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The Trade Performance Index

Technical notes

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Comments and suggestions for amelioration are welcome. Please contact the Market Analysis Section at email: mas@intracen.org, tel: +41-22-730.02.34.

SUMMARY

ITC developed the Trade Performance Index (TPI) with the aim of assessing and monitoring the multi-faceted dimensions of export performance and competitiveness by sector and by county. At present, the TPI covers 184 countries and 14 different export sectors. The index calculates the level of competitiveness and diversification of a particular export sector using comparisons with other countries. In particular, it brings out gains and losses in world market shares and sheds light on the factors causing these changes. Moreover, it monitors the evolution of export diversification for products and markets. The TPI is limited by its purely quantitative approach, although it does provide a systematic overview of sectoral export performance and comparative and competitive advantages.

For each country and each sector, the TPI provides three types of indicators: a *general profile*, a country *position* for the latest available year and *changes* in export performance in recent years. Altogether, the TPI makes use of around two dozen of quantitative performance indicators. For ease of reference, these indicators are presented in absolute terms and, in addition, ranked among the 184 countries covered by the TPI.

Moreover, one composite ranking referring to the overall *position* of a country and sector is calculated. This composite ranking is based on five criteria, namely the value of net exports, per capita exports, the world market share, the diversification of products, and the diversification of markets.

Introduction

The trade performance of individual countries tends to be a good indicator of economic performance since well performing countries tend to record higher rates of GDP growth. The majority of developing countries have joined the World Trade Organization (WTO) and have taken initiatives aimed at opening their economies. Nevertheless, the outcome has not always been systematically positive with export performance sometimes remaining disappointing. It is difficult to establish an all embracing definition of successful trade performance. Trade champions contrast with certain specialised exporters that suffer from a deterioration in their terms of trade. For example, some developing countries record high growth rates by specialising in niche markets and concentrating their export markets, while other developing countries record more moderate rates of growth with a well diversified array of products and partner countries. In other cases, successful performance is the result of a favourable product or market penetration since the beginning. Successful performance can also be gauged in terms of a country's ability to adapt its export profile to changing patterns of world demand. The last approach is the most dynamic and demand-driven trade policy stance.

The Trade Performance Index (TPI thereafter) designed by ITC aims to tackle the complex and multidimensional nature of trade patterns. This index is computed using the world's largest trade database,

COMTRADE (of the United Nations Statistics Division), covering 184 countries[1], where more than 95% of world trade in 5,000 products is reported at the 6-digit level of the Harmonized System (HS). Since COMTRADE captures around 95 % of world trade, the TPI is calculated not only for countries that report their own trade data, but also for over one hundred primarily low-income countries that do not report national trade statistics.

Given that such an amount of information would be overwhelming to the final user, products are grouped into 14 sectors (see appendix 3). Calculations are made at the product level and results are presented at the sectoral level and for the economy as a whole. For each country and each sector, the TPI provides a *general profile*, indicators on a country's *position* and indicators on *changes* in export performance in recent years.

The rest of the paper covers the objectives, methodology and results of the TPI framework.

1- Motivation for developing the Trade Performance Index

Generally, trade performance is characterised by rough indicators, such as the level of openness (total trade in goods and services divided by GDP) or growth of exports over a given period (such as the World Bank's *World Development Indicators*).

Recent research on the relationship between trade and growth suggests that openness alone is not a sufficient criteria for determining high levels of growth. Other factors, such as the type of product available, the level of market and economic diversification, the positioning on quality ladders, are also significant in explaining growth. In addition, it is important to determine the reasons for country differences in export growth and to determine the redistributive process of market shares among competitors.

Departing from the rough indicators referred to above, microeconomic and generally qualitative indicators are used to characterise the competitiveness of nations. In this light, the "Microeconomic index of competitiveness" (Porter and Christensen, 1999), is based on the micro-foundations of a country's competitiveness. Launched in 1998 as part of the Global Competitiveness Report, this index is based on a survey of some 4,000 businessmen and government officials in 58 countries, including OECD countries[2]. Regressing income per capita on this index explains more than 80% of the variance of income in the sample. A quantitative method was developed in order to complement the qualitative approach, which may be criticised on the ground of being limited to a small number of developing countries.

It appears that the relative position of a country or product on the international market, and its development over time, is a good indicator of competitiveness. Trade statistics capture these changes. Trade statistics have the advantage of being available for a substantial number of countries. For those countries which do not report trade

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[1] In the case of non-reporting countries, the trade is reconstituted on the basis of partner country statistics (mirror statistics). This approach does not capture trade among non-reporting countries.
[2] Indicators range from the overall infrastructure quality to administrative infrastructure, information infrastructure, capital availability, human resources etc.

statistics, their trade profile can be (partially) completed by using mirror statistics. Lastly, trade data is broken down at the industry and product levels, which provides a disaggregated insight into trade performances.

On this basis, developing countries can be ranked according to their trade performance, based on various criteria. A ranking can be provided by country, sector, or a combination of different criteria.

It must be stressed that the performance of individual countries cannot be determined on the basis of a restricted sample of countries or products. The derivation of the relative export performance is achieved by including a significant number of countries, together with a detailed product breakdown.

2- Content of the TPI

For each country and each sector, the TPI provides indicators on a country's general profile, on a country's position and on the decomposition of the country's change in world market share. Altogether, the TPI consists of 22 quantitative indicators of trade performance. For ease of reference, these indicators are presented in absolute terms and, in addition, combined to form a ranking among the countries. All this information is grouped under three categories referring to "general profile", "current performance" and "decomposition of changes in trade performance", as illustrated in Table 1.

Table 1: Groups of indicators used

Current performance (Indicators used for the computation of the composite index)	General profile	Decomposition of changes in world market share since 2001
P1. Value of net exports	G1. Value of exports	C1. Relative change of world market share
P2. Per capita exports	G2. Trend growth of exports, since 2001	Decomposed into:
P3. Share in world market		(C1a) Competitiveness effect
P4. Product diversification and concentration	G3. Share in national exports	(C1b) Initial geographic specialisation
	G4. Share in national imports	(C1c) Initial product specialisation
P5. Market diversification and concentration	G5. Growth in per capita exports, since 2001	(C1d) Adaptation effect
	G6. Level in relative unit values	
	G7. Matching of dynamics of world demand since 2001	
	G8. Change of world market share in % points, since 2001	

3- Data used

The raw trade data using for calculating the indicators are defined at the 6-digit level of the Harmonized System, 1996 edition, which includes more than 5'000 product items. The data are extracted from COMTRADE (http://comtrade.un.org), the United Nations Commodity Trade Statistics Database, maintained by the Statistics Division of the UN.

Around 100 countries have reported their trade data systematically over the 2001-2005 period in the 1996 edition of the HS. For the other countries (around 90), we are using mirror estimates, which are derived from partner countries statistics. Since COMTRADE captures around 95 % of world trade, mirror estimates give usually gives fairly reliable results. See Box 1 for a description of problems encountered using trade data.

In order to obtain more robust rankings of trade performance, for each sector we have only considered countries whose exports are superior to US$ 1 million for each year of the 2001-2005 period and whose total exports for the same period are superior to US$ 25 million.

Box 1: Foreign Trade Statistics: what Users Should Take into Consideration

Foreign trade statistics provide a differentiated picture of trade flows among countries. They are comprehensive in terms of product coverage (more than 5,000 products under the Harmonized System), geographical coverage (over 100 countries covering 95 per cent of world trade) and time series (data under the Harmonized System are available for the last decade). Moreover, they are readily available at moderate costs. This makes them an attractive source for market research and the assessment of trade performance.

Against this background, ITC has developed a number of tools for international marketing and trade promotion, based on trade statistics. The Trade Performance Index and TradeMaps are cases in point. All of these tools strive to present trade statistics in an analytical and user friendly format. Notwithstanding the attractiveness of this comprehensive source of information, users should factor in the following weak points of foreign trade statistics.

i) Trade data are never complete. Smuggling and non reporting represent a serious problem in a number of countries. In addition, trade statistics as any source of information are not free of mistakes and omissions.

ii) Most countries include imports for re exports and re exports in their trade statistics. A low income country may be an exporter of airplanes simply because its national airline has sold second hand planes.

iii) According to international conventions for reporting trade statistics, the export value refers to the total or contract value, which may, of course, be very different from local value added. For many processing activities, for instance, the local value added remains below 20 per cent of the export value.

iv) Detailed trade statistics are available only for merchandise trade and not for services, although the latter may account for a sizeable share of national exports.

v) Even at the lowest level of disaggregation, product groups in the trade nomenclatures do not necessarily reflect trade names and often contain a wide spread of different products. Moreover, the product nomenclature is sometimes misleading. The labels of aggregated product groups are often very general and provide at times only limited guidance on the leading items within the group of products concerned.

vi) Exchange rates fluctuations are not always properly recorded in international trade statistics. Values are normally aggregated over the period of one year in local currency and converted into US dollars.

vii) For countries that do not report trade data to the United Nations, ITC uses partner country data, an approach referred to as mirror statistics. Mirror statistics are a second best solution (better than having no data at all). At the same time, they have a number of shortcomings when compared to the first best solution of nationally reported data. First and foremost, they do not cover trade with other non reporting countries. As a result, mirror statistics hardly cover South South trade. For an assessment of intra African trade, for instance, mirror statistics are not a suitable source of information. Second, there is the problem of transshipments, which may hide the actual source of supply. Third, mirror statistics invert the reporting standards by valuing exports in cif terms (i.e. including transport cost and insurance) and imports in fob terms (excluding these items).

In view of the above shortcomings, trade statistics should never be the sole source of insight but need to be complemented by other sources and in particular cross checked by product specialists and industry insiders. Overall, ITC's experience suggests that trade statistics represent a very useful source of information and a valid point of departure for strategic market research, if analysed with a healthy mix of scepticism and pragmatism vis à vis their strength and shortcomings.

4- Description of indicators

This section examines the rationale and the calculation of each indicator entering in the TPI. General profile indicators, position-related indicators and change-related indicators are surveyed respectively.

All indicators are calculated for each of the 14 sectors at the product level. Original data used in the computation is at the 6-digit level of the HS nomenclature (1996 edition), corresponding to more than 5,000 products as a whole.

P1- Value of net exports: Net exports are defined as exports less imports. A country's net exports are a reliable indicator of its position on the world market for two reasons. Firstly, net exports eliminate re-exports, which would otherwise introduce a bias into the raw data. Secondly, the indicator takes into account the international division of production processes, since a large part of imported intermediate products found within exports usually belong to the same sector (e.g. electronic parts and assembled computers). Hence, net exports provide a very simple but reliable correction for dealing with the globalisation of production processes and the induced vertical specialisation of countries at various stages of production.

P2- Per capita exports: The value of per capita exports indicates the level of outward looking of a country and the extent to which a country's population produces for the world market.

P3- Share in world market (percentage share of world exports): the world market share for a specific country is the ratio of total country exports to total world exports.

<u>P4- Product diversification</u>: diversification, measured through exports, is a good indicator of production structures and industry's development level. Diversification limits the dependence on a small number of products and hence reduces a country's vulnerability to industry-specific external shocks.

In order to capture the degree of product diversification, two separate indicators are calculated: the equivalent number of products and the spread. The spread is the inverse of the corresponding concentration. The equivalent number (EN=1/Herfindal), is a theoretical value which represents the number of markets of identical size that would lead to the degree of export concentration exactly equal to the observed one. Because this indicator is not highly sensitive to activities of relatively weak importance, it is a measurement that is suited to sectoral studies. We start by presenting these indicators and then turn to an example illustrating the value added of combining the two indicators.

Calculating product differentiation by means of the equivalent number distinguishes for each country the equivalent number of exported goods of equal importance (either within each sector or in the whole national economy) leading to the same concentration of exports. The increase in rank is a function of the increase in the level of diversification (both for products and markets). The larger the index value, the greater the diversification of exports, and consequently the better the ranking.

The *spread index* complements the equivalent number. Spread indices measure the dispersion between the highest and lowest value in a given statistical series. They are calculated using a weighted standard error. The spread index for products calculates for each country the distribution of export products and compares it to the average export value. The greater the distribution (i.e. spread) of exports from a country as compared to the average, the higher the value of the index.

If all countries export all products, one of these indicators would be sufficient. Since this is not the case, the combination of the two indicators is useful. The arguments for combining the two indicators of dispersion are illustrated in Appendix 1.

In technical terms, the equivalent number (for products) is calculated as in equation (2).

$$NE_{icl}^t = \frac{1}{\sum_{k=1}^{n} \left(X_{i.k}^t \Big/ X_{i.cl}^t \right)^2} \quad (2)$$

with: $X_{i.k}^t$ the export of product k by country i at year t.

$X_{i.cl}^t$ country i exports of all products belonging to the cluster cl at year t.

$X_{i.k} \Big/ X_{i.cl}$ the share of product k in total exports of country i in cluster cl.

Turning to the index of weighted spread, equation (3) indicates that the standard deviation divided by the number of products times the average value of exports for individual products has been used.

$$S_{cl}^{t} = \left[\frac{\sqrt{\sum\limits_{k=1}^{cl}\left(X_{i.k}^{t} - \overline{X}_{i.cl}^{t}\right)^{2}}}{N(\overline{X}_{i.cl}^{t})} \right] \quad (3)$$

with:

$X_{i.k}^{t}$ country i exports of product k to market i in year t.

$\overline{X}_{i.cl}^{t}$ the average value of country i exports in year t for the cluster cl.

$\left(X_{i.k}^{t} - \overline{X}_{i.cl}^{t}\right)$ the deviation to the average of product k in cluster cl for country i.

$\sqrt{\sum\limits_{k=1}^{cl}\left(X_{i.k}^{t} - \overline{X}_{i.cl}^{t}\right)^{2}}$ the standard deviation.

S_{cl}^{t} the weighted spread.

P5- Diversification of markets: diversifying partner countries reduces a country's dependence on a small number of export markets and hence the vulnerability to shocks within destination countries. In order to capture the degree of market diversification, the same two complementary indicators referred to above are used: the equivalent number of markets and the spread.

The equivalent number used for calculating market diversification (equation 4) distinguishes for each country, the number of partner countries weighed according to their importance. The increase in rank is a function of the increase in the level of diversification of markets. The bigger the index value, the greater the diversification of markets and consequently the better the ranking.

$$NE_{i}^{t} = \frac{1}{\sum\limits_{j=1}^{p}\left(X_{ijcl}^{t} \Big/ X_{i.cl}^{t}\right)^{2}} \quad (4)$$

with :

X_{ijcl}^{t} country i exports of all products belonging to the cluster cl to country j in year t.

$X_{i.cl}^{t}$ country i total exports of all products belonging to the cluster cl

$X_{ijcl} \Big/ X_{i.cl}$ the share of market j in country i total exports of products belonging to the cluster cl.

Spread indices measure the existing dispersion between the highest and lowest value of a given statistical series. They are calculated using the weighted standard error (equation 5). The spread index for markets compares for each country, the share of its exports directed to different partner countries with the average export value. The greater the dispersion of exports from this country (i.e. the greater the spread) as compared to the average, the higher the value of the index.

Concerning positions, the ranking of the 184 countries is a function of the degree of diffusion of exported products (of a country's exports to partner countries). The smaller the index, the more exported products are evenly distributed (amongst partner countries) and the better the ranking.

$$S_{pcl}^{t} = \left[\frac{\sqrt{\sum_{j=1}^{p} \left(X_{ijcl}^{t} - \overline{X}_{ipcl}^{t} \right)^{2}}}{N(\overline{X}_{ipcl}^{t})} \right] \quad (5)$$

with:

X_{ijcl}^{t} country *i* total exports to market *j* in cluster *cl* in year *t*.

$\overline{X}_{ipcl}^{t}$ country *i* average export to the *p* markets of products belonging to the cluster *cl* in year *t*

$\sqrt{\sum_{k=1}^{cl} \left(X_{ijcl}^{t} - \overline{X}_{ipcl}^{t} \right)^{2}}$ the standard deviation.

In addition to these indicators, the TPI includes a **composite index** (CI)[3], which is based on a simple average of the five rankings of indicators P1 to P5, described previously.

The composite index reflects the position of a country in a given sector for a given year, in terms of trade performance. Changes over time of this position reflect improvements or deterioration in trade performance of the country under analysis.

A second set of indicators aims at giving the **general profile** for the country considered. However, these indicators are not used in the calculation of the final ranking provided by the TPI, as already mentioned.

G1- Value of exports: Value of total country exports by sector is given in million of US$ for the current year.

G2- Trend of exports: Average per annum growth of export values since the year 2001.

G3 (G4)- Share in national exports (imports): This refers to the share of exports (imports) by sector in relation to total country exports (imports).

G5- Change in per capita exports: The level of exports is determined by the demand for a country's products on world markets and a country's ability to satisfy that demand, which can be related to its size. Hence, the value of per capita exports shows how outward looking is a country, and the extent to which the population produces for the world market. The change in per capita exports reflects changes in a country's outward looking stance and performance for the group of products considered.

G6- Relative unit value: The RUV of each sector is calculated as the ratio of the average unit value of exports for a country to the world average unit value. The reference point or average relative unit value is 1 (the unit value in the targeted country equals the unit value in the world market). If the RUV is below (above) 1, then the country exports its product at a lower (higher) price than the world average unit price.

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[3] In the previous editions of the TPI, this index was referred as the "Current Index (P)".

Traditionally, the comparison of unit values for homogeneous products gives an indication of exporters' relative prices. However, according to the new theories of international trade, products are differentiated by quality, which is often reflected by differences in price. Accordingly, prices are considered as an indirect indicator of the quality of differentiated products: assuming that a consumer has access to product information, two products of different quality cannot be sold at the same price. However, since prices are not available for individual products, or even for industries, unit values (values divided by quantities) are taken as proxies for prices. Higher unit values are considered as reflecting a higher quality, other things being equal, and not as an indication of poor price competitiveness.

G7- Adaptation to world demand: this index is calculated with a view to ranking countries according to their ability to adapt to the dynamics of world demand. It is based on Spearman's rank correlation between the ranking share of the exporting countries' export products in its total exports, and the rank of growth trends in worldwide exports of those products.

Each country is given a correlation index that takes a value between 1 and –1. A value of 1 (-1) indicates that the relative importance of a country's exported goods is in full accordance (discordance) with the ranking of world export growth rates for the same goods. The country ranking is dependent on the rank correlation index. The closer the index is to 1, the better the country ranking under analysis.

G8- Change of world market share (in % points) since 2001: The change (variation over time) in a country's world market share is the difference in the world market share between time 0 and time t. If it is positive, country i has increased its world market share.

In addition to the general profile indicators, we also provide detailed figures on the **decomposition of the relative change in world market share** in different effects. The decomposition of the change in the world market share provides information on the competitiveness of the country considered. The market share variation can be tabulated as the simple average of the rankings according to four criteria: competitiveness, initial geographic specialisation, initial product specialisation and responsiveness to changes in world demand. These indicators are calculated by decomposing changes in a country's market share in elementary markets. For more information, see appendix 2.

Appendix 1: More on the use of different dispersion indicators

This appendix illustrates the need of using two different measures of diversification with an example. Let us consider the data on 4 countries and 10 industries displayed in Table 2.

Country A exhibits uniformity in the level of specialisation in its industries, thereby achieving the highest level of diversification. Country B is specialised with equal intensity in 5 out of the 10 industries. Country C exports products in 8 industries and is highly specialised in industry 7, which accounts for 35% of its exports. Lastly, country D exhibits the same specialisation patterns but tenfold. The choice between the two indicators is not the same for country A and B on the one hand, and B and C and the other hand. Neither indicator discriminates simultaneously between countries belonging to each of these pairs.

Consider the country pair A and B: the spread is zero in both cases (indicating uniformity in the specialisation in industries) whereas the equivalent number is twice as large for country A (indicating that country A is diversified twice as much as B). The spread does not take into account the number of industries in which a country is active, but only the share of each industry in total exports. The equivalent number, on the other hand, ignores the differences in each industry's share to total exports and only focuses on the number of industries a country is active in. Hence, the spread indicator does not distinguish any differences between country A and country B, whereas the equivalent number finds differences between them.

In the case of countries B and C, the opposite result is obtained. The equivalent number of markets of equal size is 5 in both cases. However, since the dispersion is much larger in country C, the spread can rank these two countries. In sum, country A is the most diversified country, followed by B. Countries C and D are the least diversified.

Lastly, the comparison of results for countries C and D highlights the advantage of using the weighted spread instead of the standard deviation. Using the standard deviation, the dispersion in country D is ten times larger than in country C, even though only their size differs.

Table 2: data and calculations of the measures of diversification

	Country A	Country B	Country C	Country D
industry 1	20		20	200
industry 2	20		15	150
industry 3	20		26	260
industry 4	20		20	200
industry 5	20		20	200
industry 6	20	40		
industry 7	20	40	74	740
industry 8	20	40	5	50
industry 9	20	40	20	200
industry 10	20	40		
Total exports	200	200	200	2000
Equivalent number	**10.00**	**5.00**	**5.00**	**5.00**
Standard deviation	0.00	0.00	20.71	207.10
Weighted spread	**0.00**	**0.00**	**0.104**	**0.104**
Rank - equivalent number	1	2	2	2
Rank - weighted spread	1	1	3	3
Ranking	*1*	*2*	*3*	*3*

Appendix 2: Decomposition of the changes in world market share

The **world market share** of exporting country i in time t is the ratio between the country's total exports ($X_{i.}$) and world exports ($X_{...}$).

In order to decompose this change, the notion of **import markets** (sometimes also referred to as "elementary markets") is useful. An import market is defined as the destination country j for a specific industry k. Examples are: Tea and tea products in the United Kingdom; Machine tools in Brazil; and Cut flowers and ornamental plants in Japan.

$$\frac{X_i^t}{X_{...}^t} = \sum_j \sum_k \frac{X_{ijk}^t}{X_{...}^t} = \sum_j \sum_k \underbrace{\frac{X_{ijk}^t}{X_{.jk}^t}}_{\substack{\text{Country's}\\\text{market}\\\text{share}\\\text{in import}\\\text{markets}}} * \underbrace{\frac{X_{.jk}^t}{X_{...}^t}}_{\substack{\text{Share}\\\text{of import}\\\text{markets}\\\text{in world}\\\text{exports}}}$$

The **change (variation over time) in a country's world market share** is the difference in the world market share between time 0 and time t. If it is positive, country i has increased its world market share.

The change in a country's world market share can be decomposed and expressed as the sum of the following effects:
(1) competitiveness effect;
(2) structural effect, which in turn can be decomposed into
(2a) a structural geographic effect and
(2b) a structural product effect, and
(3) adaptation effect.

$$\frac{X_i^t}{X_{...}^t} - \frac{X_i^0}{X_{...}^0} = \sum_j \sum_k \frac{X_{ijk}^t}{X_{...}^t} - \sum_j \sum_k \frac{X_{ijk}^0}{X_{...}^0} =$$

$$\sum_j \sum_k \underbrace{\frac{X_{ijk}^t}{X_{.jk}^t}}_{\substack{\text{Country's}\\\text{market}\\\text{share}\\\text{in import}\\\text{markets}\\\text{in time t}}} * \underbrace{\frac{X_{.jk}^t}{X_{...}^t}}_{\substack{\text{Share}\\\text{of import}\\\text{markets}\\\text{in world}\\\text{imports}\\\text{in time t}}} - \sum_j \sum_k \underbrace{\frac{X_{ijk}^0}{X_{.jk}^0}}_{\substack{\text{Country's}\\\text{initial}\\\text{market}\\\text{share}\\\text{in import}\\\text{markets}}} * \underbrace{\frac{X_{.jk}^0}{X_{...}^0}}_{\substack{\text{Initial}\\\text{share}\\\text{of import}\\\text{markets}\\\text{in world}\\\text{imports}}}$$

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(1) The **competitiveness effect** corresponds to hypothetical gains or losses of a country's aggregate market share that would occur if changes were only due to variations in the country's market share in import markets (product k and importing country j), regardless of the structure of the country's exports.
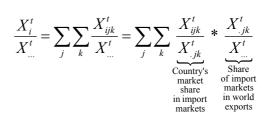
Formally, the variation in the country's market share in import markets is multiplied by the initial share of import markets in world imports (in time 0).

These effects are summed up for all import markets. The overall effect (the weighted average of the variation in the country's market share in import markets) is positive if positive effects outweigh negative effects.

$$\sum_j \sum_k \underbrace{\left(\frac{X_{ijk}^t}{X_{.jk}^t} - \frac{X_{ijk}^0}{X_{.jk}^0} \right)}_{\substack{\text{Variation}\\\text{in the country's}\\\text{market share}\\\text{in import markets}}} * \underbrace{\frac{X_{.jk}^0}{X_{...}^0}}_{\substack{\text{Initial share}\\\text{of import markets}\\\text{in world imports}}}$$

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(2) The **structural effect of initial specialisation on import markets** corresponds to hypothetical gains or losses in a country's aggregate market share that would occur if changes were only due to the dynamism of import markets (product k and importing country j), regardless of any variations in the country's market shares in these markets.

Formally, the country's initial market share in import markets (in time 0) is multiplied by the variation in the share of import markets in world imports.

These effects are summed up over all import markets. The overall effect (the weighted average of the variation in the share of import markets in world imports) is positive if the country is well positioned on dynamic import markets in the beginning of the time period.

This effect can be further split up into the two following effects, which however are not symmetric, since it is impossible to fully disentangle them.

$$\sum_j \sum_k \underbrace{\frac{X_{ijk}^0}{X_{.jk}^0}}_{\substack{\text{The country's}\\\text{initial market share}\\\text{in import markets}}} * \underbrace{\left(\frac{X_{.jk}^t}{X_{...}^t} - \frac{X_{.jk}^0}{X_{...}^0} \right)}_{\substack{\text{Variation}\\\text{in the share}\\\text{of import markets}\\\text{in world imports}}}$$

(2a) The **structural effect of initial geographic specialisation** corresponds to hypothetical gains or losses in a country's aggregate market share that would occur if changes were only due to the dynamism of its partner countries, regardless of any variations in the country's market shares in these markets.

Formally, the variation in the share of partner countries in world imports is multiplied by the initial market share of the exporting country in these countries.
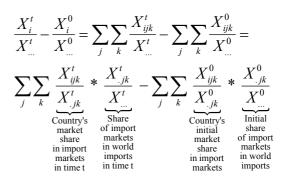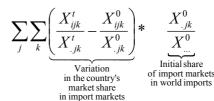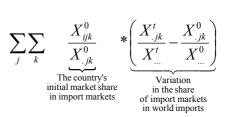
These effects are summed up over all import markets. The overall effect (the weighted average of the variation in the share of partner countries in world imports) is positive if the country is well positioned on dynamic destination markets in the beginning of the time period.

$$\sum_{j} \underbrace{\frac{X_{ij.}^{0}}{X_{.j.}^{0}}}_{\substack{\text{The country's} \\ \text{initial market share} \\ \text{in the} \\ \text{partner country's} \\ \text{imports}}} * \underbrace{\left(\frac{X_{.j.}^{t}}{X_{...}^{t}} - \frac{X_{.j.}^{0}}{X_{...}^{0}} \right)}_{\substack{\text{Variation} \\ \text{in the share} \\ \text{of the} \\ \text{partner country's} \\ \text{imports in} \\ \text{world imports}}}$$

(2b) The **structural effect of initial product specialisation** corresponds to hypothetical gains or losses in a country's aggregate market share that are associated with the initial sector specialisation of domestic supply on products characterised by dynamic demand.
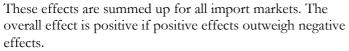
Formally, the difference between the initial share of the exporting country in import markets and the initial market share of the exporting country in destination markets is multiplied by the change in the share of import markets in world imports.
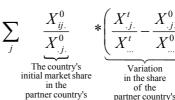
The effect is positive if both go in the same direction, i.e. if the share of an import market in world imports increases (declines) and the sector is over(under)-represented in the country's exports to its partner.

The effect is negative if both go in opposing directions, i.e. if the share of an import market in world imports declines (increases) and the sector is over(under)-represented in the country's exports to its partner.

These effects are summed up over all import markets. The overall effect is positive if the country is well positioned on dynamic products in the beginning of the time period.

$$\sum_{j}\sum_{k} \underbrace{\left(\frac{X_{ijk}^{0}}{X_{.jk}^{0}} - \frac{X_{ij.}^{0}}{X_{.j.}^{0}} \right)}_{\substack{\text{Difference between} \\ \text{the country's} \\ \text{initial market share} \\ \text{in import markets} \\ \text{and} \\ \text{the country's} \\ \text{initial market share} \\ \text{in the} \\ \text{partner country's} \\ \text{total imports}}} * \underbrace{\left(\frac{X_{.jk}^{t}}{X_{...}^{t}} - \frac{X_{.jk}^{0}}{X_{...}^{0}} \right)}_{\substack{\text{Variation} \\ \text{in the share} \\ \text{of import markets} \\ \text{in world imports}}}$$

(3) The **adaptation effect** measures a country's ability to adjust its exports to changes in world demand.

Formally, it multiplies two variations over time. The variation in the country's market share in an import market (product k and importing country j) is multiplied by the variation in the share of the import market in world imports.

The effect is positive if the country's market share increases in a growing import market (+,+) or declines in a declining market (−,−).

The effect is negative if the country's market share increases in a declining import market (+,−) or declines in a growing market (−,+).

These effects are summed up for all import markets. The overall effect is positive if positive effects outweigh negative effects.

$$\sum_{j}\sum_{k} \underbrace{\left(\frac{X_{ijk}^{t}}{X_{.jk}^{t}} - \frac{X_{ijk}^{0}}{X_{.jk}^{0}} \right)}_{\substack{\text{Variation} \\ \text{in the country's} \\ \text{market share} \\ \text{in import markets}}} * \underbrace{\left(\frac{X_{.jk}^{t}}{X_{...}^{t}} - \frac{X_{.jk}^{0}}{X_{...}^{0}} \right)}_{\substack{\text{Variation} \\ \text{in the share} \\ \text{of import markets} \\ \text{in world imports}}}$$

Appendix 3: Definition of sectors

	Sectors	SITC Rev.3	Products
1	**Fresh food and raw agro-based products**		
001	LIVE ANIMALS	075	SPICES
011	BOVINE MEAT	121	TOBACCO, UNMANUFACTURED
012	OTHER MEAT, MEAT OFFAL	211	HIDES,SKINS(EX.FURS),RAW
034	FISH,FRESH,CHILLED,FROZN	212	FURSKINS, RAW
036	CRUSTACEANS,MOLLUSCS ETC	222	OILSEED(SFT.FIX VEG.OIL)
041	WHEAT, MESLIN, UNMILLED	223	OILSEED(OTH.FIX.VEG.OIL)
0421	RICE	231	NATURAL RUBBER, ETC.
043	BARLEY, UNMILLED	261	SILK
044	MAIZE UNMILLED	263	COTTON
045	OTHER CEREALS, UNMILLED	264	JUTE,OTH.TEXTL.BAST FIBR
054	VEGETABLES	265	VEGETABLE TEXTILE FIBRES
057	FRUIT,NUTS EXCL.OIL NUTS	268	WOOL, OTHER ANIMAL HAIR
071	COFFEE,COFFEE SUBSTITUTE	291	CRUDE ANIMAL MATERLS.NES
072	COCOA	292	CRUDE VEG.MATERIALS, NES
074	TEA AND MATE		
2	**Processed food and agro-based products**		
016	MEAT,ED.OFFL,DRY,SLT,SMK	059	FRUIT, VEGETABLE JUICES
017	MEAT,OFFL.PRPD,PRSVD,NES	061	SUGARS,MOLASSES,HONEY
022	MILK AND CREAM	062	SUGAR CONFECTIONERY
023	BUTTER,OTHER FAT OF MILK	073	CHOCOLATE,OTH.COCOA PREP
024	CHEESE AND CURD	081	ANIMAL FEED STUFF
025	EGGS,BIRDS,YOLKS,ALBUMIN	091	MARGARINE AND SHORTENING
035	FISH,DRIED,SALTED,SMOKED	098	EDIBLE PROD.PREPRTNS,NES
037	FISH ETC.PREPD,PRSVD.NES	111	NON-ALCOHOL.BEVERAGE,NES
0422	RICE	112	ALCOHOLIC BEVERAGES
0423	RICE	122	TOBACCO, MANUFACTURED
046	MEAL,FLOUR OF WHEAT,MSLN	411	ANIMAL OILS AND FATS
047	OTHER CEREAL MEAL,FLOURS	421	FIXED VEG.FAT,OILS, SOFT
048	CEREAL PREPARATIONS	422	FIXED VEG.FAT,OILS,OTHER
056	VEGTABLES,PRPD,PRSVD,NES	431	ANIMAL,VEG.FATS,OILS,NES
058	FRUIT,PRESERVED,PREPARED	551	ESSNTL.OIL,PERFUME,FLAVR
3	**Wood, wood products and paper**		
244	CORK,NATURAL,RAW;WASTE	633	CORK MANUFACTURES
245	FUEL WOOD, WOOD CHARCOAL	634	VENEERS, PLYWOOD, ETC.
246	WOOD IN CHIPS, PARTICLES	635	WOOD MANUFACTURES, NES
247	WOOD ROUGH,ROUGH SQUARED	641	PAPER AND PAPERBOARD
248	WOOD, SIMPLY WORKED	642	PAPER,PAPERBOARD,CUT ETC
251	PULP AND WASTE PAPER	8215	Wooden furniture
4	**Yarn, fabrics and textiles**		
651	TEXTILE YARN	656	TULLE,LACE,EMBROIDRY.ETC
652	COTTON FABRICS, WOVEN	657	SPECIAL YARN,TXTL.FABRIC
653	FABRICS,MAN-MADE FIBRES	658	TEXTILE ARTICLES NES
654	OTH.TEXTILE FABRIC,WOVEN	659	FLOOR COVERINGS, ETC.
655	KNIT.CROCHET.FABRIC NES		
5	**Chemicals**		
232	SYNTHETIC RUBBER, ETC.	554	SOAP,CLEANERS,POLISH,ETC
266	SYNTHETIC FIBRES	562	FERTILIZER,EXCEPT GRP272
267	OTHER MAN-MADE FIBRES	571	POLYMERS OF ETHYLENE
511	HYDROCARBONS,NES,DERIVTS	572	POLYMERS OF STYRENE
512	ALCOHOL,PHENOL,ETC.DERIV	573	POLYMERS,VINYL CHLORIDE
513	CARBOXYLIC ACIDS,DERIVTS	574	POLYACETAL,POLYCARBONATE
514	NITROGEN-FUNCT.COMPOUNDS	575	OTH.PLASTIC,PRIMARY FORM
515	ORGANO-INORGANIC COMPNDS	579	PLASTIC WASTE, SCRAP ETC
516	OTHER ORGANIC CHEMICALS	581	PLASTIC TUBE,PIPE,HOSE
522	INORGANIC CHEM.ELEMENTS	582	PLASTIC PLATE,SHEETS,ETC
523	METAL.SALTS,INORGAN.ACID	583	MONOFILAMENT OF PLASTICS
524	OTHER CHEMICAL COMPOUNDS	591	INSECTICIDES, ETC.
525	RADIO-ACTIVE MATERIALS	592	STARCHES,INULIN,ETC.

531	SYNTH.COLOURS,LAKES,ETC.	593	EXPLOSIVES,PYROTECHNICS
532	DYEING,TANNING MATERIALS	597	PREPRD ADDITIVES,LIQUIDS
533	PIGMENTS, PAINTS, ETC.	598	MISC.CHEMICAL PRODTS.NES
541	MEDICINES,ETC.EXC.GRP542	621	MATERIALS OF RUBBER
542	MEDICAMENTS	625	RUBBER TYRES,TUBES,ETC.
553	PERFUMERY,COSMETICS,ETC.	629	ARTICLES OF RUBBER, NES

6 Leather and leather products

611	LEATHER	831	TRUNK,SUIT-CASES,BAG,ETC
612	MANUFACT.LEATHER ETC.NES	851	FOOTWEAR
613	FURSKINS,TANNED,DRESSED		

7 Metal and other basic manufacturing

661	LIME,CEMENT,CONSTR.MATRL	681	SILVER,PLATINUM,ETC.
662	CLAY,REFRCT.CONSTR.MATRL	682	COPPER
663	MINERAL MANUFACTURES,NES	683	NICKEL
664	GLASS	684	ALUMINIUM
665	GLASSWARE	685	LEAD
666	POTTERY	686	ZINC
670	REST OF 67 NOT DEFINED	687	TIN
671	PIG IRON,SPIEGELEISN,ETC	689	MISC.NON-FERR.BASE METAL
672	INGOTS ETC.IRON OR STEEL	691	METALLIC STRUCTURES NES
673	FLAT-ROLLED IRON ETC.	692	CONTAINERS,STORAGE,TRNSP
674	FLAT-ROLLED PLATED IRON	693	WIRE PRODUCTS EXCL.ELECT
675	FLAT-ROLLED, ALLOY STEEL	694	NAILS,SCREWS,NUTS,ETC.
676	IRON,STL.BAR,SHAPES ETC.	695	TOOLS
677	RAILWAY TRACK IRON,STEEL	696	CUTLERY
678	WIRE OF IRON OR STEEL	697	HOUSEHOLD EQUIPMENT,NES
679	TUBES,PIPES,ETC.IRON,STL	699	MANUFACTS.BASE METAL,NES

8 Non-electric machinery

711	STEAM GENER.BOILERS,ETC.	731	METAL REMOVAL WORK TOOLS
712	STEAM TURBINES	733	MACH-TOOLS,METAL-WORKING
713	INTRNL COMBUS PSTN ENGIN	735	PARTS,NES,FOR MACH-TOOLS
714	ENGINES,MOTORS NON-ELECT	737	METALWORKING MACHNRY NES
716	ROTATING ELECTRIC PLANT	741	HEATNG,COOLNG EQUIP,PART
718	OTH.POWR.GENRTNG.MACHNRY	742	PUMPS FOR LIQUIDS,PARTS
721	AGRIC.MACHINES,EX.TRACTR	743	PUMPS NES,CENTRIFUGS ETC
722	TRACTORS	744	MECHANICAL HANDLNG EQUIP
723	CIVIL ENGINEERING EQUIPT	745	OTH.NONELEC MCH,TOOL,NES
724	TEXTILE,LEATHER MACHINES	746	BALL OR ROLLER BEARINGS
725	PAPER,PULP MILL MACHINES	747	TAPS,COCKS,VALVES,ETC.
726	PRINTNG,BOOKBINDNG MACHS	748	TRANSMISSIONS SHAFTS ETC
727	FOOD-PROCESS.MCH.NON DOM	749	NON-ELECT MACH.PARTS,ETC
728	OTH.MACH,PTS,SPCL INDUST		

9 Computers, telecomm; cons. Electronics

751	OFFICE MACHINES		
752	AUTOMATC.DATA PROC.EQUIP	762	RADIO-BROADCAST RECEIVER
759	PARTS,FOR OFFICE MACHINS	763	SOUND RECORDER,PHONOGRPH
761	TELEVISION RECEIVERS ETC	764	TELECOMM.EQUIP.PARTS NES

10 Electronic components

771	ELECT POWER MACHNY.PARTS		
772	ELEC.SWITCH.RELAY.CIRCUT	775	DOM.ELEC,NON-ELEC.EQUIPT
773	ELECTR DISTRIBT.EQPT NES	776	TRANSISTORS,VALVES,ETC.
774	ELECTRO-MEDCL,XRAY EQUIP	778	ELECTRIC.MACH.APPART.NES

11 Transport equipment

781	PASS.MOTOR VEHCLS.EX.BUS		
782	GOODS,SPCL TRANSPORT VEH	786	TRAILERS,SEMI-TRAILR,ETC
783	ROAD MOTOR VEHICLES NES	791	RAILWAY VEHICLES.EQUIPNT
784	PARTS,TRACTORS,MOTOR VEH	792	AIRCRAFT,ASSOCTD.EQUIPNT
785	CYCLES,MOTORCYCLES ETC.	793	SHIP,BOAT,FLOAT.STRUCTRS

12 Clothing

841	MENS,BOYS CLOTHNG,X-KNIT		
842	WOMEN,GIRL CLOTHING,XKNIT	845	OTHR.TEXTILE APPAREL,NES
843	MENS,BOYS CLOTHING,KNIT	846	CLOTHING ACCESSRS,FABRIC
844	WOMEN,GIRLS CLOTHNG.KNIT	848	CLOTHNG,NONTXTL;HEADGEAR

13 Misc. manufacturing

811	PREFABRICATED BUILDINGS	885	WATCHES AND CLOCKS

812	PLUMBNG,SANITRY,EQPT.ETC	891	ARMS AND AMMUNITION
813	LIGHTNG FIXTURES ETC.NES	892	PRINTED MATTER
871	OPTICAL INSTRUMENTS,NES	893	ARTICLES,NES,OF PLASTICS
872	MEDICAL INSTRUMENTS NES	894	BABY CARRIAGE,TOYS,GAMES
873	METERS,COUNTERS,NES	895	OFFICE,STATIONERY SUPPLS
874	MEASURE,CONTROL INSTRMNT	896	WORKS OF ART,ANTIQUE ETC
881	PHOTOGRAPH APPAR.ETC.NES	897	GOLD,SILVERWARE,JEWL NES
882	PHOTO.CINEMATOGRPH.SUPPL	898	MUSICAL INSTRUMENTS,ETC.
883	CINE.FILM EXPOSD.DEVELPD	899	MISC MANUFCTRD GOODS NES
884	OPTICAL GOODS NES		

14 Minerals- to be excluded

272	FERTILIZERS, CRUDE	289	PREC.METAL ORES,CONCTRTS
273	STONE, SAND AND GRAVEL	321	COAL,NOT AGGLOMERATED
274	SULPHUR,UNRSTD.IRON PYRS	322	BRIQUETTES,LIGNITE,PEAT
277	NATURAL ABRASIVES, NES	325	COKE,SEMI-COKE,RET.CARBN
278	OTHER CRUDE MINERALS	333	PETROLEUM OILS, CRUDE
281	IRON ORE, CONCENTRATES	334	PETROLEUM PRODUCTS
282	FERROUS WASTE AND SCRAP	335	RESIDUAL PETROL.PRODUCTS
283	COPPER ORES,CONCENTRATES	342	LIQUEFIED PROPANE,BUTANE
284	NICKEL ORES,CONCTR,MATTE	343	NATURAL GAS
285	ALUMINIUM ORE,CONCTR.ETC	344	PETROLEUM GASES, NES
286	URANIUM,THORIUM ORES,ETC	345	COAL GAS,WATER GAS, ETC.
287	ORE,CONCENTR.BASE METALS	351	ELECTRIC CURRENT
288	NON-FERROUS WASTE,SCRAP	667	PEARLS,PRECIOUS STONES

Excluded

269	WORN CLOTHING,TEXTL.ARTL		
911	MAIL NOT CLASSED BY KIND	961	COIN NONGOLD NONCURRENT
931	SPEC.TRANSACT.NOT CLASSD	971	GOLD,NONMONTRY EXCL ORES