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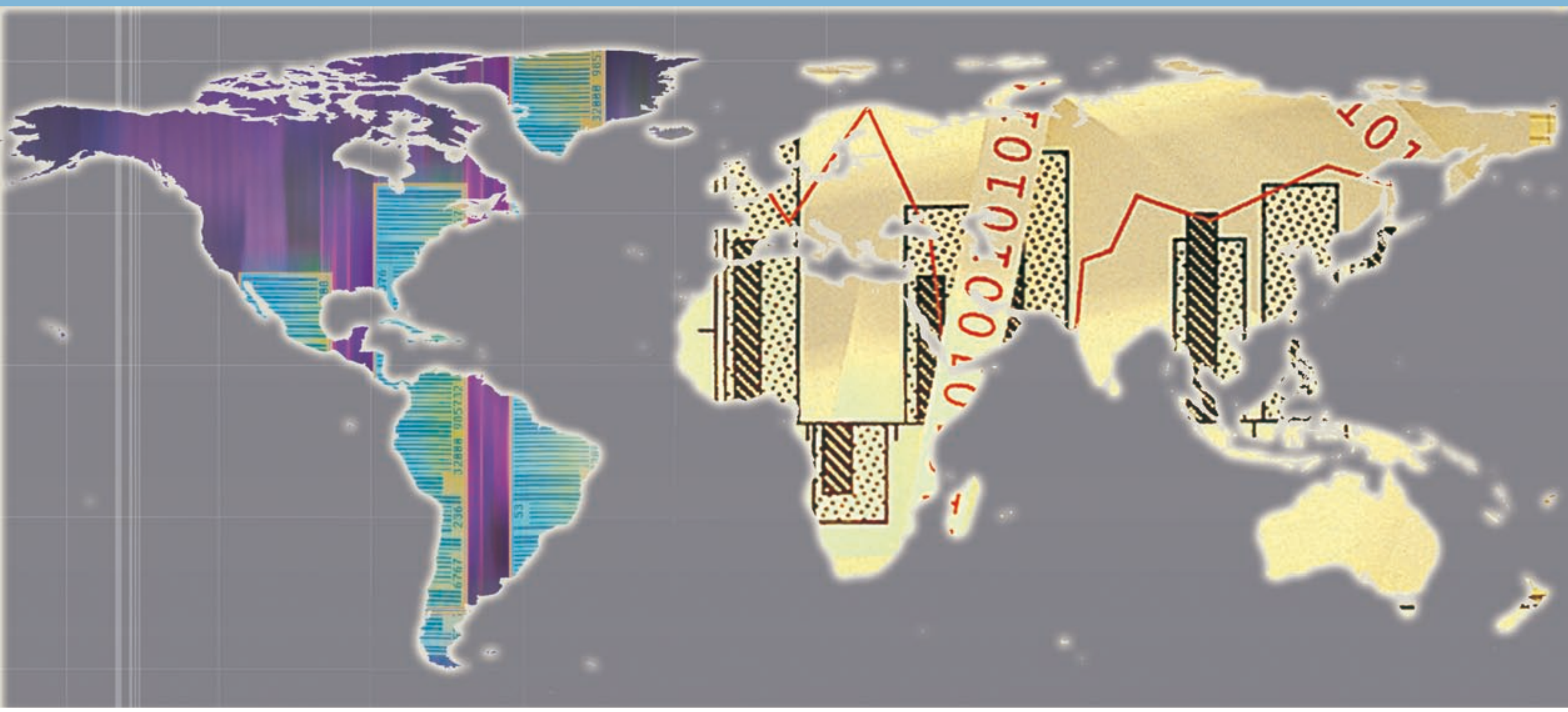

Industrial Development and the Dynamics of International Specialization Patterns

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Industrial Development and the Dynamics of International Specialization Patterns

Olga Memedovic
Research and Statistics Branch
Programme Coordination and Field Operations Division
UNIDO

Lelio Iapadre
Associate Professor of International Economics
University of L'Aquila
Johns Hopkins University — SAIS Bologna Center
UNU Institute for Comparative Regional Integration Studies

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Abstract

In this paper we investigate the complex relationship between industrial development and economic structure, by focusing on one of its trade implications, the effect of international specialisation patterns on export performances of countries. Constant-Market-Share (CMS) analysis is applied to disentangle the effect of countries' specialisation structure from competitiveness factors. This work contributes to the methodological debate on CMS putting forward a new specification of the disaggregation formula by which countries' share of world exports is explained as the result of seven different effects. This new specification is applied to the study of world merchandise exports between 1995 and 2007 for 208 countries in BACI database. Results are here presented for a sample of 37 countries selected among the main exporters in all regions. Our analysis proves that besides macroeconomic factors, specialisation patterns in the international distribution of economic activities are fundamental to explain relative trade performances and their evolution over time.

1. Introduction

In the last few decades, a group of important emerging countries have been able to achieve a considerable acceleration in economic growth, reducing their gap with developed countries. However, the majority of developing countries still remain trapped at low income levels.

Different growth rates can easily be linked to differences in labour productivity and productivity gains at a country level might be associated with higher labour efficiency in the same sector and with migration of labour from low to high productivity sectors. The connection between labour productivity and structural change has been the subject of many theoretical and empirical studies.

The structuralist approach to economic development claims that high rates of growth can be sustained only by redistributing productive resources toward the most dynamic sectors of the economy (Ocampo, 2005). More precisely, the kind of structural change which is required to sustain growth is characterised by two main features: 1) a shift toward high-productivity sectors, which often implies the ability to attract industries located in more developed economies; 2) the creation of new inter-sectoral linkages, leading to a more intensely integrated production structure. Economic systems meeting these two criteria of dynamic efficiency tend to succeed in narrowing the productivity gap between traditional and innovative sectors and to reach macroeconomic equilibrium.

Fast-growing countries show similar patterns of structural change, which can be seen as both a condition and an outcome of their economic development. The output share of agriculture has been falling consistently, to the advantage of industry and services. This correlation is less clear-cut in countries characterised by more moderate growth rates (Rada and Taylor, 2006).

The Keynesian approach introduces the role of demand as another important determinant of economic development. The interaction between productivity growth and effective demand determines the growth rate of the economy and the level of employment. However, any exogenous increase in labour productivity can have negative effects on employment, if it is not matched by an adequate increase in effective demand. In fact, as explained by the Fabricant's law (Oulton and O'Mahony, 1994), even in presence of a positive correlation between total output and labour productivity, output growth can be less than proportional to the increase in labour productivity, leading to a lower demand for labour. For example, this might occur in developing countries if real exchange rate appreciation, due to capital account liberalisation, induces a fall in the labour demand of the tradable sector (Vos, 2005).

Recognising the role of demand does not exclude the role of supply-side factors in determining productivity and growth regimes. On the contrary, demand and supply should be considered simultaneously. Cimoli and Correa (2005) consider both aspects and argue that raising import propensity due to trade liberalisation, in presence of productivity gaps, can generate low-growth traps. In this context, export expansion may fail to induce an adequate rate of economic growth, and persisting productivity gap can be related to the difficulty of spreading innovations from export enclaves to the traditional sector. Structural change in the international specialisation pattern is then called for to break the trap, ease the diffusion of knowledge across the economy and weaken the external constraint to growth.

The analysis of countries' trade performance is often conducted in macroeconomic terms. From an accounting perspective, the current account balance is equivalent to the difference between saving and investment (or between income and consumption). Its behaviour may thus be understood as the outcome of factors determining the real wealth accumulation in the economy. Even when the analysis is concentrated on foreign trade flows, the dynamics of export and import volumes is often explained by the behaviour of other aggregate variables, such as real exchange rates and foreign or domestic income.

In many cases, however, models considering only macroeconomic fundamentals are inadequate to explain trade performances. These models overlook important, but difficult to quantify, underlying factors of international trade performance, such as product quality, shifts in consumer tastes, changes in international trade rules and a whole range of other structural factors defining foreign trade distribution by product or by country. For instance, assuming the growth of world demand and all other circumstances being equal, the dynamics of a country's exports will be influenced by the concordance between its international specialisation pattern and the changes in the product composition of world demand. In other words, if the world demand favours products in which the country enjoys comparative advantages, the income elasticity of its exports will be higher. In this case we may speak of "macroeconomic" or "dynamic efficiency" of a country's international specialisation pattern.

The influence of these structural factors is more relevant than commonly understood and may sometimes override the effect of aggregate variables, such as price competitiveness. Differences in foreign trade structures between countries are therefore important determinant of their different growth rates: countries' specialisation patterns affect the income elasticity of exports and imports and so the intensity of the external constraint to growth. [1]

This paper contributes to the study of the complex relationship between industrial development and economic structure by focusing on the effects of international specialisation patterns on export performance and the external constraint to growth. If export performance is an important determinant of an economy's aggregate demand level in the short run and its productive capacity growth in the long-run, then we have to analyse the main factors affecting export performance. We distinguish two sets of factors: competitiveness factors such as relative prices, exchange rates, quality and market power, which determine the relative growth of exports by markets and products, and structural factors such as the interaction between national specialisation patterns and changes in the composition of world demand by product and country. In order to measure the relative contribution of these factors, we introduce a new formulation of the constant-market-shares (CMS) analysis.

The rest of the paper is organized as follows. Section 2 discusses the significance of CMS analysis for interpretive purposes. Section 3 addresses the main problems arising from its application. Section 4, presents a new specification of the decomposition formula, combining traditional and more recent versions of this technique. Section 5 applies the outlined methodology to 37 developing and developed countries, including the 30 leading exporters in 2007 and 7 African countries with the highest export value in the same year. Section 6 presents a further decomposition analysis, to better capture the determinants of the dynamic efficiency of specialisation patterns (i.e. the interaction between the distribution of comparative advantages and changes in the product composition of world import demand). Section 7 concludes by summarising our main methodological and empirical insights.

2. The nature of constant-market-shares analysis

A statistical method commonly used to evaluate the influence of structural factors on export growth and market share is known as CMS analysis. This decomposition technique owes its success to the simplicity of its application and to its capacity to emphasise structural factors that often tend be overlooked in the analysis. But, the heuristic value of this method and the variability of the results generated by its different specifications have been often questioned.

[1] The link between the income-elasticity of trade flows and the growth rate of an open economy was highlighted by Thirlwall (1979) and, with a different approach, by Krugman (1989). The hypothesis that international differences in such elasticity are essentially attributable to differences in the structure of foreign trade was advanced, among others, by Goldstein and Khan (1985).

Tyszynski (1951) was the first to apply CMS analysis to the study of exports. Other most influential studies based on this approach are Leamer and Stern (1970), Richardson (1971), Magee (1975), Fagerberg and Sollie (1987). Milana (1988) work placed the methodological debate on CMS analysis in the framework of the economic theory of index numbers. This work resulted in a new specification of the formula that was further perfected in Guerrieri and Milana (1990). Despite persisting scepticism about its heuristic value, CMS analysis is still widely used in academic research as well as in policy-oriented work.[2]

CMS analysis allows measuring the relative contribution of competitiveness and structural factors to export performances. In practice, this involves breaking down the variations of a country's total exports or aggregate market share over time. The analysis starts with an accounting identity to which a decomposition formula is applied. For this reason, it has often been emphasised that CMS analysis should not be employed for forecasting purposes, but instead for the *ex-post* accounting measurement of each factor's contribution to the behaviour of an aggregate variable (see Milana, 1988, pp. 453-4)[3].

Given the accounting nature of the decomposition, it would be wrong to ascribe CMS analysis with an interpretive capability similar to that of an econometric model. Nonetheless, its results are a useful tool to orient further research on the behaviour of specific variables. Each term generated by the decomposition formula has an economic meaning, which can be related to a set of explanatory factors. For instance, the competitiveness effect, obtained by decomposing export growth, represents an *ex-post* measurement of the impact exerted by the entire set of competitiveness factors on aggregate export performance, after controlling for composition effects. The competitiveness effect, therefore, should be preferred to the aggregate export market share as the dependent variable in any econometric exercise aimed at assessing the role of real exchange rates and other competitiveness factors.

CMS analysis may be likened to other statistical methods used for breaking down the changes of an economic aggregate value variable into price and quantity indexes. As we will see later, part of the problems encountered in its specification can be seen as a symptom of an "index-number problem[4] ".

[2] An example is given by the table entitled *Export performance for total goods and services*, which appears in each issue of the *OECD Economic Outlook* and is based on a very simple variant of CMS analysis. This statistical technique has been used also in economic history (see, e.g. Irwin, 1995).

[3] A new specification of CMS analysis, based on an econometric estimate of its elements, has recently been used by Cheptea, Gaulier and Zignago (2005).

[4] See Richardson (1971), p. 234 and Milana (1988).

More generally, CMS analysis may also be conceived as a special case of a decomposition method that is useful to analyse the statistical link between the behaviour of an aggregate entity and of its single parts, whenever the aggregate variable can be represented as a weighted average of its parts[5].

3. Specification problems

3.1 Introduction

Despite the conceptual simplicity of CMS analysis, its formulation has given rise to several varieties based on the different specifications of the base accounting identity and to the diverse solutions adopted for the underlying "index-number problem". Much of the debate on CMS analysis focused on the problems posed by this variety of specifications. However, as Magee points out, "if we can dispose of the methodological problems, constant-market-shares analysis still stands or falls on whether, as an identity, it yields a useful organisation of the data. If this identity, like the GNP identity, contains behavioural parts that can be explained by other independent variables, and if this process gives expanded insight into the behaviour of international trade flows, then more research is warranted, on method and application." (1975, p. 222).

The following sections review the main methodological problems posed by CMS analysis and the various specifications proposed to solve such problems. First, we explore two issues concerning the base accounting identity: the choice of the decomposition object and the number of disaggregation criteria. We also analyse the sensitivity of the results to the order of decomposition by product and by market). Second, we review the alternatives available for the decomposition formula of the base identity, starting from the choice of the weighting method, which remains the most debated issue in CMS analysis and may be regarded as an aspect of the more general "index-number problem." We also discuss the dependence of decomposition results on the time-path of the elementary data, an issue raised by Milana (1988).

3.2 The Choice of the Base Accounting Identity

The starting point of CMS analysis is an accounting identity, relating an aggregate variable, exports or market shares, to its disaggregated components at product and/or destination market level. A decomposition formula is then applied to this identity, so that changes of the aggregate variable over time are expressed as the sum of two or more terms, representing changes in its

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[5] Actually, the CMS method can be seen as an application to international trade data of a technique, called shift-and-share analysis, widely used in regional economics and pioneered by Creamer (1943). Useful surveys of this field of research have been provided by Holden, Nairn and Swales (1989) and Loveridge and Selting (1998). An interesting application of the shift-and-share method to international trade data at sub-national level can be found in Coughlin and Pollard (2001).

underlying factors. The specification problems of this decomposition formula are discussed later in this paper (in Section 3.3). This section addresses the base accounting identity and is divided into two sub-sections. The first sub-section looks at the variable to be decomposed, which appears on the left-hand side of the identity. The second sub-section deals with the various disaggregation criteria, used in the right-hand side of the identity.

3.2.1 The Decomposition Object

The selection of aggregate variable appearing on the left-hand side of the base accounting identity depends on the research aims and affects the choice of the decomposition formula. The most common options adopted in CMS-based studies are discussed below, as follows:

a) The Choice of the Trade Variable

As mentioned in Section 2, the CMS method is used to analyze the relative contribution of competitiveness and structural factors to a country's trade performance. Export growth rate has been often used to represent such performance. But to get a more proper evaluation of a country's position in international trade, its imports should also be taken into consideration. This would require constructing decomposition formulas similar to CMS analysis for the normalised trade balance or for the export-import ratio.

The key issue is then: how to express the trade flows? In the literature, in some cases, trade performance is simply measured as the absolute or relative change in a country's exports, without reference to any comparison term. In other cases, trade performance is explicitly measured as the change in a country's market share, defined as the ratio between its exports and the exports of a reference area such as the world or a group of competitors[6]. Equivalently, trade performance can be measured as the difference between the growth rate of a country's exports and that of the reference area[7].

[6] The choice of the data on which the formula is applied, raises an additional problem. A country's exports toward the rest of the world may also be viewed as imports of the world from this same country and correspondingly, the market share may be calculated either as the ratio between a country's exports and those of the world, or as the ratio between the world's imports from that country and total world imports. If one actually had data for the whole matrix of world trade, this choice would be of marginal importance, since any divergence in the results could only be due to statistical discrepancies, for example the difference between F.O.B and C.I.F data. The issue becomes more relevant, when data referring to a more restricted set of countries (for example industrial countries) are available. In these cases, using export data allows to regard the entire world as a market, but forces to exclude from the set of competitors, those countries for which export data is not available (for example developing countries). On the other hand, if import data is used, the analysis must be narrowed to a smaller market (industrial countries), but all competitors may be considered. The choice will thus be based on data availability and on the research target.

[7] See, for example, European Central Bank (2005).

These variants are substantially equivalent because their ultimate goal is to compare a country's trade performance with that of the reference area. But if specifications based on export changes are chosen, then the decomposition formula will be slightly more complex, as another term appears, besides those measuring competitiveness and composition effects, which measures the effects of world demand growth.

b) Data at Current or Constant Prices

A widely discussed issue is the choice between variables in current or constant prices[8]. This is an important issue because data in constant prices would be necessary when the task is to assess the effect of price competitiveness on export volumes, but are often unavailable or not reliable at the disaggregated level. If competitiveness is understood in a wider sense to include not only prices but also the whole range of other underlying factors, such as quality, image and organisation of sales, then the data in current prices can be favoured as they allow measuring these factors' overall effects on export values. For example, the aggregate market share in value terms can improve when higher price competitiveness of national products stimulates a rise in export volumes and when the qualitative characteristics of national products allow selling them at higher prices or entering more lucrative segments of the foreign marketplace.

3.2.2 Disaggregation Criteria

Besides the choice of the decomposition object, the second important aspect for the definition of the base accounting identity is the number of disaggregation criteria. Total exports (the aggregate market share) may be treated as the sum (weighted average) of export flows of its components (of the components' market shares) classified according to one or more criteria: by product, by destination country, by firm size, by production region, and so on. The earliest studies based on CMS analysis used a sole disaggregation criterion (by product), but successive formulations took both products and destination markets into account.

For simplicity's sake, we start by using a single disaggregation criterion, applied to an exporting country's aggregate share in a destination market's imports, which can be expressed as[9]:

$$S^t \equiv \frac{\sum_k m_k^t}{\sum_k M_k^t} \qquad [1]$$

in which:

[8] See, for example, Richardson (1971) pp. 230-1.
[9] Throughout this section superscript *t* denotes time.

S^t : the exporting country's aggregate market share at time *t*;
m_k^t : destination market imports from the exporting country in the k^{th} product (k = 1 ... p);
M_k^t : destination market imports from the world in the k^{th} product.

The following base accounting identity expresses the aggregate market share as the weighted arithmetic mean of the elementary shares recorded for each product:

$$S^t \equiv \sum_k s_k^t w_k^t \qquad [2]$$

in which:
$s_k^t \equiv \dfrac{m_k^t}{M_k^t}$: the exporting country's share in the destination market's imports by k^{th} product;
$w_k^t \equiv \dfrac{M_k^t}{\sum_k M_k^t}$: weight of the k^{th} product over the destination market's total imports from the world.

If, on the other hand, there are two classification criteria, for instance by product and importing country, as may happen when the destination market is a geographic area or the world, the aggregate share of an exporting country in the destination market imports may be expressed as:

$$S^t \equiv \frac{\sum_i \sum_j m_{ij}^t}{\sum_i \sum_j M_{ij}^t} \qquad [3]$$

in which:
m_{ij}^t : imports of the j^{th} country (j = 1…m) from the exporting country in the i^{th} product (i = 1…n);
M_{ij}^t : imports of the j^{th} country from the world in the i^{th} product.

From definition [3] five alternative specifications of the base accounting identity can be derived as follows:

$$S^t \equiv \sum_i \sum_j s_{ij}^t w_{ij}^t \qquad [4]$$

$$S^t \equiv \sum_i \sum_j s_{ij}^t g_{ij}^t p_{i.}^t \qquad [5]$$

$$S^t \equiv \sum_i \sum_j s_{ij}^t g_{.j}^t p_{ij}^t \qquad [6]$$

$$S^t \equiv \sum_i \sum_j s_{ij}^t g_{.j}^t p_{i.}^t d_{ij}^t \qquad [7]$$

$$S^t \equiv \sum_i \sum_j s_{ij}^t g_{ij}^t p_{ij}^t \frac{1}{d_{ij}^t} \qquad [8]$$

in which:

$s_{ij}^t \equiv \dfrac{m_{ij}^t}{M_{ij}^t}$: the exporting country's share of the j^{th} country's imports from the world in the i^{th} product;

$w_{ij}^t \equiv \dfrac{M_{ij}^t}{\sum_i \sum_j M_{ij}^t}$: weight of the j^{th} country's imports from the world in the i^{th} product over the destination market's total imports from the world;

$g_{ij}^t \equiv \dfrac{M_{ij}^t}{\sum_j M_{ij}^t}$: weight of the j^{th} country's imports over the destination market's imports from the world in the i^{th} product;

$g_{.j}^t \equiv \dfrac{\sum_i M_{ij}^t}{\sum_i \sum_j M_{ij}^t}$: weight of the j^{th} country's imports over the destination market's total imports from the world;

$p_{ij}^t \equiv \dfrac{M_{ij}^t}{\sum_i M_{ij}^t}$: weight of the i^{th} product over the j^{th} country's total imports from the world;

$p_{i.}^t \equiv \dfrac{\sum_j M_{ij}^t}{\sum_i \sum_j M_{ij}^t}$: weight of the i^{th} product over the destination market total imports from the world;

$$d_{ij}^t \equiv \frac{M_{ij}^t \cdot \sum_i \sum_j M_{ij}^t}{\left(\sum_i M_{ij}^t\right)\left(\sum_j M_{ij}^t\right)} \equiv \frac{w_{ij}^t}{p_{i.}^t g_{.j}^t} :$$

Structural diversification index (SDI): ratio between the weight of the j^{th} country (of the i^{th} product) over the destination markets' imports in the i^{th} product (over the j^{th} country's total imports) and the weight of that country (of that product) over the destination market's total imports from the world.

Identity [4] is substantially equivalent to [2]: the two vectors of elementary market shares and weights contain a number of elements (*m* x *n*) equalling the cells of a double-entry table in which the rows refer to the products and the columns to the importing countries. But in [4] it is not possible to distinguish the commodity from the geographic disaggregation criterion, because each weight is the ratio between the value of imports of each cell and the total value of the destination market's imports from the world. Such cells will henceforth be designated as "segments" of the importing market being considered.

Identities [5] and [6] have most often been used (explicitly or implicitly) as base identities in CMS analysis. In [5] the data on the destination market's imports are first disaggregated according to product type and then, for each one of these, by importing country, while in [6] the opposite occurs. This is evident because identity [5] can also be expressed as follows:

$$S^t \equiv \sum_i s_{i.}^t \, p_{i.}^t \qquad [9]$$

in which:

$$s_{i.}^t \equiv \frac{\sum_j m_{ij}^t}{\sum_j M_{ij}^t} \equiv \sum_j s_{ij}^t \, g_{ij}^t \qquad [10]$$

the exporting country's share of the destination market's imports from the world in the i^{th} product;

and similarly identity [6] may be written as follows:

$$S^t \equiv \sum_j s_{.j}^t \, g_{.j}^t \qquad [11]$$

in which:

$$s_{.j}^t \equiv \frac{\sum_i m_{ij}^t}{\sum_i M_{ij}^t} \equiv \sum_i s_{ij}^t \, p_{ij}^t \qquad [12]$$

the exporting country's share of the j^{th} country's total imports from the world.

In practice, identity [5] is attained by constructing two identities similar to [2] at different disaggregation levels: first, the aggregate market share is expressed as the weighted average of market shares by product (identity [9]) and second, each of these is treated as the weighted average of the elementary market shares by each product in each importing country (identity [10]). A similar statement is also valid for identity [6].

This remark shows that identities [5] and [6] are characterised by an internal asymmetry in the degree of data disaggregation by product and by country. This affects the decomposition formulas giving rise to one of the most discussed methodological problems of CMS analysis, namely the variability of results with respect to the decomposition order.

To solve this problem, Guerrieri and Milana (1990) proposed accounting identities [7] and [8],[10] with the product weights defined at the same disaggregation degree as the geographic ones, as follows:

- In [7], both are calculated at the margins of the double-entry table of the destination market's imports; the destination market's imports distribution by product is determined independent of that by importing country[11].
- In [8], all the weights are calculated inside the double-entry table, which generates as many product distributions as there are importing countries and as many geographical distributions as products.

Still, these formulation do not make results independent of disaggregation order, as claimed by Guerrieri and Milana (1990, p. 332). They simply present this problem in a different shape. The results change with the choice between "marginal" (identity [7]) or "internal" (identity [8]) weights in the double-entry table. Between [7] and [8], there is essentially the same relation as between identities [5] and [6] in the traditional formulations[12].

In any case, the symmetry in geographic and product disaggregation levels characterizing identities [7] and [8], makes them preferable to the traditional ones. But such result can only be reached by introducing in the formulas another element, the matrix of *structural diversification indexes* (SDIs). These indexes show to what degree the product distribution of a destination market's imports is differentiated across importing countries, or to what degree its distribution by importing country varies by products. Thus, the SDIs reveal the degree of reciprocal dependence between the structure of the market by importing country and that by product, and show if the imports of the destination market are uniformly distributed among the various segments, or are instead concentrated in some segments.

In the extreme case of all SDIs being equal to one, the commodity (or the geographic) distribution of imports would be equal for all countries (and for all products). Thus there is a

[10] An English version of this proposal can be found in Milana (2004).
[11] A similar approach has been followed in European Central Bank (2005).
[12] A different solution for this problem has been adopted by Cheptea, Gaulier and Zignago (2005), who derive the CMS effects from an econometric exercise, making the decomposition order not relevant for the results.

precise relation between these indexes and Pearson's quadratic average contingency coefficient (**f**), calculated on the double-entry table showing the destination market imports' distribution by product and by importing country, as follows:

$$\left(\mathrm{f}^{t}\right)^{2} = \sum_{ij} d_{ij}^{t} w_{ij}^{t} - 1 \qquad [13]$$

From this expression, we can see that if all the diversification indexes were equal to one, there would be no statistical connection between the two disaggregation criteria (by product and by importing country), while as interdependence between the two distributions grows, these indexes depart from one.

3.3 The Choice of the Decomposition Formula

Besides the specification of the base accounting identity, other issues affecting the CMS decomposition formula have been explored in the literature. The most important one stems from the shift from a continuous to a discrete time formulation, and lies in the choice of the weighting system to be used in the decomposition (i.e. the *index-number problem* of CMS analysis, as discussed in Richardson, 1971 and Milana, 1988). The next sub-section surveys the various alternatives proposed for weighting the decomposition formula. Sub-section 3.3.2 discusses the related problem of the dependence of decomposition results on the time-path of the elementary data.

3.3.1 The Weighting Method and the Index-Number Problem in CMS Analysis

Referring to the base identity [2], the continuous-time decomposition of its variations can be expressed as follows:

$$\frac{dS^{t}}{dt} = \sum_{k} \frac{ds_{k}^{t}}{dt} w_{k}^{t} + \sum_{k} \frac{dw_{k}^{t}}{dt} s_{k}^{t} \qquad [14]$$

where, the aggregate market share rate of change over time is the sum of two terms: the weighted average of disaggregated market shares' changes and the effects of changes in the structure of destination market's imports. The first term is defined as the *competitiveness effect* (CE). Given the demand structure, one can hold that changes in disaggregated market shares mirror *ex-post* the effects of changes in relative prices and other factors of competitiveness. The second term is called the *structure effect* (SE). It represents the variation that the aggregate market share would in any case have because of the effect of changes in the structure of the destination market's imports, even if the elementary market shares did not change (*constant-market-shares*). It mirrors the conformity of a country's specialisation pattern to changes in the structure of demand.

The “index-number problem” of CMS analysis refers to the variety of possible solutions in adapting identity [14], which is formulated for continuous time, to the discrete-time data available for empirical analysis. The suggested alternatives, differing by the weighting method chosen, are the following:

$$S^t - S^0 = \sum_k \left(s_k^t - s_k^0\right) w_k^0 + \sum_k \left(w_k^t - w_k^0\right) s_k^t \qquad [15]$$

$$S^t - S^0 = \sum_k \left(s_k^t - s_k^0\right) w_k^t + \sum_k \left(w_k^t - w_k^0\right) s_k^0 \qquad [16]$$

$$S^t - S^0 = \sum_k \left(s_k^t - s_k^0\right)\left[\alpha\, w_k^t + (1-\alpha)\, w_k^0\right] + \sum_k \left(w_k^t - w_k^0\right)\left[(1-\alpha)\, s_k^t + \alpha\, s_k^0\right] \qquad [17]$$

$$S^t - S^0 = \sum_k \left(s_k^t - s_k^0\right) w_k^0 + \sum_k \left(w_k^t - w_k^0\right) s_k^0 + \sum_k \left(w_k^t - w_k^0\right)\left(s_k^t - s_k^0\right) \qquad [18]$$

$$S^t - S^0 = \sum_k \left(s_k^t - s_k^0\right) w_k^t + \sum_k \left(w_k^t - w_k^0\right) s_k^t - \sum_k \left(w_k^t - w_k^0\right)\left(s_k^t - s_k^0\right) \qquad [19]$$

The most widely used formulas in CMS analysis have been based on identities [15] or [16], because of their simplicity; or on identity [18], because it offers the advantage of a coherent weighting method, so that all weights refer to the initial period. However, identity [18] requires introducing an additional decomposition term, based on the interaction between changes of disaggregated market shares and variations of demand structure.

The economic meaning of this term has long been debated. Richardson (1971) considered this as a “second measure of competitiveness", because it shows how much a country succeeds in concentrating positive trade performances (the rise in its market shares) in the most dynamic segments of the destination market’s imports. Fagerberg and Sollie (1987) defined the interaction term as a measure of the export specialisation pattern’s flexibility in response to changes in the structure of demand and called it the *adaptation effect* (AE). They also showed that such a term could be decomposed in three elements according to the following formula:

$$AE = r_A \sqrt{\sum_k \left(s_k^t - s_k^0 - \mu_s^t + \mu_s^0\right)^2} \sqrt{\sum_k \left(w_k^t - w_k^0\right)^2} \qquad [20]$$

In which:

r_A: Linear correlation coefficient between changes of disaggregated market shares and changes of market segment weights;

μ_s^t: Unweighted arithmetic mean of disaggregated market shares.

In this formula, the correlation coefficient r_A establishes the sign of the interaction term, while its value depends on two measures: a measure of dispersion of disaggregated share changes around their average and a measure of variation in the structure of market demand.

Milana (1988) departed from all the traditional formulations of CMS analysis and criticised the use of the interaction term, contending that the only specification coherent with index-number theory is [17], with $\alpha = 0.5$. This is equivalent to using the averages between the starting and the final period as weights, similarly to the price index formula devised by Törnqvist (1936). Milana claimed that this formulation is to be preferred to all the others, as it allows for a better discrete-time approximation of the continuous-time decomposition formula. On the contrary, the interaction term appearing in equations [18] and [19] "is produced by the inability of the linear approximating formula to completely disentangle the component effects by tracing a non-linear function" (Milana 1988, p. 467).[13]

This argument is based on the economic approach to index-number theory that splits up a value variable into its price and quantity components, assuming an aggregation function of such components founded on the microeconomic theory of consumer behaviour. In CMS analysis, instead, it appears impossible to postulate a precise and theoretically founded functional relationship between the two elementary components of the accounting identity (market shares and weights), and so we lack the continuous-time aggregation function, based on which we could select the best discrete-time approximation.

Besides this theoretical problem, formula [17] appears inferior to formula [18] in terms of descriptive power. Indeed, using the averages between the starting and final periods as weights does not allow us to neatly disentangle the competitiveness from the structure effect[14] . For instance, the structure effect no longer represents the aggregate market share change between period 0 and period t, had the elementary market shares remained equal to those at the starting period, as in formula [18], but is computed as if such shares had remained constant at an intermediate level between the starting and the final one. By doing this, however, the structure effect ends up by capturing a part of the changes of the elementary market shares that should instead be captured by the competitiveness effect, and *vice versa*.

[13] Milana's approach has been followed, among the others, by Simonis (2000).

[14] Similar arguments, in a different context, may be found in a contribution by Menzler-Hokkanen and Langhammer (1994, pp. 311-312) on the bilateral index number technique for the measurement of the quality of imports and the substitution among trading partners.

It is true that equation [17] splits the entire change of the aggregate market share into only two components, without any residual, but by doing so it muddles their economic meaning. On the contrary, equation [18] does not produce an exact bipartition, but allows the structure effect to be clearly distinguished from the competitiveness effect.

Moreover its residual interaction term may have an interesting economic interpretation, concerning the flexibility of export specialisation patterns. In equation [17] the structure effect is static: it measures the influence of a country's international specialisation pattern, defined in a certain period (halfway between 0 and t), on changes in its aggregate market share, but ignores the effects of mutations in the specialisation pattern itself. In [18], on the other hand, the static structure effect is coupled with a dynamic adaptation effect, which measures the effect of *changes* in a country's specialisation pattern on its global export performance.

3.3.2 The Dependence of Decomposition Results on the Time Path of the Elementary Data

Another problem linked to the choice of the weighting method for the decomposition formula is that of the dependence of its results on the time-path of the elementary data. Milana (1988) raised this issue in his reformulation of CMS analysis, tying it to the approximation error that appears when expressing a continuous aggregation function with an index number constructed in discrete time. To avoid this approximation error, Milana referred again to the index-number theory, which suggests building indexes for a certain time span, subdividing it into the shortest possible intervals and chaining together the indexes calculated at those intervals.

Similarly in CMS analysis, by using the chain method, we may consider the whole path followed by the data from the starting to the final period. Hence, the size and the sign of the effects become strictly dependent on such a path, in that for any given levels of market shares and weights in the starting and final period, their intermediate levels determine the values of the terms generated by the decomposition. In this sense, the path-dependency problem is not solved, as claimed by Guerrieri and Milana (1990, pp. 332-3), but is created by the chain method. In contrast, in traditional formulations, the decomposition is performed by directly comparing final and starting period data, thus losing the opportunity to benefit from all the information conveyed by the intermediate data. But, it is precisely because of this simplification that decomposition results are independent of the path followed by the elementary data in the intermediate periods, whatever formula used.

However, the practice of subdividing the time span into short intervals can be useful to better understand the dynamics of the underlying variables, and to generate time series of the decomposition effects that can be integrated in econometric models[15].

4. A new specification of CMS analysis

In this section, we present a new decomposition formula for CMS analysis, addressing the problems discussed in section 3. This formula may be used for analyzing data on import market shares, classified by importing country and by product. The base accounting identity is given by equation [3] as specified in [7], where symbols assume the same meaning as already showed in Section 3.2.2.

$$S^t \equiv \sum_i \sum_j s_{ij}^t g_{.j}^t p_{i.}^t d_{ij}^t$$

Changes of [7] over time are decomposed with a formula similar to [18]. But since in [7] each addend is the product of four factors, the number of terms generated by the decomposition is not three, as in [18], but fifteen. Not all these terms can easily be given an economic interpretation. So it is more convenient to group some of them together and use a decomposition formula extracting seven effects:

15 Recent applications of the *shift-and-share* analysis make wide use of this practice, advocated by Barff and Knight (1988). For an interesting example of how *shift-and-share* analysis can be integrated into econometric models, see Banasick and Hanham (2006).

$$S^t - S^0 = \sum_i \sum_j \left(s_{ij}^t - s_{ij}^0\right) w_{ij}^0 +$$

[CE]

$$\sum_i \left(p_{i.}^t - p_{i.}^0\right) s_{i.}^0 +$$

[CSE]

$$\sum_j \left(g_{.j}^t - g_{.j}^0\right) s_{.j}^0 +$$

[GSE]

$$\sum_i \sum_j \begin{bmatrix} \left(d_{ij}^t - d_{ij}^0\right) s_{ij}^0\, p_{i.}^0\, g_{.j}^0 + \\ \left(p_{i.}^t - p_{i.}^0\right)\left(g_{.j}^t - g_{.j}^0\right) s_{ij}^0\, d_{ij}^0 + \\ \left(p_{i.}^t - p_{i.}^0\right)\left(d_{ij}^t - d_{ij}^0\right) s_{ij}^0\, g_{.j}^0 + \\ \left(g_{.j}^t - g_{.j}^0\right)\left(d_{ij}^t - d_{ij}^0\right) s_{ij}^0\, p_{i.}^0 + \\ \left(p_{i.}^t - p_{i.}^0\right)\left(g_{.j}^t - g_{.j}^0\right)\left(d_{ij}^t - d_{ij}^0\right) s_{ij}^0 \end{bmatrix} + \qquad [\ 21\ ]$$

[SIE]

$$\sum_i \sum_j \left(s_{ij}^t - s_{ij}^0\right)\left(p_{i.}^t - p_{i.}^0\right) g_{.j}^0\, d_{ij}^0 +$$

[CAE]

$$\sum_i \sum_j \left(s_{ij}^t - s_{ij}^0\right)\left(g_{.j}^t - g_{.j}^0\right) p_{i.}^0\, d_{ij}^0 +$$

[GAE]

$$\sum_i \sum_j \begin{bmatrix} \left(s_{ij}^t - s_{ij}^0\right)\left(d_{ij}^t - d_{ij}^0\right) p_{i.}^0\, g_{.j}^0 + \\ \left(s_{ij}^t - s_{ij}^0\right)\left(p_{i.}^t - p_{i.}^0\right)\left(g_{.j}^t - g_{.j}^0\right) d_{ij}^0 + \\ \left(s_{ij}^t - s_{ij}^0\right)\left(p_{i.}^t - p_{i.}^0\right)\left(d_{ij}^t - d_{ij}^0\right) g_{.j}^0 + \\ \left(s_{ij}^t - s_{ij}^0\right)\left(g_{.j}^t - g_{.j}^0\right)\left(d_{ij}^t - d_{ij}^0\right) p_{i.}^0 + \\ \left(s_{ij}^t - s_{ij}^0\right)\left(p_{i.}^t - p_{i.}^0\right)\left(g_{.j}^t - g_{.j}^0\right)\left(d_{ij}^t - d_{ij}^0\right) \end{bmatrix}$$

[RAE]

The first term is called the *competitiveness effect* (CE), as it is the weighted average of the changes of an exporting country's market shares in all the product/country segments into which the import market is subdivided. The underlying idea is that such changes display the effects of variations in relative prices and in the other competitiveness factors such as quality, image, distribution network, and so on, that make one country's products preferred to those of competitors. Essentially, this effect is not *ex-ante* measure of the competitive strength of a country's products, but a synthetic *ex-post* indicator of their competitive performance in the destination market.

The subsequent three terms, taken as a whole, are equivalent to the second term of [18], which is the *structure effect* (SE). They show how a country's aggregate market share would have changed because of the effect of changes in the structure of import demand, given the starting level of its disaggregated market shares.

The *commodity structure effect* (CSE) measures how changes in the product composition of the destination market import demand affect an exporting country's aggregate market share. Its sign depends on the correlation between changes in the relative importance of each product in total imports of the destination market, and the market shares held by the exporting country in each product in the starting period. In other words, the more the country's export specialisation pattern (defined by the vector of its product shares in the starting period) is oriented toward the products with fast growing foreign demand, the more the CSE becomes favourable.

Similarly, the *geographic structure effect* (GSE) shows to what degree the behaviour of a country's aggregate market share is influenced by changes in the distribution of the destination market demand by importing country. The better the geographic orientation of a country's exports corresponds to these changes, the higher its GSE. In other words, countries whose export market shares are relatively larger in the most dynamic importing countries will reach a positive and high GSE.

The *structural interaction effect* (SIE) depends on how changes in the geographic and commodity structure of destination market imports are related to each other. It is positive if such changes tend to raise the relative incidence of the market segments in which a country is specialised. As we can see from the formula, the SIE is made of five terms generated by the decomposition. The first of these, named the *structural diversification effect* (SDE), depends on how the SDIs of the destination market import demand change over time. The sign of this effect is determined by the interaction between SDI changes and the initial levels of disaggregated market shares and of the total country and product weights. The greater the demand for imports concentrates in the segments in which an exporting country is specialised (the more these segments raise their "specific weight" in total destination market imports), the more the SDE becomes favourable for that country. The SDE is substantially equivalent to the "specific market-product effect" introduced for the first time in CMS analysis by Guerrieri and Milana (1990). Its usefulness derives from the fact that including SDIs into the decomposition formula allows using homogeneous weights (at a similar degree of disaggregation) in the calculation of the other structure effects (CSE and GSE), as discussed in Section 3.2.2.

The other terms that make up the SIE arise from the interaction among the various kinds of weights used in the formula (product weights, geographic weights and structural diversification indexes). The economic importance of these terms is not intuitive. Loosely speaking, they tend to have a positive sign for those countries with specialisation in those market segments with rising importance. The last three terms of formula [21], taken as a whole, represent the *adaptation effect* (AE) and are exactly equal to the corresponding term of equation [18].

The *commodity adaptation effect* (CAE) shows the interaction between the competitiveness effects recorded by a country in each product[16] and the changes in the product structure of destination market demand for imports. The CAE can be interpreted both as a "second competitiveness measure", if a country succeeds in gaining market shares in the most dynamic products, and as an indicator of flexibility of the country's international specialisation pattern, if such a pattern changes in ways conforming to the tendencies of market demand. This ambivalence occurs because changes of market shares over time can be read both as an effect of competitiveness factors (as in the CE), and as an outcome of changes in the specialisation pattern, which is defined by the market share distribution around their average (as in the SE).

Similarly, the *geographic adaptation effect* (GAE) shows to what degree an exporting country's market share gains tend to be concentrated in the most dynamic countries in terms of import demand. Its sign depends on the correlation between changes in the structure of destination market demand for imports by importing country and the competitiveness effects recorded by the exporting country in each importing country. [17]

Finally the *residual adaptation effect* (RAE) encompasses five interaction terms, whose dimensions are normally small. They capture the correlation among the changes of disaggregated market shares, structural diversification indexes and a combination of geographic and product weights. Even the RAE, if positive, shows that a country's best trade performances tend to be concentrated in the most dynamic segments of the market.

The main value of CMS analysis lies in its ability to gauge the role played by composition

[16] For each exporting country it is possible to calculate a set of *product competitiveness effects*. Each one of those effects is equal to the weighted average of the market share changes recorded for that product in the various importing countries. Actually, these product competitiveness effects, similarly to the global one (CE), indicate how the product market shares of the exporting country would have changed, had the geographic structure (by importing country) of destination market imports in individual products remained unchanged.

[17] Each one of these *country competitiveness effects* is equal to the weighted average of market share changes recorded by the exporting country for the various products. In other words, they indicate how the market shares of the exporting country in each importing country would have changed, had the product structure of the importing country's demand remained unchanged.

factors in determining export performance. This role may be better understood by further decomposing the structure effects measured by the CMS formula, using an approach similar to that proposed by Fagerberg and Sollie (1987) for the adaptation effect. [18]

For instance, we may express the commodity structure effect (CSE) as follows:

$$CSE = r_{SC}\sqrt{\sum_i\left(s_{i.}^0-\mu_s^0\right)^2}\sqrt{\sum_i\left(p_{i.}^t-p_{i.}^0\right)^2} \qquad [22]$$

in which: r_{SC} = linear correlation coefficient between an exporting country's initial export market shares in each product and the changes of product weights in destination market imports;

$s_{i.}^0$ = an exporting country's initial export market share in product *i*;

μ_s^0 = unweighted arithmetic mean of an exporting country's initial product market shares;

$p_{i.}^t$ = product *i*'s weight on destination market total imports.

Equation [22] shows the commodity structure effect as the product of three factors:

a) The degree of correlation between the product structure of an exporting country's market shares, which defines its specialisation pattern, and the changes in the product structure of destination market import demand.

b) An indicator of the variability of product market shares around their mean or, in other terms, of the degree of *polarisation* of the specialisation pattern.

c) An indicator of change in the structure of demand, as measured by the variation of the product weights in destination market imports.

Since the third factor is common to all exporting countries, it is the first two that are decisive for differentiating each country's CSE. More precisely, the sign of the CSE is established by the coefficient of correlation, while its size relative to other countries, depends on the intensity of the correlation and on the coefficient of comparative advantage polarisation. In other words, at equal correlation degree between the exporting countries' specialisation patterns and the changes in the structure of import demand, the highest positive (or negative) CSEs are recorded by those countries whose specialisation patterns are more differentiated between strong and weak points: the polarisation degree of the specialisation pattern amplifies the magnitude of the structure effects.

[18] See section 3.3.1.

5. Constant-market-shares analysis of export performances: 1995-2007

In this section we present the results obtained from applying the CMS analysis described in Section 4 to the study of world merchandise exports in the period 1995-2007. The analysis was based on the BACI database, developed by the Centre d' Études Prospectives et d'Informations Internationales (CEPII) using the UN COMTRADE data.[19] We considered 208 exporting countries in the database, but here we present results only for the first 30 exporters in 2007, and for the 7 largest African exporters (South Africa, Nigeria, Algeria, Angola, Egypt, Morocco and Tunisia), which are included for a more comprehensive representation of world exports (our sample of 37 countries together makes up for around 87 percent of total world exports on average over the period).

The world market was disaggregated into the 208 destination countries and into 4,968 products at the HS 6-digit classification, which multiplied among them resulted in 1,033,344 elementary market segments. The analysis was performed for each year of the period 1995 to 2007, as suggested in sub-section 3.3.2, and then the results were aggregated over time.

Table 1 shows these results for the entire period 1995-2007. The most striking result is the remarkable expansion of Chinese exports. China ranked first in the world ranking of exporters already in 2006, with a market share of 10 percentage points of world exports, moving from the seventh place in 1995. Chinese exports grew constantly, and faster than competitors, at an annual rate of 17.4 per cent (in current US dollars) or double than that for the world average. This rise has come at the expense of all major developed countries. The greatest absolute market share losses were recorded by the United States of America, from 12.3 to 8.4 per cent of world exports, and Japan from 9.1 to 5.3, followed by all the largest member countries of the EU-15, and Canada, Malaysia, Singapore and Switzerland with sizable losses. More striking is that no other emerging economy has reached comparable results in absolute terms, although other countries of the BRICS grouping (including Brazil, Russian Federation, India, China and South Africa) have also increased their export market shares.

The second largest rise in absolute terms was recorded by the Russian Federation (from 1.1 to 2.5), followed by oil exporting countries such as Kingdom of Saudi Arabia and the United Arab

[19] BACI (Base pour l'Analyse du Commerce International) is the world trade database developed by CEPII at the HS 6-digit product disaggregation. BACI is developed using an original procedure that reconciles the declarations of the exporter and the importer. Original data are from the United Nations Statistical Division (COMTRADE database). The harmonisation procedure enables to extend considerably the number of countries for which trade data are available, as compared to the original dataset. BACI provides bilateral values and quantities of exports at the HS 6-digit product disaggregation, for more than 200 countries over the period 1995-2007. For further information, see Gaulier and Zignago (2009).

Emirates. Other countries which gained higher market shares include new EU members such as Poland and the Czech Republic; African exporters of raw materials, such as Algeria and Nigeria, and 'export platforms', such as Ireland and Mexico, which attracted considerable inflows of market access-seeking foreign direct investment (FDI). Table 1 presents 37 countries that made up 88 per cent of world exports in 1995. Their share decreased to 85 per cent in 2007, indicating a fall in the world export market concentration. Many other developing countries not listed in the table expanded their market shares, such as for instance Vietnam, with an annual export growth of 21.4 per cent. Overall, their gains were larger than the losses of other not listed countries.

Constant-market-shares analysis confirms that these market share changes are strongly influenced by competitiveness factors. Their sign almost always coincide with the sign of the *competitiveness effect* (CE), which makes up for a high percentage of the total share variations (79 per cent for the total of 37 countries). However, taken together, the three 'static' structure effects are even more important (100 per cent) and the three 'dynamic' adaptation effects are equally important as the CE. So, the prevalence of the CE is only because of the contrasting signs of the other terms.

As argued earlier, CE is not an *ex-ante* measure of a country's export competitive capacity, but an *ex-post* indicator of its competitive performance at the disaggregated level. The CE measures what would have been the change of the country's aggregate export share, in the absence of composition effects, that is under the assumption that the commodity and geographic distributions of world import demand had remained unchanged. In other words, the CE allows measuring to what extent changes in a country's aggregate export market share reflect its average competitive performance in each destination market for each product. This can be the result not only of *ex-ante* competitiveness variables, such as price, quality, exchange rates, and so on, but also of other factors affecting export performance, such as the country's capacity to attract FDI or participate in international production fragmentation.

The data presented in Table 1 show clearly the deep changes shaking the international economy in the last years. A group of emerging economies and developing countries, led by China, is progressively gaining importance in the international distribution of economic activities, at the expense of all developed economies. From this perspective, trade is the most evident and easy to measure sign of a more profound transformation that involves the geographic location of production.

Table 1 Constant Market-Shares Analysis of World Merchandise Exports: 1995-2007

(effects expressed as a percentage of market shares in 1995 – data in current prices)

Exporting countries	Market shares		Changes	Compe-titiveness (CE)	Commodity structure (CSE)	Geographic structure (GSE)	Structural interaction (SIE)	Commo-dity adaptation (CAE)	Geogra-phic adapta-tion (GAE)	Residual adapta-tion (RAE)
	1995	2007	2007-1995							
China	4.18	10.47	150	172	-38	-14	8	9	-2	15
Germany	10.32	9.48	-8	-3	-2	4	1	0	0	-7
USA	12.33	8.40	-32	-31	-1	-1	-2	0	0	3
Japan	9.08	5.33	-41	-33	-6	0	-3	2	1	-2
France	5.75	4.12	-28	-22	-1	0	-4	-1	0	0
Italy	4.66	3.69	-21	-8	-6	1	3	-1	0	-10
United Kingdom	4.79	3.29	-31	-29	5	-1	0	-1	0	-5
Netherlands	3.57	3.18	-11	-5	-1	-4	-2	2	-1	-1
Canada	3.96	3.13	-21	-14	2	-2	-2	-2	0	-4
Republic of Korea	2.55	2.85	12	2	-14	8	-18	6	1	27
Belgium-Luxemburg	3.18	2.69	-15	-5	-1	-5	1	0	0	-6
Russian Federation	1.14	2.51	121	-12	60	40	-70	8	5	91
Mexico	1.69	2.10	24	22	5	-8	3	-4	1	5
Spain	1.90	1.90	0	10	-5	-8	-2	0	-1	6
Saudi Arabia	0.99	1.63	65	-67	73	-10	-13	6	8	68
Malaysia	1.71	1.52	-11	20	-10	-7	1	-8	0	-6
Singapore	1.98	1.50	-24	-33	-2	0	-2	5	-1	8
Switzerland	1.92	1.48	-23	-20	2	-3	2	-3	0	-2
Sweden	1.60	1.28	-20	-19	11	-1	-3	-5	0	-3
India	0.76	1.28	68	77	-13	9	3	-11	-1	4
Brazil	1.04	1.28	23	28	-11	3	-6	-2	1	11
Thailand	1.20	1.24	4	25	-17	-2	3	0	0	-5
Austria	1.12	1.14	2	2	0	1	5	-1	-1	-4
Ireland	0.91	1.12	23	-29	-5	-16	0	17	2	54
Australia	1.06	1.10	4	6	9	-2	-2	0	0	-7
Indonesia	1.05	1.07	2	19	-3	-3	-1	-14	-2	6
Poland	0.50	1.02	103	100	-2	16	26	-1	-5	-32
Norway	0.90	1.01	13	-9	41	-7	9	-5	0	-16
United Arab Emirates	0.36	0.95	162	59	71	-15	-25	-4	17	57
Czech Republic	0.46	0.90	98	108	-8	14	19	-2	-2	-31
South Africa	0.54	0.68	26	24	-1	-5	-4	-1	1	11
Nigeria	0.24	0.49	107	5	92	-11	-27	29	-7	25
Algeria	0.22	0.49	118	12	109	-5	-3	-2	-5	13
Angola	0.07	0.26	298	125	111	17	19	5	6	15
Egypt	0.13	0.19	44	19	26	9	-4	-6	0	-2
Morocco	0.15	0.14	-6	17	-18	-1	1	-9	-1	4
Tunisia	0.12	0.13	7	29	-12	-7	6	-10	0	0
TOTAL	88.12	85.05	-3.5	-2.8	-0.8	-0.9	-1.8	0.4	0.1	2.3

Source: UNIDO calculations based on BACI database.

Indeed, the CE is negative for almost all the developed economies in Table 1, except Australia, Austria and Spain, where it is positive but small; CE is negative for members of the euro area, whose recent competitive performance might be hampered by the strength of their currency, and even more for the United States of America, despite the prolonged depreciation of the US dollar's real effective exchange rate (taking also the bilateral exchange rate with the renminbi into account). This suggests that recent changes in export market shares should be understood not much as the result of fluctuations of exchange rates and other competitiveness factors, but as the outcome of more profound changes in the distribution of manufacturing activities through outsourcing and offshoring. This process of relocation seems to hit the market shares of developed economies, regardless of changes in the price competitiveness of their exports.

Besides the CE, *composition effects* play an important and sometimes decisive role in market share behaviour. In some cases, they substantially strengthen a CE of the same sign, such as in Algeria, Belgium-Luxemburg, Italy, Nigeria, Republic of Korea, and United Arab Emirates; in other cases such as Australia, Indonesia, Spain, Thailand and Tunisia, they lessen considerably its influence; while in cases such as Ireland, Malaysia, Morocco, Norway, Russian Federation and Kingdom of Saudi Arabia, the size of the composition effects is so large to overturn the CE, showing thus to be determinant for the evolution of export market shares.

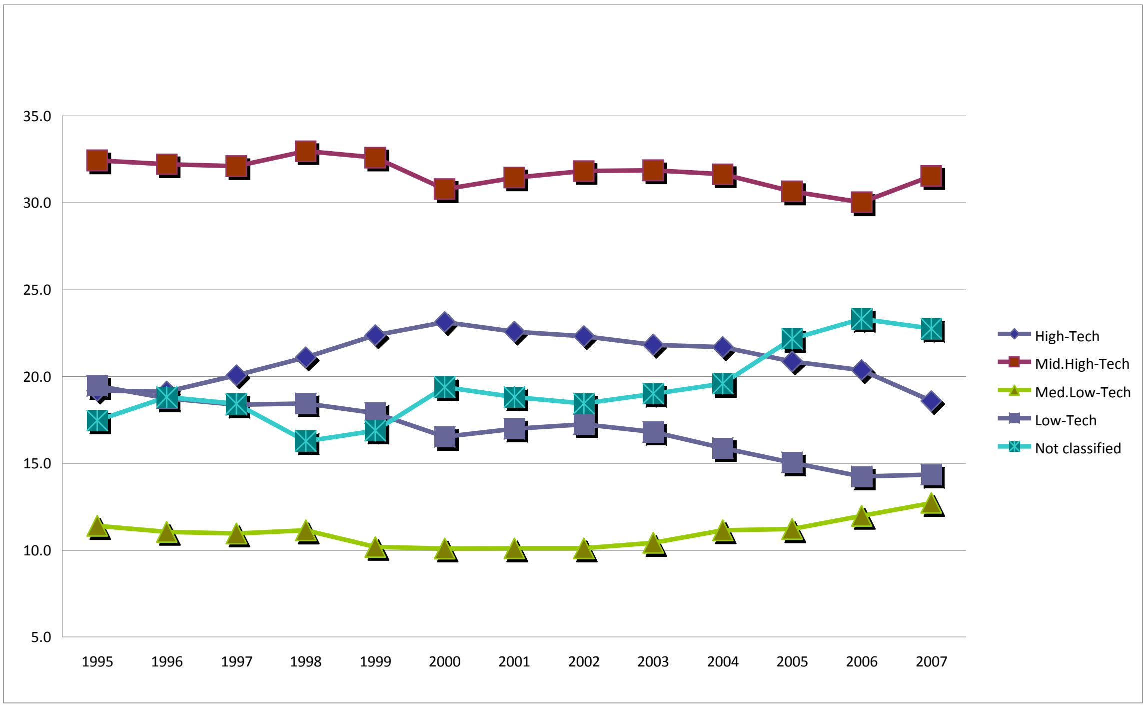
Taken as a whole, the six composition effects are negative for most of the countries in Table 1. The largest negative contributions, relative to country size, were recorded for most Southeast Asian countries, including China, several European countries (Italy in particular), Morocco and Tunisia. Overall, as mentioned earlier, 'static' structure effects are negative and slightly more important than the 'dynamic' adaptation effects, which tend to be positive.

A second feature of our results is that the largest composition effects are those related to the interaction between the commodity and geographic distribution of world trade, namely the 'structural interaction effect' (SIE) and the 'residual adaptation effect' (RAE). As mentioned, these terms are more difficult to interpret, but tend to be of negligible size in most applications of CMS analysis. The extremely high disaggregation level of the analysis probably causes that, in our case, they happen to be larger than the corresponding 'non-mixed' commodity and geographic effects, taken at the margins of our world trade matrix. In many of the over one million market segments of our database, the value of world imports is zero or a low number, even when the corresponding commodity and country total is fairly large. Other things being equal, this polarisation of the world trade matrix generates large *structural diversification indices* (see sub-section 3.2.2), which translate into fairly large SIEs and RAEs. In normal applications of CMS analysis, elementary market segments are much less, which lowers the probability of zero flows and rises the degree of statistical connection between the commodity and market distributions of world imports.

The *commodity structure effect* (CSE) measures the effect on aggregate market share changes of the correlation between a country's export specialisation pattern and trends in the product structure of world import demand. Countries whose comparative advantages are concentrated in products in which world import demand grows more rapidly would be favoured by this effect, even if their market shares remained constant over time for every product. Given the link between differences in growth rates of world imports across products and the income-elasticity of their demand, CSE can be considered as a synthetic measure of the 'dynamic efficiency' of export specialisation patterns, as defined in Section 1.

To interpret this term, the evolution of world import structure by commodity must be looked at. Several classification criteria can be used and one of the most important is based on the technological intensity of each product. Figure 1 shows that, contrary to common believe, high-tech products' importance in world trade, after rising fast in the second half of the 1990s, was falling significantly in the following decade, to the advantage of medium-low technology products and the grouping of goods not classified by technological level. But low-tech products have confirmed their downward trend throughout the observed period.

Figure 1 World merchandise exports by technology level



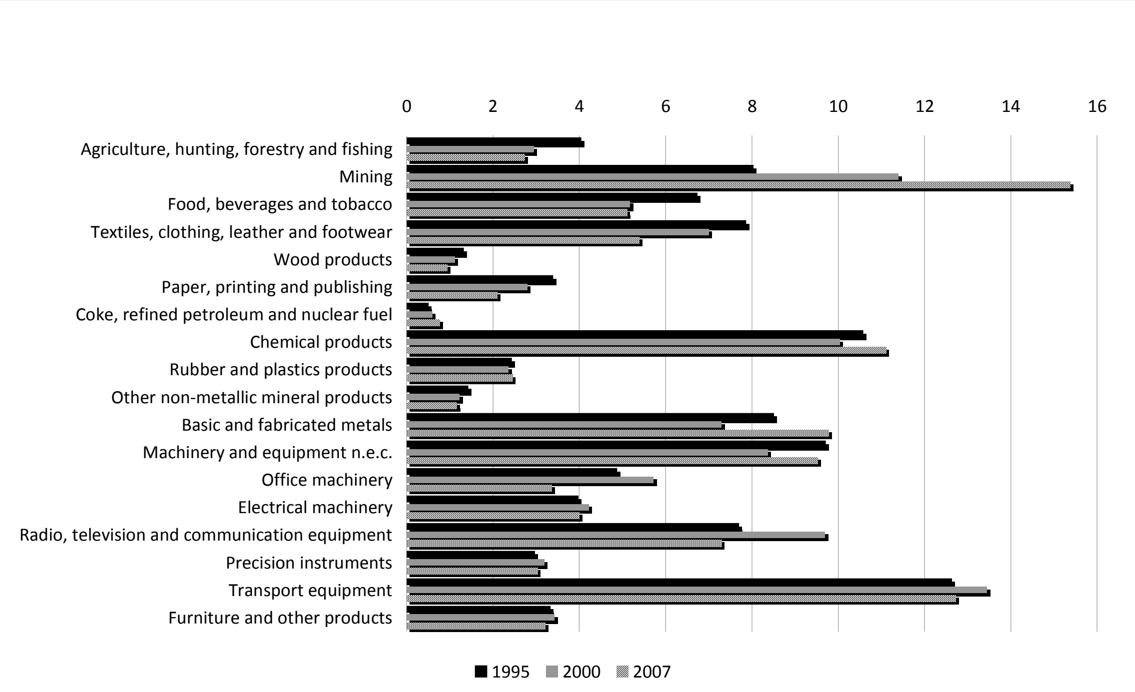
Source: UNIDO classification based on BACI and OECD (see Annex) .

The implication of these changes is that the positive correlation between technology level and growth of world import demand does not hold any longer. Even if specialisation in traditional low-tech products is still to be considered as dynamically inefficient, comparative advantages in high-tech products are not necessarily better at relaxing the external constraint to growth.

To better understand these changes, we converted and aggregated the product level data by industries, according to the ISIC Rev. 3. Figure 2 portrays the main results. It is clear that the structural evolution of international trade in the last years has been dominated by the dramatic rise of the mining sector, whose share of world merchandise imports has almost doubled between 1995 and 2007. This was mostly caused by changes in relative prices, and by the rising demand for raw materials coming from emerging economies. On the other hand, the importance of traditional activities, such as agriculture, food and other consumption good industries, declined. Remarkably, even the ICT-based industries (such as office machinery, radio, television and communication equipment), after rising considerably in the second half of the 1900s, experienced a strong downsizing in the following decade, recording lower world trade shares in 2007 than in 1995. This unexpected fall might be attributed to the downward trend of the prices of many consumption electronics goods, but might also suggest that the consumption patterns of the previous decade have lost their momentum. Even if new products continue to be generated in ICT industries, it could be argued that the absorption capacity of consumers has hit a ceiling, so that the budget shares of these products in family spending cannot grow as rapidly as before.

Figure 2 offers some signs of other important trends in the structure of the global economy. Besides mining, other industries such as chemicals, metals and machinery have substantially expanded their share of world trade since 2000. In other words, the demand for intermediate and capital goods has been the most dynamic in world trade in the last decade. This could be attributed to the rapid growth of industrial capacity in several emerging economies and to the related process of international production and consumption fragmentation, generating global production chains and networks and leading to more intense exchanges of inputs across the different nodes of these networks. It could even be contemplated that the recent global crisis, regardless of its financial roots, has showed an unbalance between the growth of productive capacity and effective demand at the global level, signs of which can be seen also in the recent evolution of world trade flows.

Figure 2 World merchandise exports by industry (in % - at current prices)



Source: UNIDO calculation based on BACI.

Coming back to the results of our CMS analysis, Table 1 shows that CSE is in general negative for the 37 selected countries, explaining roughly 24 per cent of their aggregate market share loss, but again this is the result of widely diversified figures across countries.It is clear from the table that CSE is positive for most of the developing and developed countries specialised in natural resource-based exports, whose demand has been growing much faster than the average of world merchandise imports. This underlines the usefulness of CMS analysis to better understand the nature of changes in aggregate export market shares in current prices, in a context of large differences in price trends across products.

Take the example of the Kingdom of Saudi Arabia, whose aggregate market share rose from 1 to 1.6 per cent in the period 1995-2007. It is clear from the Table 1 that this rise is not at all a sign of a good competitive performance. On the contrary, the CE is negative and of considerable size. The aggregate performance results are so positive only because of favourable composition effects and of a strong CSE in particular. This shows that the comparative advantage of the Kingdom of Saudi Arabia in energy products, whose weight in world imports has been inflated by their rising relative prices, is so strong to more than offset the market share losses recorded, on average, for single products and markets.

This case shows what can be considered as a second channel of transformation of the global economy, in addition to international production fragmentation. Even countries with domestic macroeconomic and structural conditions lagging behind those of the emerging economies can participate in the benefits of a global expansion, if their specialisation pattern is dynamically efficient. Indeed, the demand for natural resources coming from emerging economies is a powerful international transmission channel of these benefits. But, the opposite can happen during economic crisis, when the vulnerability of development patterns based only on exhaustible natural resources underlines the need to use the rents generated by their price raises to invest in the diversification of their economic base.

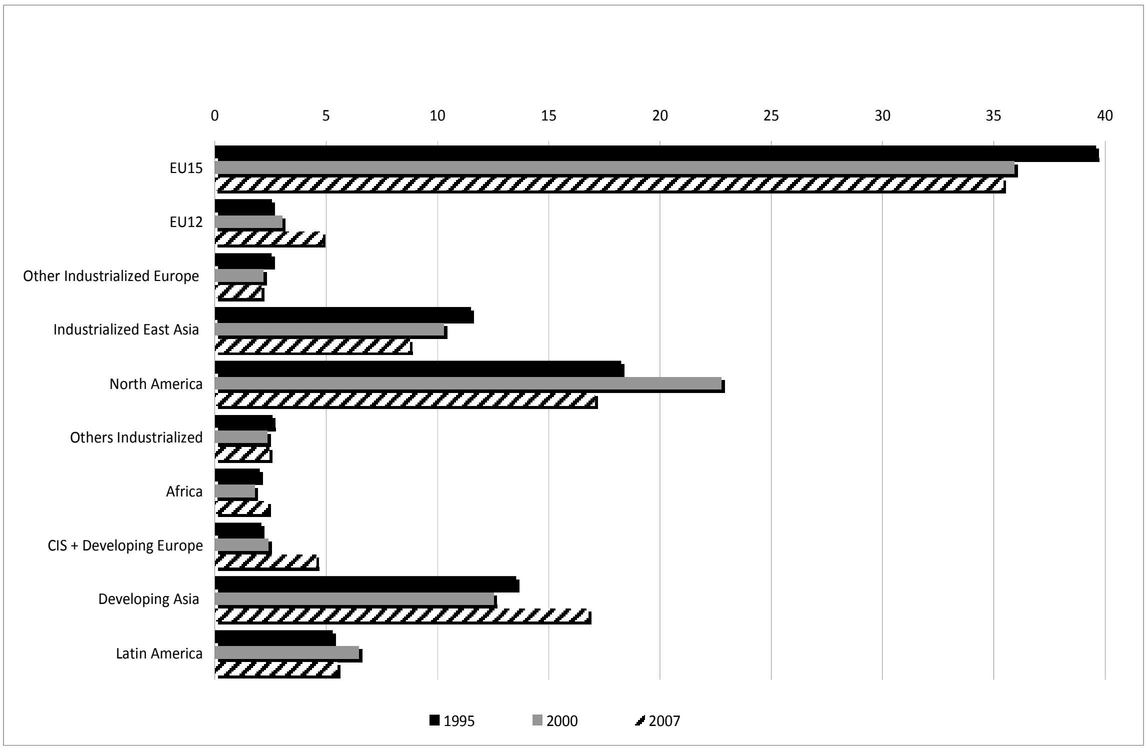
Countries characterised by the largest negative CSEs are most of the African and South-East Asian exporters specialised in labour-intensive consumption goods, such as China, India, Malaysia, Morocco, Republic of Korea, Taiwan, Tunisia, and some Southern European countries such as Italy and Spain, with similar export patterns.

The *geographic structure effect* (GSE), can be interpreted similarly to the CSE. It is a measure of the total export market share effect following from the correlation between a country's 'geographic pattern of specialisation' and changes in the world import demand's distribution by country. In other words, GSE tends to favour countries whose exports are more oriented toward the most dynamic destination markets, which can be the result of distance and of other factors creating preferential trade linkages or barriers.

Similarly to CSE, the interpretation of GSE must take into account that the available data are in current prices and exchange rates. Thus, assuming other things being equal, a market can be more dynamic than the world average not only (and not always) because the volume of its imports grows rapidly, as it happens, for example, during industrial take-off phases. The relative growth of a country's import value is also affected by relative prices and exchange rates. So, for example, the euro appreciation *vis-à-vis* the US dollar can translate into a higher growth rate of imports in Euro area members. In this case, the nominal impact of the currency appreciation reinforces its real substitution effects.

Figure 3 shows the world imports' geographic distribution by destination region and confirms the relevance of these arguments. Since 2000, the most dynamic import markets have been those of developing countries and emerging economies, particularly in Asia and Europe. In contrast, North American imports, after rising faster than the world average in the second half of the 1990s, have experienced a sharp decline relative to other regions, because of the dollar depreciation. Conversely, the fall in the relative importance of the EU-15 market has been slowed down by the euro appreciation.

Figure 3 World merchandise exports by destination region (in % - at current prices)



Source: UNIDO calculations based on BACI.

Table 1 confirms that the largest positive GSEs have been recorded by countries, such as those in Central and Eastern Europe, whose exports are more oriented toward the EU-15 markets. Overall, however, this effect is negative for the 37 countries considered in Table 1, and its total size is similar to that of the CSE.

The *structural interaction effect* (SIE) is less intuitive than the other two elements of the structure effect. Loosely speaking, it has to do with the correlation between an exporting country's comparative advantages and changes in *structural diversification* of the world import matrix by product and destination market relative to a hypothetical world import matrix, in which the product and market distributions have no statistical connection. In other words, SIE tends to favour countries whose exports are fairly more oriented toward specific product/market segments that grow faster than expected based on the product growth in all markets and the market growth for all products.

As mentioned earlier, with data at moderate disaggregation levels, this effect tends to be small. On the contrary, in our database, the extremely high disaggregation level translates into a high structural diversification of the world import matrix. So, for the total of our 37 countries, SIE results negative and larger than the sum of CSE and GSE, showing that an analysis of export specialisation patterns' dynamic efficiency cannot be based only on the product distribution of a country's exports to the world but must be also differentiated across destination markets. Broadly speaking, SIE tends to be larger in countries with larger CSEs and GSEs, such as natural resource-based exporters and Central and Eastern European countries.

The *commodity adaptation effect* (CAE) is one of the three terms measuring the 'flexibility' of a country's export specialisation pattern, defined as its ability to concentrate its best competitive performances in the fastest growing products and markets. CAE refers in particular to the world import distribution by product and measures the aggregate market share effect of a country's ability to change its specialisation pattern along directions similar to the trends of world demand. For the sample of 37 countries, CAE is positive but small. Relative to country size, the largest CAEs were recorded by Nigeria and Ireland, while Indonesia, India and Tunisia show the largest negative CAEs.

The *geographic adaptation effect* (GAE) measures the correlation between an exporting country's competitive performance by destination market and changes in world import geographic distribution. Being successful in dynamic markets means large positive GAE and hence high geographic flexibility of the country's export pattern.

Table 1 shows that for the total of our 37 exporters GAE is the smallest effect identified by our analysis, limiting the fall in their total share of world exports by 2 per cent. Relative to country size, the GAE is largest in resource-exporting economies, but its sign varies even between countries in this group.

The *residual adaptation effect* (RAE) is the last term identified by our formulation of the CMS analysis. Its interpretation is similar to that already discussed for SIE. The RAE tends to favour those countries with best competitive performances in specific product and destination market segments, whose importance in world trade tends to rise more than what would be expected from the total growth of imports of that product in all markets, and of that market for all products.

As explained earlier, the high data disaggregation of our analysis makes the RAE on average much larger than in other more aggregated applications of CMS analysis. Its total size amounts to two thirds of the total change of our countries' total market share, but its sign is positive. Relative to country size, large RAEs were recorded by the Russian Federation, Kingdom of Saudi Arabia, the United Arab Emirates, Ireland and several other developing and emerging economies, which seems to confirm the higher flexibility of their export specialisation patterns.

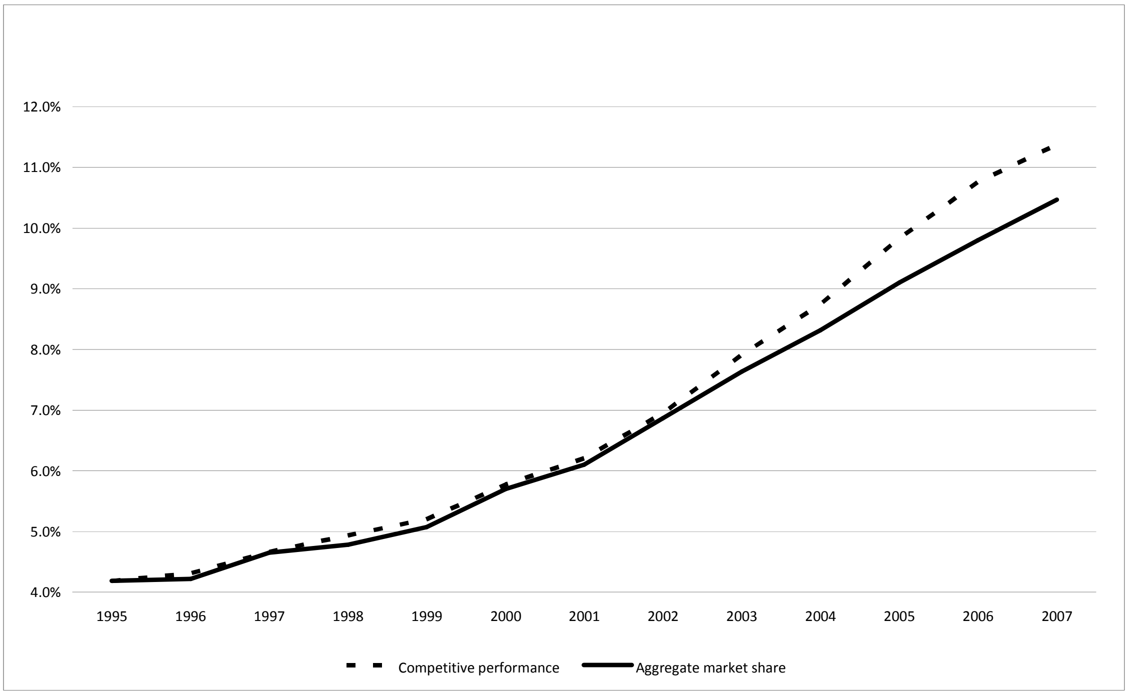
In general, for almost every country, the analysis undertaken highlights effects with different signs. Only for Angola, all the terms generated by the decomposition have a positive sign. Starting from low levels in 1995, Angola shows the most spectacular relative export performance in our group (a market share rise of 300 per cent in 12 years).

As CE measures each country's competitive performance net of composition effects, it can be used to determine what could have been its aggregate export market share, in the abstract assumption that the world import distribution by commodity and destination market had remained unchanged, year after year. This is done simply by adding CE cumulatively to the aggregate market share in the starting year (1985). The following graphs compare the 'true' competitive performance computed in this way for a set of countries with the time path of their aggregate market share, highlighting the usefulness of CMS analysis to understand export performance.

Figure 4 refers to China and shows not only the already mentioned spectacular rise of its export market share, but also the negative role of composition effects (the dynamic inefficiency of its specialisation pattern), particularly in the last five years. Absent this problem, Chinese share of world exports would have become even larger, going beyond 11 per cent in 2007. As Table 1 shows, this gap is because of the negative structure effects (particularly CSE), which more than offset the positive contribution of adaptation effects. In other words, the Chinese export specialisation pattern, although being negatively correlated with changes in the structure of world demand, partly corrected this problem in the observed period, showing a remarkable flexibility.

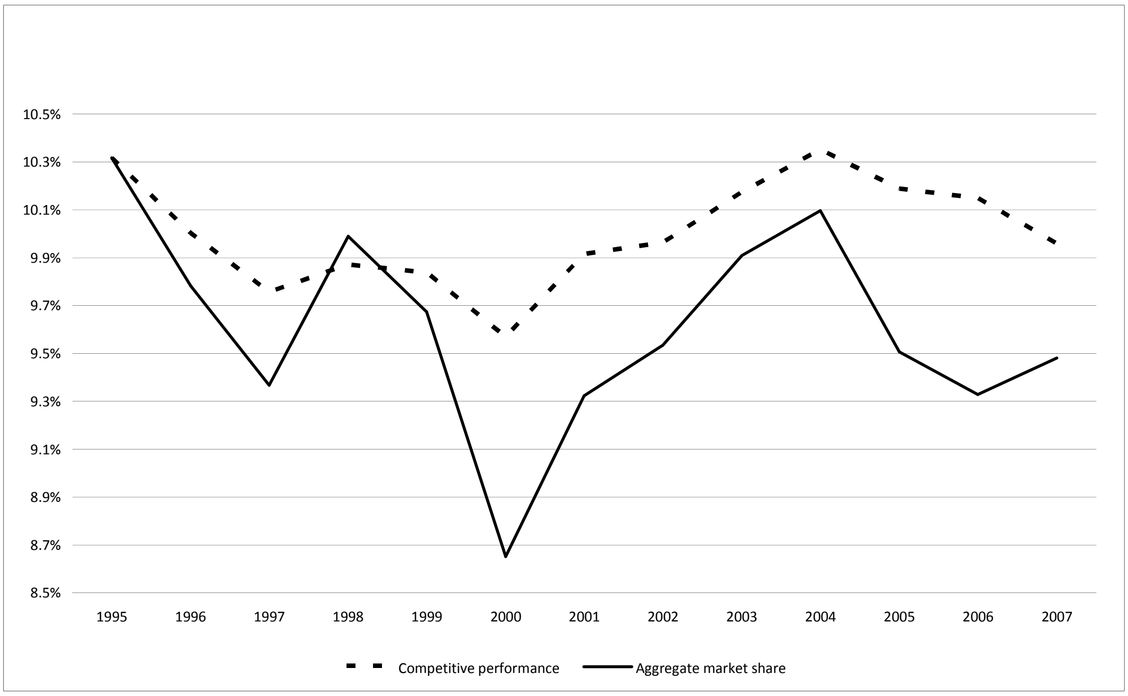
For Germany (Figure 5), the competitive performance was better than the aggregate export market share shows. Correcting for composition effects smoothens the time path of this variable, showing a stationary trend, but three phases are clearly visible in the figure: after a decline in the second half of the 1990s, German exports have reached a substantial recovery, despite the euro appreciation. In the last three years their competitive performance has become slightly negative again, but less than what shown by the aggregate market share. In general, the negative role of composition effects is mostly because of the adaptation effects and partly offset by a positive GSE caused by the short distance from the most dynamic European markets.

Figure 4 China: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI.

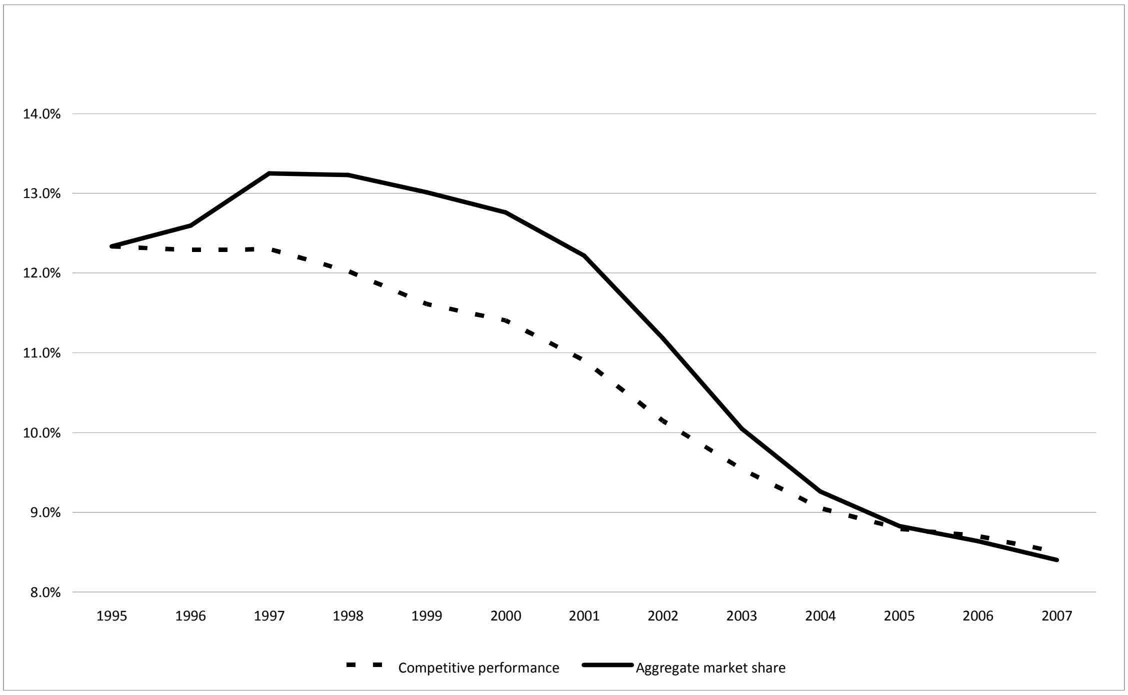
Figure 5 Germany: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI.

The collapse of US export competitive performance was only temporarily masked by favourable composition effects (Figure 6). More precisely, in the second half of the 1990s, the dynamic efficiency of US export specialisation pattern, revealed in particular by a positive CSE, has sustained its aggregate market share. Since 1999, however, these indicators show a marked downward trend, so that, considering the entire period 1995-2007, the market share decline equals that of the competitive performance. As already argued, the depreciation of the dollar's real effective exchange rate has proved unable to stop this decline, possibly because of the negative effects of FDI and international outsourcing on US exports.

Figure 6 United States: CMS analysis of export performance (in % - at current prices)



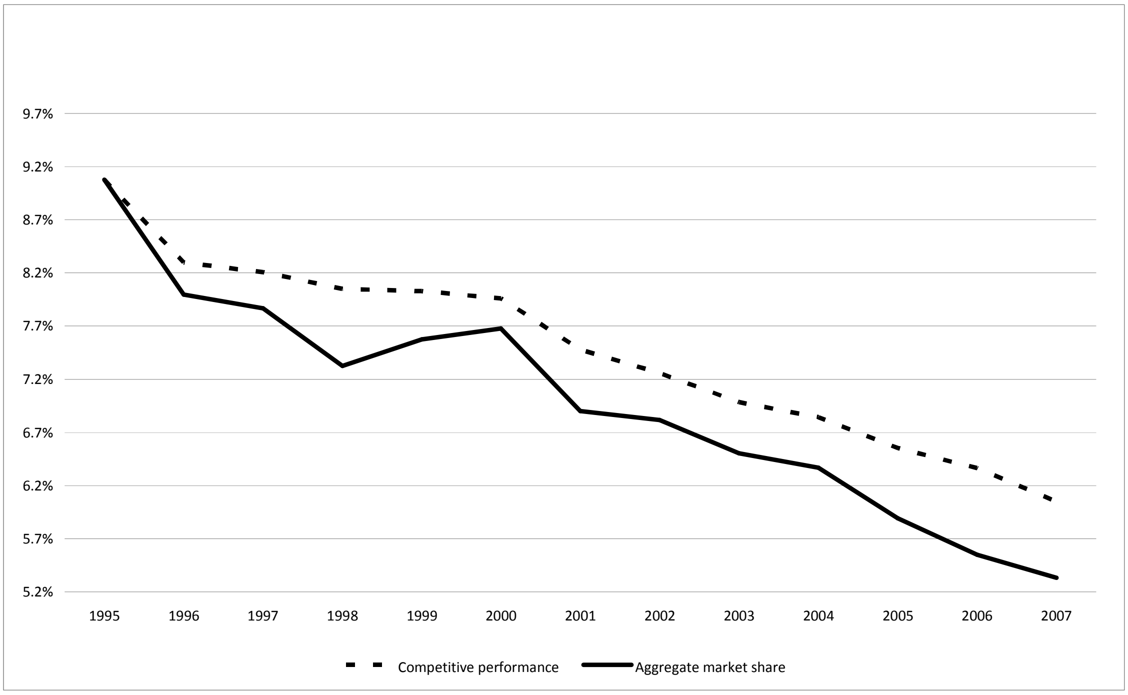
Source: UNIDO calculation based on BACI.

The Japanese case (Figure 7) is partly different from that of the United States of America. The strong downward trend of Japanese export competitive performance was almost constantly reinforced by negative composition effects in general, and by the CSE in particular. Geographic composition factors have given a small positive contribution, because of the favourable position of Japan in dynamic East Asian markets.

The French case (Figure 8) looks similar to that of Japan. A negative downward trend of the competitive performance was reinforced by composition effects, and particularly by SIE and CSE. But in some periods composition effects have played a positive role, masking the decline of export performance.

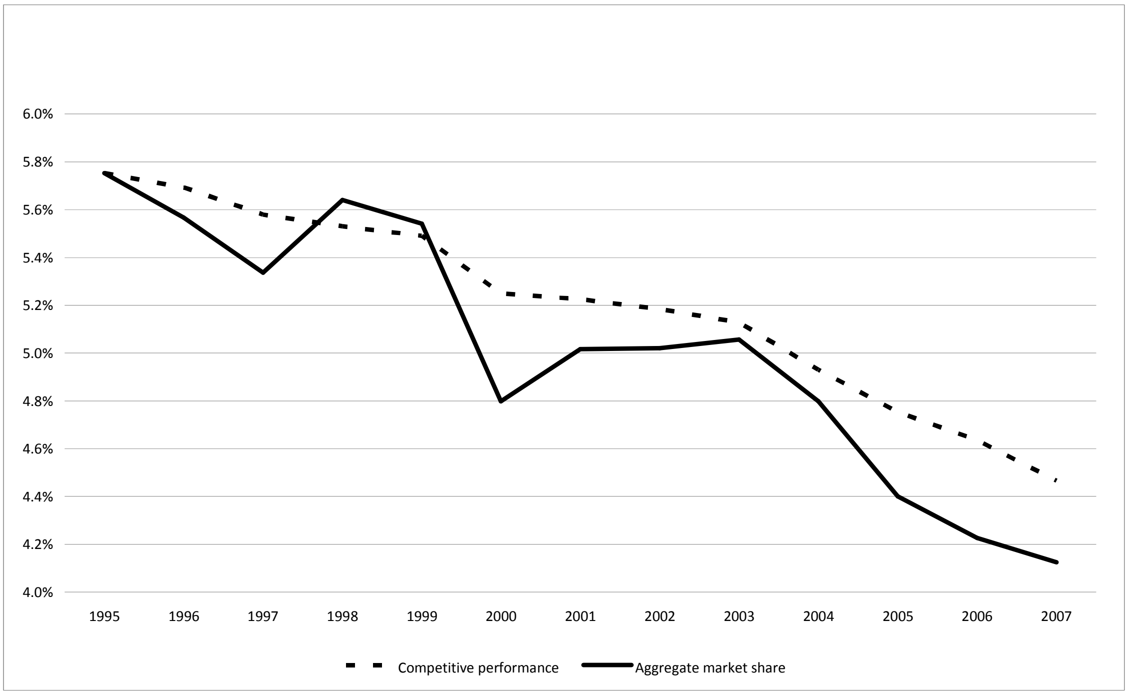
Italy is a striking example of a dynamically inefficient specialisation pattern (Figure 9). The negative trend of its export performance has been less pronounced than in other developed countries, but composition effects have played a strongly negative role. This is true particularly for the adaptation effects and for CSE.

Figure 7 Japan: CMS analysis of export performance (in % - at current prices)



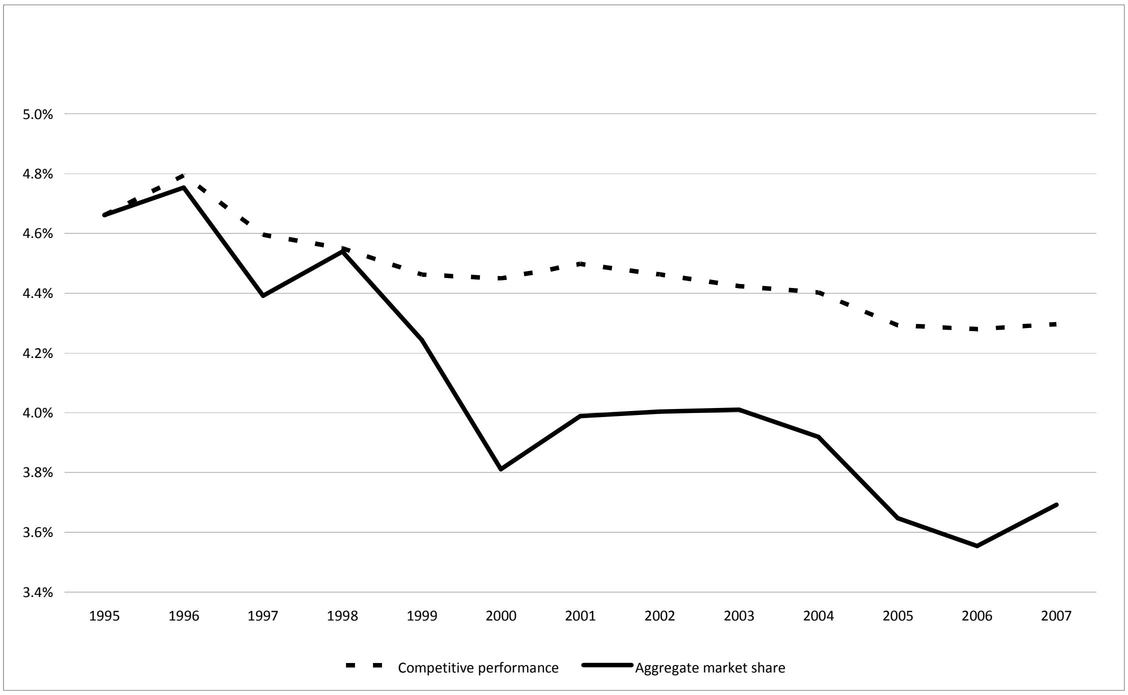
Source: UNIDO calculation based on BACI.

Figure 8 France: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI.

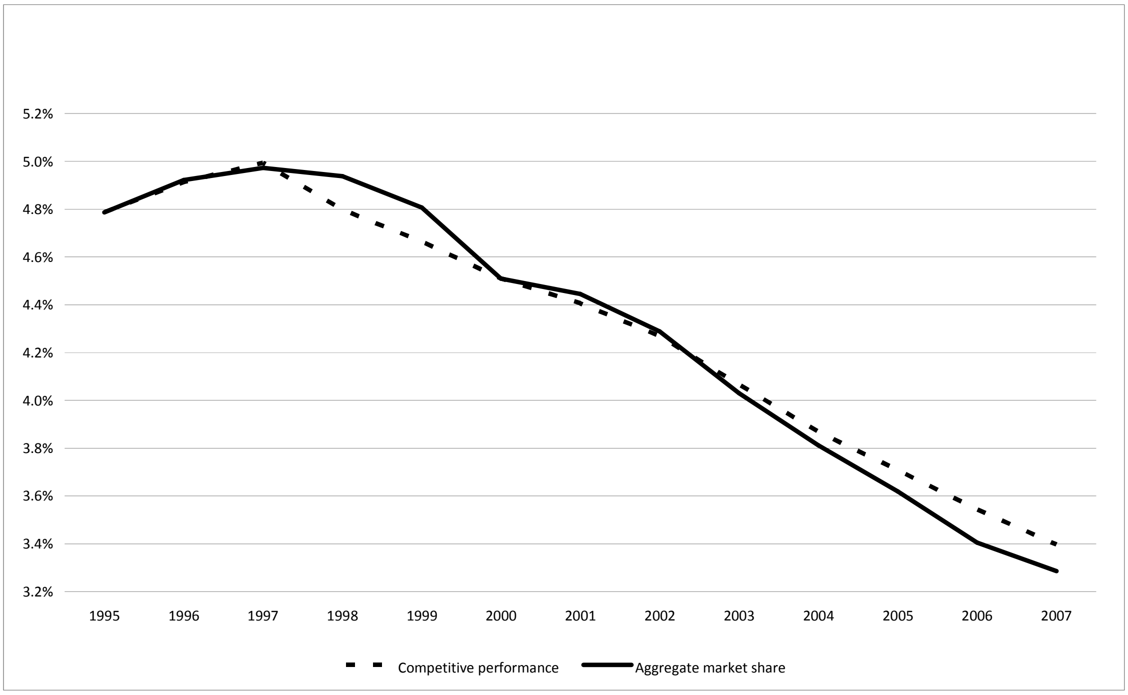
Figure 9 Italy: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI

In contrast, the United Kingdom (Figure 10) represents a case in which CMS analysis does not add much to what can be understood by observing the aggregate market share. The two declining lines describing export performance coincide almost perfectly, since the negative GSE and adaptation effects offset the positive CSE.

Figure 10 United Kingdom: CMS analysis of export performance (in % - at current prices)

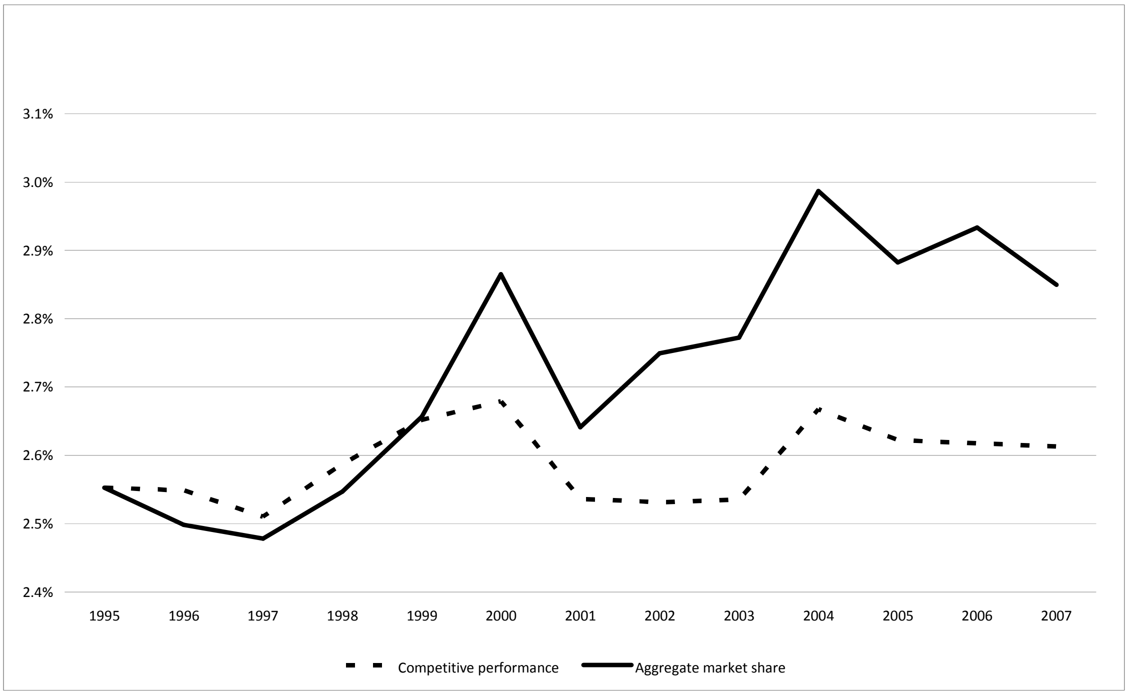


Source: UNIDO calculation based on BACI.

The upward trend of Republic of Korea's aggregate export market share (Figure 11) is mostly the result of composition effects. The competitive performance has been much weaker since 2000, as in other fairly advanced East Asian economies. But the gap is not because of structure effects, which were negative (except GSE), but because of the strong positive contribution of adaptation effects.

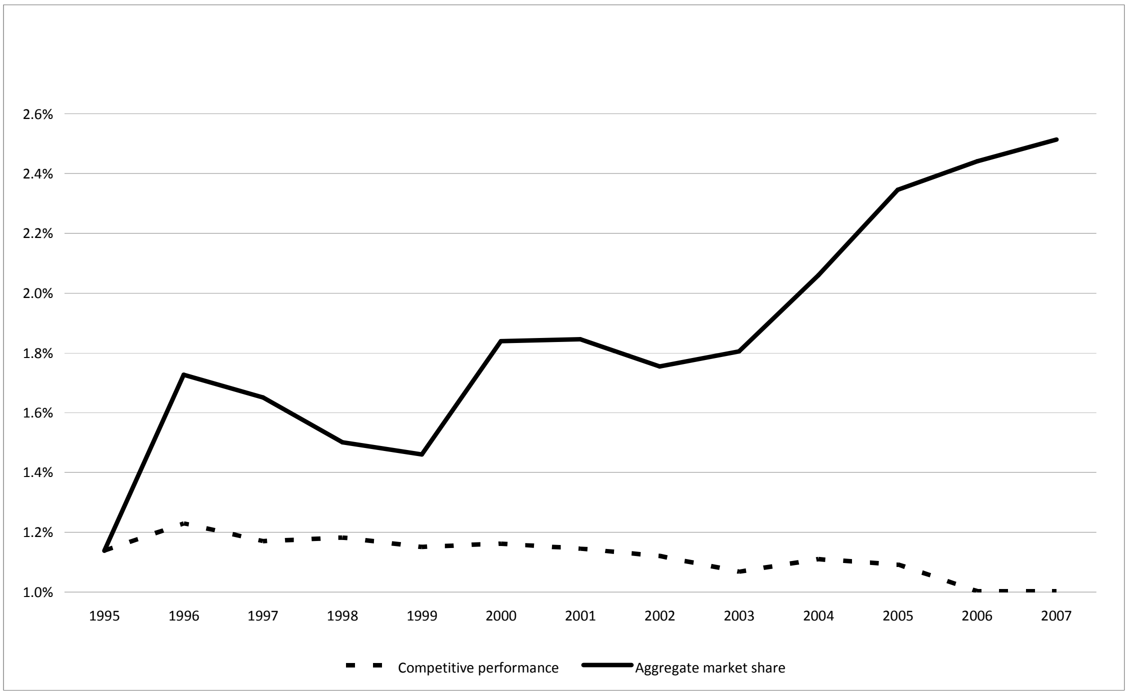
The Russian Federation (Figure 12) is a country in which composition effects, due mostly to the upward trend in the relative prices of resource-based exports, are by large the most important factors determining the aggregate export market share evolution. Absent these effects, which include also a favourable GSE, Russia's competitive performance would have brought its market share down to a level which is only two fifths of the share recorded in 2007.

Figure 11 Republic of Korea: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI.

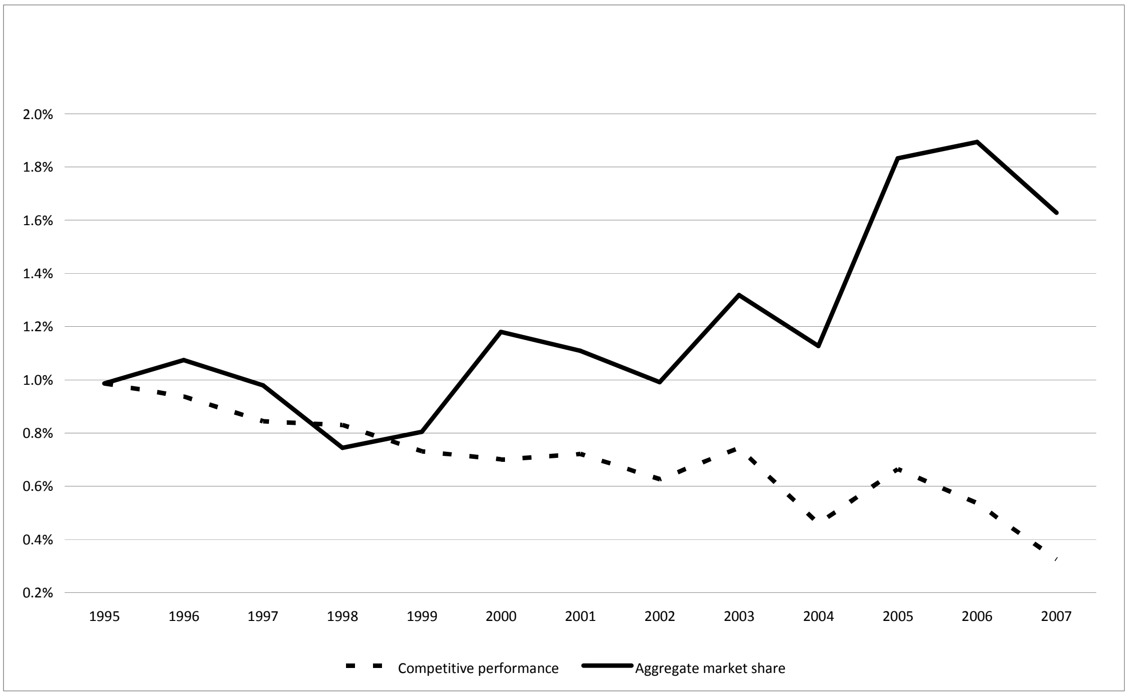
Figure 12 Russian Federation: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI.

An even more striking example is that of Kingdom of Saudi Arabia (Figure 13), where favourable composition effects (mostly CSE and RAE) hide a strongly negative competitive performance.

Figure 13 Kingdom of Saudi Arabia: CMS analysis of export performance (in % - at current prices)

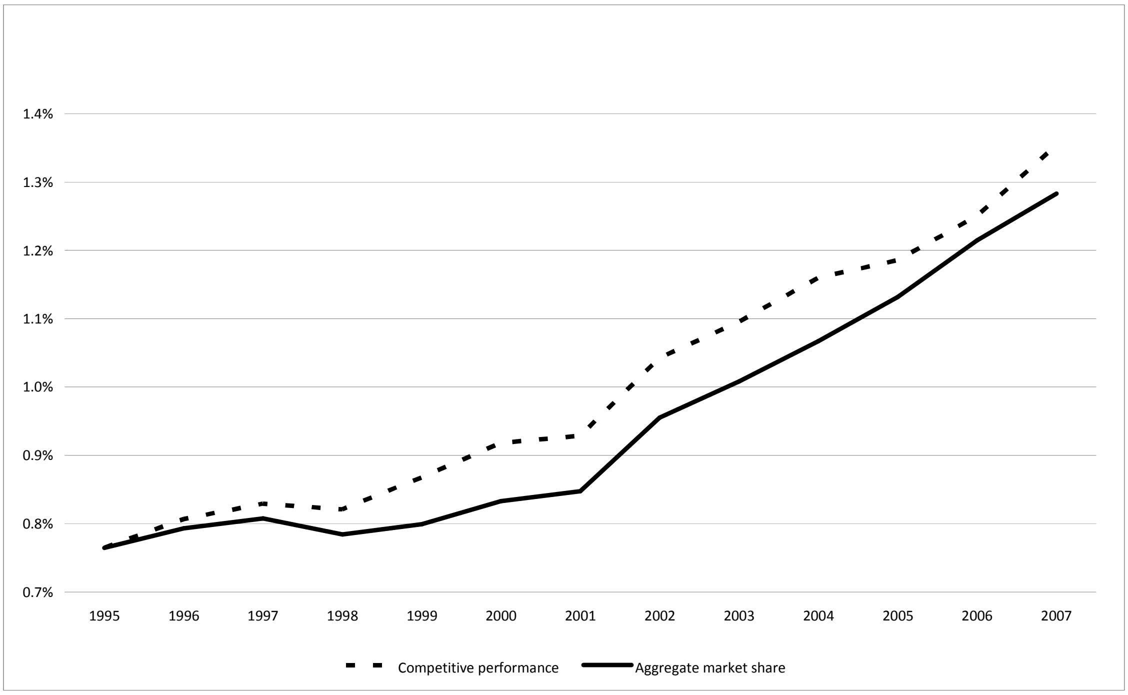


Source: UNIDO calculation based on BACI.

India (Figure 14) is a similar case to that of China, with a fairly strong competitive performance, slightly diminished by negative composition effects (CSE and CAE), which have to do with the dynamic inefficiency of the commodity specialisation pattern of Indian exports.

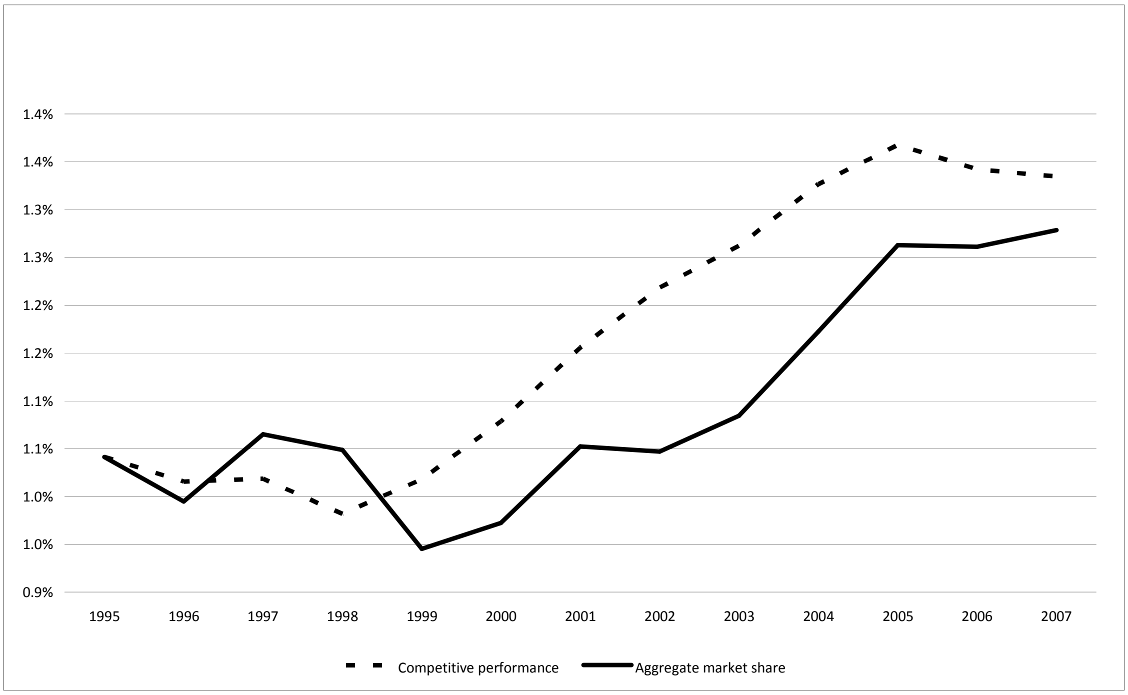
The same can be said, to a certain extent, for Brazilian exports (Figure 15). The rapid improvement of their competitive performance between 1999 and 2005 was partly impaired by negative composition effects, particularly CSE and SIE. In the last two years, however, composition effects became positive, possibly caused by relative price changes that are more than offsetting the unexpected decline in competitive performance.

Figure 14 India: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI.

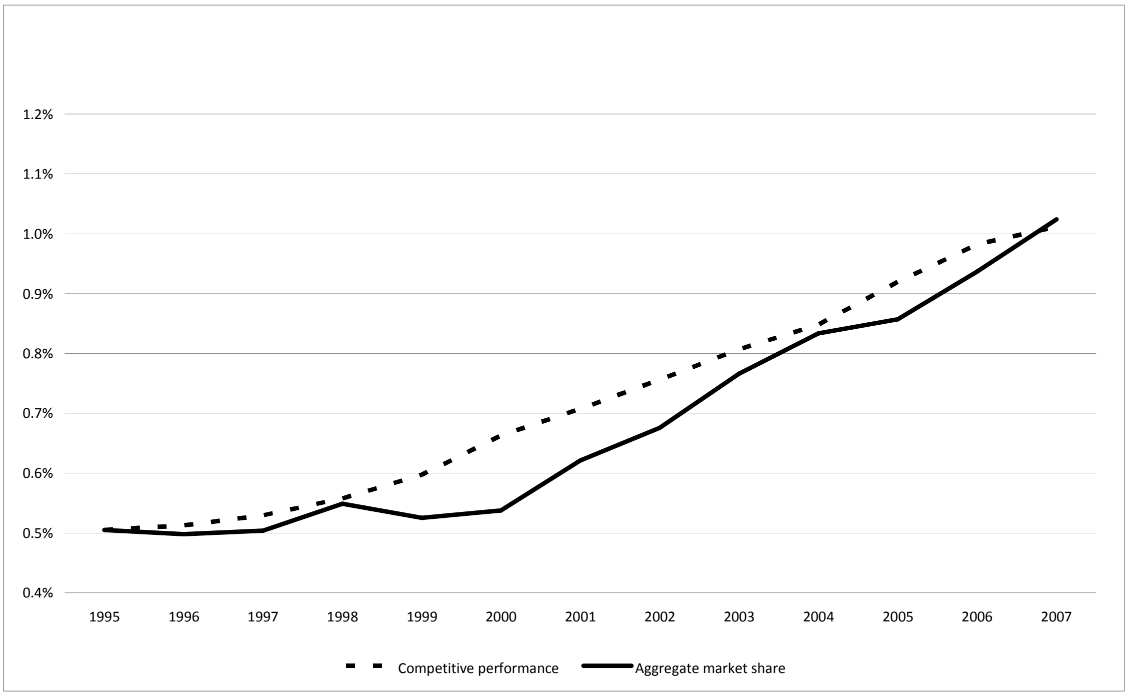
Figure 15 Brazil: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI.

For Poland, the composition effects were neutral (Figure 16), so that its aggregate market share and competitive performance reached the same level in 2007. Positive structure effects were offset by unfavourable adaptation effects, but their net contribution has often been negative during the observed period, and particularly in the end of the 1990s.

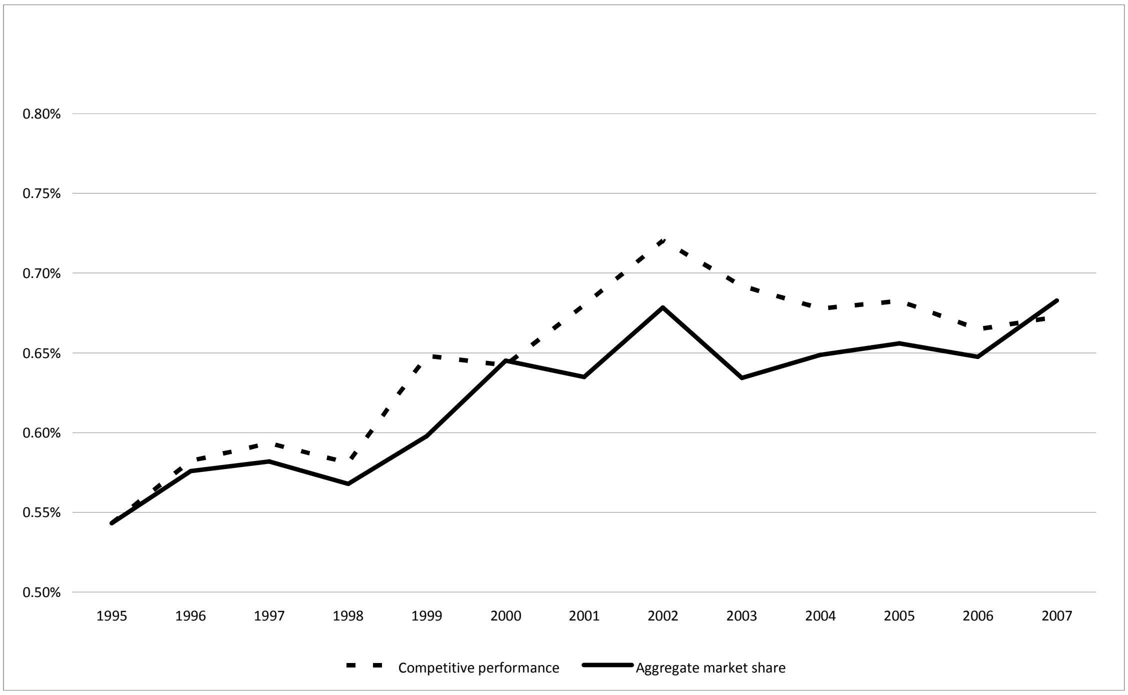
Figure 16 Poland: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI.

Figure 17 refers to South Africa, whose export competitive performance shows a downward trend since 2002, after a rapid improvement in the previous period. Composition effects have corrected marginally these trends, sustaining the aggregate market share in the last few years, when CSE has become strongly positive.

Figure 17 South Africa: CMS analysis of export performance (in % - at current prices)



Source: UNIDO calculation based on BACI.

6. Dynamic efficiency and polarisation of export specialisation patterns

CMS analysis of world trade, laid out in Section 5, illustrated the role played by structural factors in the evolution of market shares of the exporting countries. The commodity structure effect (CSE), appears as one of the most interesting factors. This is meant to measure the dynamic efficiency of export specialisation patterns, based on the degree of conformity between the distribution of a country's comparative advantages and the shifts in the product composition of world import demand.

In order to deepen the analysis of this effect, we may use the additional decomposition formula contained in section 4, namely equation [22], which singles out three multiplicative factors determining CSE:

a) the degree of correlation between a country's specialisation pattern and the changes in the product distribution of world imports.
b) the degree of polarisation of the specialisation pattern.
c) the variability of the product structure of world import demand in the target period.

As we have seen in section 5, the absolute value of all the terms generated by the CMS decomposition, including CSE, is influenced by the size of the country being studied. In order to depurate the analysis of this factor, both members of equation [22] can be divided by the average size of the world market share held by each exporting country in the period 1995-2007.

Table 2 displays the results obtained applying this procedure to the commodity structure effects identified by our CMS analysis. The third column displays CSE in proportion to the average size of the aggregate market share, as indicated in the first column. The other two columns refer to the first two factors appearing in equation [22], respectively the correlation between the specialisation pattern and the changes in the product structure of import demand, and the degree of polarisation of the specialisation pattern (divided as well by each country's average market share). The third factor, representing the degree of variability of the product structure of world import demand, being equal for all the exporting countries, appears in the last line of the table.

In the period 1995-2007, the countries whose relative CSE was largest are a group of raw materials exporters, including Algeria, Nigeria, Angola, Kingdom of Saudi Arabia, United Arab Emirates, Norway and the Russian Federation. These countries can be said to have the most dynamically-efficient specialisation patterns, in the sense explained in section 5: their comparative advantages are concentrated in products whose world import demand has been growing more rapidly than the average, due to the rise of their relative prices.

As the table shows, similar levels of relative CSE can be the result of different combinations of correlation with world demand and polarisation of export specialisation pattern. For example, Angola's specialisation pattern is highly correlated with trends in the product composition of world imports, much more than any other country in our group. Yet, its CSE is similar to those of Nigeria and Kingdom of Saudi Arabia, which offset the lower correlation with a slightly higher degree of polarisation. A less extreme example is that of Brazil and India. Both countries' specialisation patterns are negatively correlated with changes in the structure of world demand, but this problem is more severe in Brazil than in India. However, Indian comparative advantages are much more polarised than those of Brazil, so that their relative CSEs happen to be approximately the same.

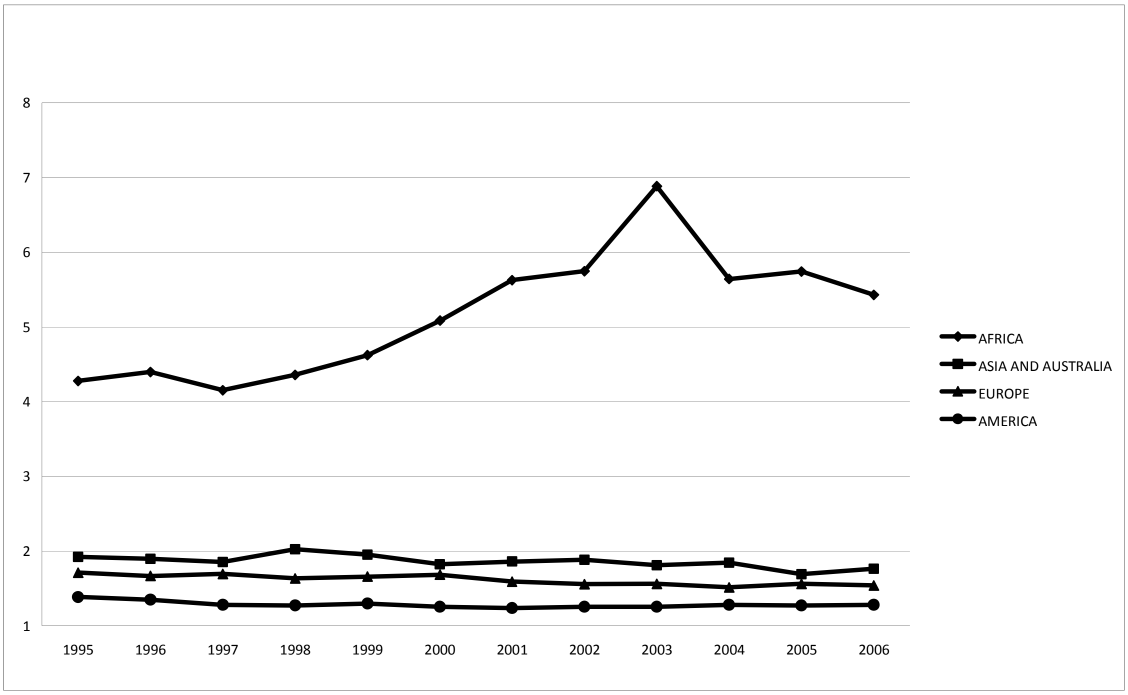
Our relative polarisation coefficient is a measure of dispersion of product market shares around their average, and should not be confused with an indicator of concentration. Even countries with a richly diversified export structure, such as most developed economies, can have a relatively polarised specialisation pattern, if the average intensity of their comparative advantages and disadvantages is high. On the other hand, a country with an export supply concentrated in a few number of products might show a low degree of polarisation, if the product distribution of its market shares does not show much variability (as in the case of Angola, Nigeria, Kingdom of Saudi Arabia and United Arab Emirates). In general, however, relative polarisation is negatively associated with country size, as measured by the aggregate export market share in the observed period.

Table 2 Determinants of the commodity-structure effect, 1995-2007 ***(Percentages at current prices)***

	A	*B*	*C = B/A*	*D*	*E*
Exporting countries	Average Market Share (1995-2007)	Commodity structure effect (CSE)	Relative CSE	Correlation with world import demand	Relative polarisation
Algeria	0.35	0.24	70.3	2.98	1.7
Nigeria	0.35	0.22	62.4	3.96	1.1
Angola	0.12	0.07	59.8	17.02	0.3
Saudi Arabia	1.21	0.72	59.7	4.40	1.0
United Arab Emirates	0.57	0.26	45.2	2.59	1.3
Norway	0.96	0.37	38.3	1.23	2.3
Russian Federation	1.85	0.68	36.6	1.85	1.4
Egypt	0.13	0.03	25.7	0.15	12.5
Sweden	1.44	0.17	12.0	0.54	1.6
Australia	1.05	0.10	9.1	0.26	2.5
United Kingdom	4.29	0.22	5.2	0.43	0.9
Mexico	2.25	0.09	3.8	0.26	1.1
Switzerland	1.61	0.05	2.9	0.10	2.1
Canada	3.88	0.09	2.2	0.14	1.2
Austria	1.09	0.00	-0.4	-0.01	2.1
Belgium-Luxemburg	2.81	-0.02	-0.8	-0.04	1.4
United States of America	11.21	-0.09	-0.8	-0.09	0.7
Netherlands	3.26	-0.03	-0.8	-0.05	1.3
South Africa	0.62	-0.01	-0.9	-0.02	3.6
Poland	0.68	-0.01	-1.2	-0.04	2.0
France	5.02	-0.06	-1.3	-0.10	0.9
Germany	9.61	-0.18	-1.9	-0.19	0.7
Singapore	1.68	-0.03	-1.9	-0.13	1.1
Indonesia	1.09	-0.03	-2.6	-0.07	2.8
Ireland	1.26	-0.04	-3.3	-0.13	1.8
Spain	1.97	-0.10	-5.1	-0.23	1.6
Czech Republic	0.62	-0.04	-5.9	-0.18	2.3
Italy	4.09	-0.28	-6.9	-0.37	1.3
Japan	6.99	-0.52	-7.4	-0.63	0.8
Brazil	1.09	-0.11	-10.1	-0.33	2.2
India	0.95	-0.10	-10.3	-0.18	4.1
Malaysia	1.68	-0.18	-10.7	-0.48	1.6
Tunisia	0.12	-0.01	-11.6	-0.12	7.3
Republic of Korea	2.72	-0.37	-13.4	-0.94	1.0
Thailand	1.19	-0.20	-16.7	-0.54	2.3
Morocco	0.15	-0.03	-18.6	-0.16	8.6
China	6.68	-1.60	-24.0	-1.24	1.4
Demand variability coefficient: 0.137					

Source: UNIDO calculation based on BACI.

Figure 18 Relative polarisations of export specialisation patterns (ratio between the polarisation index and the aggregate market share – non-weighted average of country data)



Source: UNIDO calculation based on BACI.

Figure 18 shows the average levels of our relative polarisation index in four regional groupings between 1995 and 2006. African countries show the largest indices, as a result of their relatively lower export size. Moreover, they are characterised by a marked upward trend, at least until 2003, which confirms that export specialisation patterns in least developed countries often tend to evolve towards a reinforcement of their comparative advantages and disadvantages.

The opposite happens in the rest of the world, where all the three regional groupings show a moderate decline of relative polarisation. This is however the result of different trends at country level. In particular, most developed countries, starting from relatively low polarisation indices, have recorded an increase in the observed period.

7. Summary and conclusions

To assess trade performance it is necessary to consider the role played by structural factors and particularly the interaction between a country's specialisation pattern and changes in the distribution of world demand. In order to study these connections, a statistical decomposition technique known as *constant-market-shares* analysis has often been used. In this paper we have surveyed the main methodological questions raised during the long debate on CMS analysis, with the aim to devise a new formulation of this technique while integrating those features of traditional specifications that appear still valid.

The first set of problems we have examined concerns the accounting identity on which the decomposition is based. In theory, a method similar to CMS analysis may be applied to any aggregate which can be defined as a weighted average of its elementary components. In practice, the choice of the variable to be analysed depends on the research subject and on data availability.

Moreover if the base accounting identity allows to distinguish more than one disaggregation criterion (for example by product and destination country), the results of CMS analysis are sensitive to their sequence. To deal with this problem, the different disaggregation criteria may be used independently of each other, but in this case the formula must include structural diversification indexes, which have been shown to be related to the degree of statistical connection between the classification criteria.

The most controversial methodological issue arising from CMS analysis concerns the choice of the decomposition formula applied to the base identity. It has often been argued that CMS analysis faces an "index-number problem" in the selection of the weighting system for that formula. Index-number theory provides arguments for choosing a specification without interaction terms, similar to the Törnqvist price index. This approach however is based on the microeconomic theory of demand, whilst in CMS analysis no *a priori* theoretical relation may be assumed between market shares and the structure of demand. Moreover the descriptive power of specifications based on the Törnqvist weighting method appears weak, in comparison with traditional formulations incorporating interaction terms, which have therefore been preferred in this research.

The decomposition formula proposed in this paper breaks down changes in aggregate market shares into seven terms: the competitiveness effect, three structure effects, measuring the influence of product as well as geographic specialisation patterns and three adaptation effects, which quantify the importance of the flexibility of those patterns in relation to changes in the structure of the market's import demand.

Given its importance, the contribution of export specialisation patterns to changes in market shares has been analyzed somewhat more thoroughly. This contribution has been shown to depend not only on the conformity of specialisation patterns to changes in the structure of demand but also on the degree of their polarisation in strong and weak points. With all other things being equal, the extent of changes in aggregate market shares is higher for countries whose comparative advantages and disadvantages are more pronounced, than for countries characterised by a better-balanced specialisation pattern.

We have then applied our specification of CMS analysis to the study of recent changes in the distribution of world trade. More precisely, we have analysed export performances of 37 countries in the 1995-2007 period, taking into account the structure of their exports by product and destination market at the highest level of disaggregation made possible by the BACI database (more than one million product-market combinations).

Our results allow better understanding of the rapid structural transformation of the global economy in the last decade by identifying two main channels of change. On the one hand, China and other emerging and developing countries have considerably expanded their shares of world exports, at the expense of developed economies, thanks to a better average competitive performance at the level of single products and destination markets. This seems more the result of changes in the international distribution of production activities (FDI and international outsourcing), than of traditional competitiveness factors, as measured by real effective exchange rates.

The second main channel of transformation is related to the increase in relative prices of raw materials. This trend has drastically affected the product distribution of world trade values, favouring those countries which are more intensely specialised in exports of raw materials. Other things being equal, this has made their export specialisation patterns more ‘dynamically-efficient’, sustaining their aggregate market share, even in cases in which their competitive performance has been negative. As a result, part of the benefits generated by the expansion of emerging economies has been transmitted to developing countries specialised in raw material exports.

We have also seen to what extent different degrees of polarisation of export specialisation patterns have affected their dynamic efficiency, by reinforcing or smoothing their sensitivity to changes in the distribution of world demand. More generally, we have claimed that export performance, which is so important for economic growth, cannot be understood without properly integrating traditional macroeconomic variables with structural factors connected to specialisation patterns and changes in the international distribution of economic activities.

This has important implications for policy-related analysis. More specifically, the set of statistical indicators normally used to monitor a country's external performance[20] could be enriched with a properly designed selection of the terms generated by our CMS methodology. By allowing distinguishing between competitive performance effects, on one side, and structural factors on the other, the proposed methodology would increase the accuracy and the informative power of the indicators.

The choice of proper statistical tools is crucial to devise evidence-based policies and increase their accountability. From this perspective, the main insight of our research is that macroeconomic stabilisation, although of fundamental importance, is not enough to ensure an externally-balanced development path and must be complemented with structural reforms aimed at creating the conditions for a successful integration into the international economy.

[20] Examples include the ITC *Market Analysis Tools* (http://www.intracen.org/marketanalysis/?mn=0&sm=0%E2%96%AA1) and the OECD *International Trade Indicators* (http://www.oecd.org/document/13/0,3343,en_2649_33715_36853069_1_1_1_1,00.html) and the UNIDO *Competitive Industrial Performance Index* (http://www.unido.org/index.php?id=5058).

References

Balassa, B. 1965. “Trade Liberalization and ‘Revealed’ Comparative Advantage,” *The Manchester School of Economic and Social Studies*, Vol. 33, pp. 99-123.

Banasick, S. and R. Q. Hanham, 2006. “Time Paths of Uneven Industrial Development in Japan,” *The Industrial Geographer*, Vol. 3, pp. 27-45.

Barff, R. A. and P. I. Knight III, 1988. “Dynamic Shift-Share Analysis,” *Growth and Change*, Vol. 19, pp. 2-10.

Cheptea, A., Gaulier, G. and S. Zignago, 2005. “World Trade Competitiveness: A Disaggregated View by Shift-Share Analysis,” CEPII Working Paper No. 23.

Cimoli, M. and N. Correa, 2005. “Trade Openness and Technology Gaps in Latin America: A “Low-Growth Trap,”’ in Ocampo, J. A., ed., *Beyond Reforms – Structural Dynamics and Macroeconomic Vulnerability*. Stanford University Press and the World Bank, pp. 45-70.

Coughlin, C. and P. S. Pollard, 2001. “Comparing Manufacturing Export Growth across States: What Accounts for the Differences?” *Federal Reserve Bank of St. Louis Review*, January, pp. 25-40.

Creamer, D. 1943. “Shifts of Manufacturing Industries in *Industrial Location and Natural Resources*,” US National Resources Planning Board.

Diewert, W.E. 1976. “Exact and Superlative Index Numbers,” *Journal of Econometrics*, Vol. 4, pp. 115-145.

European Central Bank. 2005. “Competitiveness and the Export Performance of the Euro Area,” Task Force of the Monetary Policy Committee of the European System of Central Banks, Occasional Paper No. 30.

Fagerberg, J. and G. Sollie, 1987. “The Method of Constant Market Shares Analysis Reconsidered,” *Applied Economics*, Vol. 19, pp. 1571-1583.

Frisch, R. 1936. “Annual Survey of General Economic Theory: the Problem of Index Numbers,” *Econometrica*, Vol. 4, pp. 1-38.

Gaulier, G. and S. Zignago, 2009. “BACI: International Trade Database at the Product-Level. The 1994-2007 Version,” CEPII Working Paper, Centre d’Études Prospectives et d’Informations Internationales, Paris.

Goldstein, M. and M. S. Khan, 1985. “Income and Price Effects in Foreign Trade,” in Ronald W. Jones and Peter B. Kenen (eds), *Handbook of International Economics*, Vol. **2**, North-Holland, pp. 1041-1105.

Guerrieri, P. and C. Milana, 1990. *L’Italia e il commercio mondiale*, Il Mulino, Bologna.

Holden, D. R., Nairn A. G.M., and J. K. Swales, 1989. “Shift-Share Analysis of Regional Growth and Policy: A Critique,” *Oxford Bulletin of Economics and Statistics*, Vol. **51**, pp. 15-34.

Irwin D. A. 1995. “The Lion’s Share: Britain’s Export Performance Revisited, 1899–1929,” *Structural Change and Economic Dynamics*, Vol. **6**, pp. 97-109.

Krugman, P. R. 1989. “Differences in Income Elasticities and Trends in Real Exchange Rates,” *European Economic Review*, Vol. 33, pp. 1031-1046.

Leamer, E. E. and R. M. Stern, 1970. *Quantitative International Economics,* Aldine, Chicago.

Loveridge, S. and A. C. Selting, 1998. “A Review and Comparison of Shift-Share Identities,” *International Regional Science Review*, Vol. 21, pp. 37-58.

Magee, S. P. 1975. “Prices, Incomes, and Foreign Trade,” in Kenen P. B. (ed.), *International Trade and Finance - Frontiers for Research*, Cambridge University Press, Cambridge, pp. 175-252.

Menzler-H. I. and R. J. Langhammer, 1994. “Product and Country Substitution in Imports: An Empirical Comparison of Theoretical Concepts,” *Weltwirtschaftliches Archiv*, Vol. 130, pp. 311-328.

Milana, C. 1988. “Constant-Market-Shares Analysis and Index Number Theory,” *European Journal of Political Economy*, Vol. 4, pp. 453-478.

Milana, C. 2004. *A Note on the General Formulation of Constant-Market-Shares Analysis*, mimeograph, ISAE, Rome.

Ocampo, J. A. ed. 2005, *Beyond Reforms–Structural Dynamics and Macroeconomic Vulnerability*. Stanford University Press and the World Bank.

Organisation for Economic Cooperation and Development (OECD). 2007. Science, Technology and Industry, Scoreboard 2007, p. 220.

Oulton, N. and M. O’Mahony, 1994. *Productivity and Growth: A Study of British Industry 1954-86*. National Institute of Economic and Social Research Occasional Papers.

Rada, C. and L. Taylor, 2006. “Developing and Transition Economies in the Late 20th Century: Diverging Growth Rates, Economic Structures, and Sources of Demand,” SCEPA Working Paper 2006-1.

Richardson, J. D. 1971. “Constant-Market-Shares Analysis of Export Growth,” *Journal of International Economics*, Vol. 1, pp. 227-239.

Vos, R. 2005. “Globalization, Rising Labour Inequality, and Poverty in Latin America,” in Ocampo, J. A., ed., *Beyond Reforms–Structural Dynamics and Macroeconomic Vulnerability*. Stanford University Press and the World Bank, pp. 117-142.

Simonis, D. 2000. *Belgium’s Export Performance–A Constant Market Shares Analysis*, Federal Planning Bureau, Working Paper: 2-00.

Thirlwall, A. P. 1979. “The Balance of Payments Constraint as an Explanation of International Growth Rate Differences,” *Banca Nazionale del Lavoro Quarterly Review*, Vol. **32**, pp. 45-53.

Törnqvist, L. 1936. “The Bank of Finland’s Consumption Price Index,” *Bank of Finland Monthly Bulletin*, Vol. 10, pp. 1-8.

Tyszynski, H. 1951. “World Trade in Manufactured Commodities, 1899-1950,” *The Manchester School of Economic and Social Studies*, Vol. 19, pp. 222-304.

Annex

Table 1 **Constant Market-Shares Analysis of the World Merchandise Exports** (effects expressed as a percentage of market-shares in 1995 - data at current prices)

Exporting countries	Market shares 1995	Market shares 2007	Changes 2007-1995	Competi-tiveness	Commodity structure	Geographic structure	Structural interaction	Commodity adaptation	Geographic adaptation	Residual adaptation
China	4.18	10.47	150	172	-38	-14	8	9	-2	15
Germany	10.32	9.48	-8	-3	-2	4	1	0	0	-7
United States of America	12.33	8.40	-32	-31	-1	-1	-2	0	0	3
Japan	9.08	5.33	-41	-33	-6	0	-3	2	1	-2
France	5.75	4.12	-28	-22	-1	0	-4	-1	0	0
Italy	4.66	3.69	-21	-8	-6	1	3	-1	0	-10
United Kingdom	4.79	3.29	-31	-29	5	-1	0	-1	0	-5
Netherlands	3.57	3.18	-11	-5	-1	-4	-2	2	-1	-1
Canada	3.96	3.13	-21	-14	2	-2	-2	-2	0	-4
Republic of Korea	2.55	2.85	12	2	-14	8	-18	6	1	27
Belgium-Luxemburg	3.18	2.69	-15	-5	-1	-5	1	0	0	-6
Russian Federation	1.14	2.51	121	-12	60	40	-70	8	5	91
Mexico	1.69	2.10	24	22	5	-8	3	-4	1	5
Spain	1.90	1.90	0	10	-5	-8	-2	0	-1	6
Kingdom of Saudi Arabia	0.99	1.63	65	-67	73	-10	-13	6	8	68
Malaysia	1.71	1.52	-11	20	-10	-7	1	-8	0	-6
Singapore	1.98	1.50	-24	-33	-2	0	-2	5	-1	8
Switzerland	1.92	1.48	-23	-20	2	-3	2	-3	0	-2
Sweden	1.60	1.28	-20	-19	11	-1	-3	-5	0	-3
India	0.76	1.28	68	77	-13	9	3	-11	-1	4
Brazil	1.04	1.28	23	28	-11	3	-6	-2	1	11
Thailand	1.20	1.24	4	25	-17	-2	3	0	0	-5
Austria	1.12	1.14	2	2	0	1	5	-1	-1	-4
Ireland	0.91	1.12	23	-29	-5	-16	0	17	2	54
Australia	1.06	1.10	4	6	9	-2	-2	0	0	-7
Indonesia	1.05	1.07	2	19	-3	-3	-1	-14	-2	6
Poland	0.50	1.02	103	100	-2	16	26	-1	-5	-32
Norway	0.90	1.01	13	-9	41	-7	9	-5	0	-16
United Arab Emirates	0.36	0.95	162	59	71	-15	-25	-4	17	57
Czech Republic	0.46	0.90	98	108	-8	14	19	-2	-2	-31
Turkey	0.49	0.88	81	86	-8	17	12	1	0	-29
Denmark	0.93	0.73	-21	-13	2	-3	1	-1	0	-8

Exporting countries *Continues*	Market shares		Changes	Competi-tiveness	Commodity structure	Geographic structure	Structural interaction	Commodity adaptation	Geographic adaptation	Residual adaptation
	1995	2007	2007-1995							
Finland	0.85	0.72	-15	-23	0	7	1	1	-1	0
Hungary	0.31	0.70	126	127	-18	14	9	1	-2	-5
South Africa	0.54	0.68	26	24	-1	-5	-4	-1	1	11
Hong Kong SAR	1.40	0.66	-53	-55	-15	11	-9	2	0	13
Iran (Islamic Republic of)	0.30	0.52	71	-37	74	8	-15	-4	6	39
Chile	0.33	0.50	51	18	30	-5	2	-1	2	5
Philippines	0.38	0.50	29	36	-29	-6	-13	0	-1	42
Nigeria	0.24	0.49	107	5	92	-11	-27	29	-7	25
Algeria	0.22	0.49	118	12	109	-5	-3	-2	-5	13
Argentina	0.48	0.44	-8	6	-6	-1	-11	-1	0	4
Slovakia	0.20	0.44	124	106	-3	23	16	1	-3	-17
Venezuela	0.42	0.44	4	-52	59	-16	-10	4	3	16
Ukraine	0.13	0.41	230	33	32	118	-81	-23	7	144
Viet Nam	0.11	0.41	276	336	-27	-22	33	-56	-7	19
Israel	0.42	0.41	-2	-4	7	-1	9	-11	0	0
Portugal	0.49	0.38	-22	-10	-7	-2	10	0	0	-13
Kuwait	0.19	0.37	99	-14	95	-13	-15	-3	9	41
Qatar	0.06	0.33	433	244	175	-25	56	17	-27	-7
Kazakhstan	0.03	0.33	1038	564	245	104	-216	34	128	178
Libyan Arab Jamahiriya	0.17	0.33	87	31	84	-4	-18	2	1	-9
Romania	0.18	0.30	63	63	-14	19	28	-3	-6	-24
Angola	0.07	0.26	298	125	111	17	19	5	6	15
Colombia	0.23	0.26	13	-1	10	-1	17	-5	-1	-6
Iraq	0.01	0.23	2543	901	1524	-137	24	-272	110	394
Peru	0.12	0.22	86	38	28	2	13	-4	0	10
New Zealand	0.29	0.21	-27	9	-22	-3	18	-3	-1	-25
Slovenia	0.19	0.21	12	13	3	11	11	-2	-1	-23
Greece	0.23	0.19	-17	-20	-3	15	7	1	-2	-15
Belarus	0.03	0.19	492	273	62	182	-36	-35	-36	82
Egypt	0.13	0.19	44	19	26	9	-4	-6	0	-2
Oman	0.13	0.17	35	-80	57	14	34	3	-10	17
Pakistan	0.15	0.15	-3	13	-45	1	-8	5	3	29
Morocco	0.15	0.14	-6	17	-18	-1	1	-9	-1	4
Bulgaria	0.08	0.14	73	52	0	17	13	3	14	-27
Tunisia	0.12	0.13	7	29	-12	-7	6	-10	0	0

Exporting countries *Continues*	Market shares		Changes	Competi-tiveness	Commodity structure	Geographic structure	Structural interaction	Commodity adaptation	Geographic adaptation	Residual adaptation
	1995	**2007**	**2007-1995**							
Lithuania	0.07	0.13	89	50	5	62	59	-2	-5	-79
Ecuador	0.11	0.12	15	21	10	-3	9	-2	-12	-10
Bangladesh	0.10	0.12	23	43	-47	-5	-3	5	-1	31
Trinidad and Tobago	0.05	0.11	108	-22	62	-14	-7	19	-3	72
Azerbaijan	0.00	0.11	4227	3033	565	288	5	90	83	165
Costa Rica	0.08	0.10	33	63	-41	-2	1	1	0	11
Croatia	0.10	0.10	2	53	-7	22	31	-6	-21	-69
Estonia	0.05	0.09	80	42	8	36	32	10	-3	-45
Serbia and Montenegro	0.01	0.08	1400	1081	-71	164	33	-106	117	182
Syrian Arab Republic	0.06	0.08	26	-36	45	10	-34	-14	1	53
Latvia	0.05	0.08	52	30	4	21	22	-2	-1	-23
Côte d'Ivoire	0.10	0.07	-27	-28	-6	9	-29	-2	-5	34
Sri Lanka	0.07	0.06	-16	3	-29	4	-9	0	2	13
Sudan	0.02	0.06	269	-6	93	94	-11	47	10	41
Yemen	0.03	0.06	66	-45	98	30	153	-24	-16	-128
Guatemala	0.06	0.06	-3	36	-33	3	8	-3	1	-16
Equatorial Guinea	0.00	0.05	2567	1445	803	113	145	88	-2	-24
Brunei Darussalam	0.05	0.05	14	-52	74	-21	4	-6	1	14
Bahrain	0.03	0.05	62	-44	48	9	-59	0	6	101
Congo	0.03	0.05	100	-10	53	6	-1	16	-1	37
Jordan	0.04	0.05	36	11	-38	38	-40	22	5	39
Dominican Republic	0.08	0.05	-41	-45	-9	4	-3	3	0	10
Zambia	0.03	0.05	67	9	15	-1	-36	11	-2	71
Turkmenistan	0.01	0.05	410	-78	131	286	-708	45	-6	740
Honduras	0.05	0.05	-7	-3	-37	-1	1	13	0	19
Panama	0.06	0.05	-26	-36	4	-3	-6	-4	10	9
Uzbekistan	0.03	0.04	47	43	-45	36	-44	8	19	31
Malta	0.05	0.04	-12	-3	-16	-6	-17	-1	2	29
Gabon	0.05	0.04	-16	-61	35	10	-20	-1	-6	27
Iceland	0.04	0.04	-3	16	-18	-4	11	-4	-1	-2
Uruguay	0.05	0.04	-28	53	-31	-13	-13	-10	-2	-13
Ghana	0.03	0.04	32	-31	7	3	-77	-8	2	135
Bolivia	0.03	0.04	34	-8	18	1	63	-8	-4	-28
Myanmar	0.03	0.04	38	10	-40	14	55	3	4	-8
Papua New Guinea	0.05	0.04	-31	-56	0	-10	-16	14	5	32

Exporting countries *Continues*	Market shares		Changes	Competi-tiveness	Commodity structure	Geographic structure	Structural interaction	Commodity adaptation	Geographic adaptation	Residual adaptation
	1995	**2007**	**2007-1995**							
Cambodia	0.01	0.04	447	394	-192	-94	-78	90	10	316
Bosnia and Herzegovina	0.00	0.03	2877	2615	-131	212	-135	-587	293	610
Kenya	0.03	0.03	5	45	-20	15	4	-8	-5	-25
Cameroon	0.04	0.03	-23	-13	-3	3	-21	0	-1	12
Aruba	0.01	0.03	161	-23	127	-22	19	33	10	16
Zimbabwe	0.04	0.03	-31	-63	-2	3	-41	-6	1	76
Cyprus	0.03	0.03	-12	-6	-29	10	16	19	-8	-13
Macedonia	0.03	0.03	-17	-37	-11	57	-10	4	-24	3
Netherlands Antilles	0.02	0.03	19	-43	48	-12	-11	18	13	5
Lebanon	0.01	0.03	156	191	-6	49	128	-11	9	-204
Paraguay	0.03	0.03	-5	37	-13	-4	-26	-8	-5	15
Mozambique	0.01	0.03	382	285	-23	27	69	-8	12	20
China (Macao SAR)	0.05	0.02	-52	-25	-14	3	10	-2	1	-24
El Salvador	0.03	0.02	-25	-10	-32	12	17	-2	0	-11
Tanzania	0.01	0.02	66	34	-15	16	58	-22	-1	-5
Bahamas	0.01	0.02	52	8	39	-1	-13	-31	5	44
Jamaica	0.04	0.02	-45	-41	3	4	-13	-8	-1	10
Mauritius	0.04	0.02	-52	-20	-22	-3	5	1	0	-13
Chad	0.00	0.02	573	572	115	-78	21	27	-13	-71
Guinea	0.02	0.02	-12	-31	-6	19	-75	-4	7	79
Cuba	0.02	0.02	-28	-109	-15	17	-59	8	11	119
Mongolia	0.01	0.02	179	167	44	48	84	-25	-7	-132
Republic of Moldova	0.02	0.02	-16	-16	-9	53	43	-11	-3	-73
Democratic Rep. Congo	0.03	0.02	-50	-50	6	-1	-57	33	3	16
Georgia	0.00	0.02	636	690	236	178	342	-176	-27	-607
Nicaragua	0.01	0.01	6	39	-49	-3	17	-8	-2	12
Mauritania	0.01	0.01	10	-32	-10	1	-57	19	3	87
Senegal	0.01	0.01	22	17	-40	24	-18	12	2	26
New Caledonia	0.01	0.01	12	-41	72	-1	-26	-8	-3	19
Uganda	0.02	0.01	-20	39	-40	14	-1	-9	1	-24
Ethiopia	0.01	0.01	-1	12	-88	1	-13	14	5	67
Democratic Rep. Korea	0.02	0.01	-37	-70	-23	16	10	10	11	9
Madagascar	0.01	0.01	-17	30	-36	-17	3	-5	1	7
Mali	0.00	0.01	134	26	-73	-8	-153	-11	-14	367
Suriname	0.01	0.01	-19	16	12	-2	-49	2	-32	33

Exporting countries *Continues*	Market shares		Changes	Competi-tiveness	Commodity structure	Geographic structure	Structural interaction	Commodity adaptation	Geographic adaptation	Residual adaptation
	1995	**2007**	**2007-1995**							
Armenia	0.00	0.01	701	335	199	47	176	10	70	-137
Kyrgyzstan	0.01	0.01	-10	-5	-18	91	121	7	-14	-193
Albania	0.00	0.01	93	129	-43	-7	42	-21	7	-13
Lao People's Dem. Rep.	0.00	0.01	75	69	-32	-6	20	20	7	-3
Togo	0.01	0.01	7	-35	-13	15	33	-73	8	73
Malawi	0.01	0.01	-16	48	-41	1	8	0	-1	-31
Tajikistan	0.01	0.01	58	49	-34	56	-60	-2	18	31
Liberia	0.02	0.01	-61	-140	22	-2	-61	6	6	108
Guyana	0.01	0.01	-28	2	-43	1	30	-14	-2	-3
Fiji	0.01	0.01	-46	-37	-9	-10	18	-11	4	-2
Nepal	0.01	0.01	-24	-28	-48	42	-30	4	-7	42
Benin	0.00	0.01	30	-71	-61	32	43	30	-5	62
Niger	0.01	0.00	-49	-90	21	12	-69	-1	2	75
Haiti	0.00	0.00	16	42	5	-5	-1	-28	-2	7
Seychelles	0.00	0.00	199	259	35	2	-104	-63	-27	96
Greenland	0.01	0.00	-50	1	-29	-8	-9	-7	0	0
Marshall Islands	0.00	0.00	607	-345	195	125	-740	-46	-1	1419
Barbados	0.00	0.00	20	80	45	30	36	-118	-7	-47
Belize	0.01	0.00	-35	-2	-28	1	-9	-17	-3	25
Burkina Faso	0.01	0.00	-44	-65	-43	-18	-8	-2	22	70
British Virgin Islands	0.00	0.00	51	163	-12	2	-18	-57	-4	-25
Sierra Leone	0.00	0.00	-22	-14	-6	2	-14	-15	-4	28
Vanuatu	0.00	0.00	381	461	-57	-8	114	112	-17	-223
Afghanistan	0.00	0.00	46	-13	-50	25	7	14	12	51
Solomon Islands	0.00	0.00	-37	29	-35	-10	-23	-5	-3	11
Bhutan	0.00	0.00	159	-70	19	72	-184	21	45	254
Cayman Islands	0.00	0.00	-18	-392	-42	-16	-296	171	36	521
French Polynesia	0.00	0.00	-9	67	-72	-22	57	6	-1	-45
Rwanda	0.00	0.00	128	329	-8	38	850	-151	1	-930
Gibraltar	0.00	0.00	12	-47	21	-14	4	2	3	44
Antigua and Barbuda	0.00	0.00	110	80	95	14	-54	-143	9	109
Somalia	0.00	0.00	-34	-84	-26	8	-54	14	12	95
Bermuda	0.00	0.00	-63	-231	20	-1	-93	17	-3	227
Djibouti	0.00	0.00	67	-54	4	-14	-57	-1	75	113
Samoa	0.00	0.00	13	684	5	0	165	-58	-473	-311

Exporting countries *Continues*	Market shares 1995	Market shares 2007	Changes 2007-1995	Competi-tiveness	Commodity structure	Geographic structure	Structural interaction	Commodity adaptation	Geographic adaptation	Residual adaptation
Falkland Islands	0.00	0.00	143	294	-129	34	-52	-20	23	-9
St. Vincent and Grenadines	0.00	0.00	-47	63	-2	21	503	11	-11	-632
Burundi	0.01	0.00	-76	26	-8	0	66	-3	16	-174
Andorra	0.00	0.00	-11	20	-10	7	66	22	2	-119
Maldives	0.00	0.00	-37	10	-25	-13	94	15	-2	-117
Central African Republic	0.00	0.00	-78	-41	-42	-2	-14	42	1	-22
Cape Verde	0.00	0.00	321	301	-65	-23	-49	-97	24	231
Saint Lucia	0.00	0.00	-66	-11	-7	3	0	-7	-2	-41
Dominica	0.00	0.00	-61	-53	-13	5	12	7	1	-19
Guinea-Bissau	0.00	0.00	-71	-64	-9	16	-49	-5	3	37
Eritrea	0.00	0.00	160	164	256	9	-251	-170	-21	172
St. Kitts and Nevis	0.00	0.00	-37	7	-6	-4	-37	-29	5	28
Grenada	0.00	0.00	-23	-3	-7	0	-24	-12	24	0
Turks and Caicos Islands	0.00	0.00	56	105	-27	-10	-33	-17	11	27
Comoros	0.00	0.00	27	44	-71	-1	-90	94	-1	52
Gambia	0.00	0.00	-90	-80	-3	-3	-18	-2	5	11
Palau	0.00	0.00	-57	-29	-29	-16	7	-8	13	5
Timor-Leste	0.00	0.00	1164	82	971	-186	-325	166	690	-234
Tokelau	0.00	0.00	18	-20	-35	-1	-16	3	-11	98
Micronesia	0.00	0.00	-93	-85	-3	-5	10	-11	6	-4
St. Helena	0.00	0.00	55	-265	-148	6	-566	60	-17	985
Anguilla	0.00	0.00	76	-96	15	-9	-71	-33	49	221
Nauru	0.00	0.00	-82	-54	-2	-16	-13	-1	14	-10
St. Pierre and Miquelon	0.00	0.00	-1	23	-20	-6	-22	-31	37	19
Cook Islands	0.00	0.00	-13	71	-47	-9	43	-4	2	-69
Tonga	0.00	0.00	-69	-22	-12	-16	-12	8	4	-19
Sao Tome and Principe	0.00	0.00	-27	-2	-55	9	31	45	-38	-16
Northern Mariana Islands	0.00	0.00	81	303	-63	-54	-9	41	-17	-121
Kiribati	0.00	0.00	-68	46	1	-67	37	0	-68	-18
Montserrat	0.00	0.00	-83	-73	6	15	49	-5	0	-76
Western Sahara	0.00	0.00	278	-17	82	-143	-341	242	262	193
Pitcairn Islands	0.00	0.00	-58	-79	-74	-2	-30	111	9	7
Niue	0.00	0.00	37	1497	69	119	713	-360	-91	-1910
Norfolk Islands	0.00	0.00	-99	-95	-1	0	-32	1	1	29
Tuvalu	0.00	0.00	-55	65	-10	-18	-29	7	-16	-53
Wallis and Futuna Islands	0.00	0.00	-59	-39	11	16	-62	-18	10	21

Source: UNIDO calculation based on BACI

Table 2 World exports by technology level (Millions USD – current prices)

Technology	Total Exports 1995	Total Exports 1996	Total Exports 1997	Total Exports 1998	Total Exports 1999	Total Exports 2000	Total Exports 2001	Total Exports 2002	Total Exports 2003	Total Exports 2004	Total Exports 2005	Total Exports 2006	Total Exports 2007
High-Tech	907.2	958.3	1,042.3	1,088.6	1,191.5	1,378.8	1,312.2	1,346.2	1,539.0	1,852.3	2,033.8	2,286.9	2,394.3
Mid.High-Tech	1,532.7	1,613.0	1,666.6	1,700.4	1,735.8	1,835.1	1,827.4	1,919.3	2,246.0	2,701.2	2,988.6	3,370.2	4,061.7
Med.Low-Tech	539.2	554.0	569.3	575.0	542.6	601.9	587.7	610.1	734.8	952.3	1,094.2	1,345.2	1,638.7
Low-Tech	920.0	938.5	954.5	951.9	953.5	985.5	987.6	1,041.0	1,185.5	1,357.2	1,468.1	1,598.8	1,848.7
Not classified	825.9	942.3	956.6	839.9	899.6	1,156.1	1,093.7	1,112.4	1,340.4	1,672.4	2,161.8	2,617.5	2,930.3
Sum	4,724.9	5,006.1	5,189.3	5,155.8	5,323.0	5,957.4	5,808.6	6,029.0	7,045.8	8,535.4	9,746.4	11,218.7	12,873.7

Source: UNIDO calculation based on BACI

Table 3 World exports by destination region (Millions USD – current prices)

Region	Total Exports 1995	Total Exports 1996	Total Exports 1997	Total Exports 1998	Total Exports 1999	Total Exports 2000	Total Exports 2001	Total Exports 2002	Total Exports 2003	Total Exports 2004	Total Exports 2005	Total Exports 2006	Total Exports 2007
CIS	52.1	87.8	96.5	87.5	64.6	77.8	92.9	98.7	127.6	171.1	214.0	281.0	383.5
EU	1,991.0	2,070.8	2,091.0	2,201.7	2,231.2	2,322.1	2,323.9	2,433.5	2,911.0	3,545.8	3,907.0	4,485.3	5,180.3
Other Europe: industrialized	120.0	124.5	120.9	130.9	125.5	130.6	129.6	130.1	151.2	177.0	203.4	229.3	269.0
East Asia: industrialized	543.9	574.9	561.6	437.2	493.0	613.3	551.5	553.2	631.6	763.1	888.5	1,019.1	1,123.9
North America	861.7	908.7	1,001.3	1,046.3	1,157.5	1,356.2	1,267.6	1,292.4	1,398.5	1,634.3	1,865.0	2,070.1	2,197.3
Others: industrialized	122.0	127.0	124.0	119.8	129.6	140.8	125.7	139.4	166.0	207.4	237.4	268.1	313.6
North Africa	50.5	50.2	52.4	57.2	55.2	55.8	56.0	60.2	67.4	85.6	102.8	116.1	145.6
Central Africa	6.6	7.6	7.6	7.6	6.4	6.3	8.8	8.5	11.1	13.8	17.8	23.7	26.9
Western Africa (ECOWAS)	21.2	24.1	25.0	28.0	24.8	28.0	29.5	32.9	39.2	44.4	49.7	64.6	83.4
Eastern and southern Africa	16.3	14.8	16.5	17.2	16.9	16.3	18.0	18.3	22.3	24.9	33.8	40.3	49.0
Europe: developing	46.7	55.3	61.8	58.7	52.9	66.2	55.2	65.5	87.1	119.9	142.2	164.2	201.7
Asia: developing	639.4	671.4	691.8	612.5	626.9	747.3	761.6	833.0	1,048.4	1,287.2	1,533.4	1,812.6	2,158.7
Latin America: developing Countries	249.9	281.1	329.6	341.8	330.0	386.7	377.7	351.7	372.2	442.0	523.9	617.7	707.0
EU15	1,870.4	1,932.5	1,940.2	2,034.8	2,069.2	2,141.2	2,131.2	2,219.6	2,639.1	3,200.8	3,510.2	3,994.3	4,558.1
EU12	120.6	138.3	150.8	166.9	162.0	180.9	192.7	213.9	271.9	345.0	396.8	490.9	622.3
Not classified	3.6	7.9	9.4	9.3	8.4	10.0	10.4	11.6	12.2	18.8	27.4	26.5	33.5

Source: UNIDO calculation based on BACI

Table 4 OECD industry classification by technological level

Industry	**ISIC Rev. 3**
High-technology industries	
Aircraft and spacecraft	353
Pharmaceuticals	2423
Office, accounting and computing machinery	30
Radio, TV and communications equipment	32
Medical, precision and optical instruments	33
Medium High-technology industries	
Electrical machinery and apparatus, n.e.c.	31
Motor vehicles, trailers and semi-trailers	34
Chemicals excluding pharmaceuticals	24 excl. 2423
Railroad equipment and transport equipment	352+359
Machinery and equipment, n.e.c.	29
Medium low-technology industries	
Building and repairing of ships and boats	351
Rubber and plastic products	25
Coke, refined petroleum products and nuclear fuel	23
Other non-metallic mineral products	26
Basic metals and fabricated metal products	27-28
Low-technology industries	
Manufacturing, n.e.c.; Recycling	36-37
Wood, pulp, paper products, printing and publishing	20-22
Food products, beverages and tobacco	15-16
Textile, textile products, leather and footwear	17-19

Source: OECD, 2007. Science, Technology and Industry, Scoreboard 2007: 220.

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Telephone: (+43-1) 26026-0, Fax: (+43-1) 26926-69
E-mail: unido@unido.org, Internet: www.unido.org