of the newness of the phenomenon, at least within the period observed. Between 1993 and 1997, no countries in our sample have been significantly more advanced in quality than in GDP level.

Even if this phenomenon is not normal, for such countries as Malaysia, Mexico and the Philippines, far from the European Union and having limited trade with it that may not be very alarming. However, the Czech Republic's and Hungary's cases are different. Their exports to the European Union are above one-third of their GDP (and are increasing faster than their GDP). In their case, the qualitative level of these exports seems to be a rather important structural indicator. Relationship rules between important structural indicators (indicators partly different from ours) and GDP levels have already been formulated in the economic literature.[8] The regularity violated here by the Czech Republic and Hungary may also be such a relationship rule. If this is the case then the discrepancy between their qualitative and quantitative performances may have to wither away and maybe rather fast. Of course, we do not know whether this guess is a threat or a promise for these countries.

Conclusion

The synthetic qualitative indicator of the manufacturing industry, which we constructed from eight different partial indicators, embraces various qualitative features of trade in manufacturing goods between the selected 46 countries and the European Union. The European Union being an important trading partner of all countries in our sample, and a particularly important one to the transition countries at the centre of our interest, our synthetic indicator can be used to approximate the general level of qualitative performance of the selected countries' manufacturing sectors. Considering the very nature of parts of its components, the qualitative performance can also be regarded as the level of similarity/diversity with the European level of industrial development.

The qualitative upgrading differences visible amongst countries between 1993 and 2000 can be explained by a set of institutional factors. For the whole sample of 46 countries, regression analysis associates the qualitative development with such

[8] *Cf. e. g. Barios – Barry – Strobl (2002).*

policy-influenced variables as the openness of the economy to foreign trade (with a positive sign), and low level of investment risk. Within the sample of 16 transition countries, the influential policy-influenced parameters are; progress in transition (as measured by the EBRD), capital investment levels, and financial intermediation development. The role of the latter factors seems to be greater on qualitative development than on quantitative increase of industrial GDP.

Within the sample of transition countries, the qualitative development of manufacturing industry was initially somewhat higher in most CEEC countries than in the FSU countries. Over the transition period the gap between CEEC and FSU widened, as the CEEC countries (except Bulgaria and Romania) showed favourable performance and the FSU countries (except Estonia and Lithuania) were mostly laggards. Among the transition countries, we have also observed a correlation between qualitative upgrading over the period 1993-2000 and distance from the European Union. Obviously, this leaves aside the impact of more or less intensive century old contacts, with today's EU member states, as well as the consequences of the more recent eastern enlargement process of the European Union.

A special mention should be made of the Czech Republic and Hungary. Regarding their levels of per capita GDP, we noticed that they have built up unusually high levels of qualitative advancement in their trade of manufacturing products with the European Union. This discrepancy in these economies, deeply penetrated by trade with the EU, can probably not remain constant. Of course, we do not know whether this hypothesis is a threat or a promise for these countries.

ANNEX 1 : The Quality Indicators

$$IITtotal = \frac{2*\sum_i[MIN(x_i;m_i)]}{x_t+m_t}$$

where x_t is total exports, m_t is total imports of "narrow processing industry"; x_i and m_i stand for their respective breakdowns by CN eight-digit sectors.

$$IITsuperior = \frac{2*\sum_i[MIN(x^s_i;m^s_i)]}{x_t+m_t}$$

where x^s_i and m^s_istand for export and import, respectively, in CN eight-digit sectors for which the unit value of exports exceeds the unit value of imports by 15 per cent or more.

$$IIThoriz = \frac{2*\sum_i[MIN(x^h_i;m^h_i)]}{x_t+m_t}$$

where x^h_i and m^h_istand for export and import, respectively, in CN eight-digit sectors for which the unit value of exports is between 85 and 115 per cent of the unit value of imports.

$$TECHexp = \frac{x^{techt}}{x^{t}}$$

where $x^{tech}{}_t$ is total of high and medium-high technology exports of "narrow processing industry".

$$RELunitval = Exp(\Sigma_i\, r_{it}^{c} * v_{it}^{c} / \Sigma_i\, v_{it}^{c})$$

where r_{it}^{c} is the logarithm of the ratio of unit values of country c compared to the EU for product i at time t; and v_{it}^{c} stands for the export volume of product i at time t from country c to the EU(see Havlik, 2001).

$$TECHexp/imp = \frac{(x^{tech}{}_t / x_t)}{(m^{tech}{}_t / m_t)}$$

where $x^{tech}{}_t$ and $m^{tech}{}_t$ represent total exports and total imports of products of high and medium-high technology.

$$FRGptivity = \frac{\Box_i\, x_i * p_i}{x_t}$$

where p_i stands for productivity of a branch of German manufacturing industry in breakdown by NACE four digits.

$$\text{US/FRGexpstr} = \text{Correl}\,[x_i;\ (x^{US}{}_i + x^{FRG}{}_i)/2]$$

where x_i stands for exports of the US and Germany in breakdown by CN eight digits.

ANNEX 2 : List of regressors

Qultytotal93EXP the natural antilogarithm of *QULTYtotal* 1993 ($e^{QULTYtotal\ 1993}$).

GDP p.c. GDP per capita (thousands of constant 1995 US dollars), 1999, World Bank.

InvestRisk Institutional Investor credit rating, ranks the chances of country's default, 2000, World Bank. Inverse scale (0 – highest risk, 100 - lowest).

Credit domestic credit provided by banking sector (% of GDP), 1999, World Bank.

Openness (exports+imports)/2 in percent of GDP, 1999, World Bank.

Resources exports of natural resources: agricultural raw materials, food, fuels, ores and metals in percent of GDP, 1999, World Bank.

TransitnEXP the natural antilogarithm of one hundredth of the sum of the transition indicators calculated and published by the European Bank for Reconstruction and Development, assessing progress in transition in large-scale and small-scale privatisation, governance and enterprise restructuring, price liberalisation, trade and foreign exchange system, competition policy, banking reform and interest rate liberalisation, securities markets and non-bank financial institutions for the years from 1994 to 2001 ($e^{\frac{sum\ldots of\ \ldots transition\ldots indicators}{100}}$).

CapInvest gross capital formation, percent of GDP, 1999, World Bank.

FDI FDI, peercent of GDP, net inflows from 1993 to 1999, World Bank.

Distance distance from the "central (economic) axis" of the EU. We suppose that such an axis runs between London and Milan, and "distance" is the sum of the distance (in thousands of kilometres) of the capital of each country from London and Milan.

ANNEX 3

Correlation between distance from the EU and basic **national systemic** indicators

	Distance	***CapInvest***	***InvestRisk***	***BankCredit***	***Openness***	***GDP p.c.***	***Transition***
Distance	1						
CapInvest	-0.8353	1					
InvestRisk	-0.7071	0.7222	1				
BankCredit	-0.6432	0.7171	0.6331	1			
Openness	-0.6777	0.7239	0.8292	0.5612	1		
GDP p.c.	-0.6825	0.6427	0.7555	0.6124	0.8013	1	
Transition	-0.6014	0.6552	0.9228	0.6905	0.7224	0.5663	1

ANNEX 4:

Methodological remarks : breakdown by technology level

NACE two- and three-digit sectors by technology level

high technology

241	basic chemicals
242	pesticides
244	pharmaceuticals
283	steam generators (exc. centr. heating boilers)
291	machinery and equipment n. e. c.
294	machine-tools
295	other special purpose machinery
296	weapons and ammunition
30	office machinery and computers
312	electricity distribution and control apparatus
313	insulated wire and cable
316	electrical equipment n. e. c.
321	electronic valves and tubes and other electronic components
33	medical, precision and optical instruments, watches and clocks (except 335: watches and clocks)
353	aircraft and spacecraft
366	miscellaneous manufactured gods n. e. c.

medium-high technology

243	paints, varnishes, printing ink and mastics
245	glycerol, soap, detergents, cosmetics
246	other chemical products
247	man-made fibers
292	other general purpose machinery
293	agricultural and forestry machinery
297	domestic appliances n. e. c.
311	electric motors, generators and transformers
314	accumulators, primary cells and primary batteries
315	lighting equipment and electric lamps
322	television and radio transmitters, apparatus for line telephony and telegraphy
323	television and radio receivers, sound or video recording or reproducing apparatus watches and
335	clocks
34	motor vehicles, trailers and semi-trailers
35	other transport equipment (except 353: aircraft and spacecraft)

medium-low technology

25	rubber and plastic products
26	other non-metallic products
27	basic metals
28	fabricated metal products (except 283: steam generators)
36	furniture; other manufactured goods n. e. c. (except 361: furniture and 366:

miscellaneous manufactured gods n. e. c.

low technology

all others

Source: Lionel Fontagné - Michael Freudenberg - Deniz Ünal-Kesenci, Haute technologie et échelles de qualité: de fortes asymétries en Europe. CEPII, Paris, 1999 (mimeo)

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