Standards, a catalyst for the winners - a barrier for the losers? An empirical analysis of the impact of higher SPS measures on the trade performance of developing countries

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Abstract. *Within the debate about developing countries export competitiveness the increasing importance of food safety and quality standards especially in OECD countries appeals to be one of the major sources of concern. The paper analyses the trade performance of 73 developing countries within the context of stricter SPS measures. The analysis concentrates on the meat and fruit/ vegetable sectors as especially high value product sectors are determined by standards. The periods under consideration are 1993- 1995, as a period before the implementation of the SPS Agreement and 2002- 2004, as a period after the implementation. A cluster analysis groups the countries according to the variables "ratio" and "difference" of the export value to OECD countries including the possibility to explore trade performance regarding to the absolute level of change and relative dynamics. Subsequently, interconnections with EU and US border rejections as well as with STDF (Standards and Trade Development Facility) investment are explored. For the results three major findings should be underlined: e) The group of developing countries shows as well in total as in relative terms a very heterogeneous picture of their export development and there is no linear relation between total export value and direction of development. ee) Ten groups were identified in the cluster analysis, like e.g. small winners, large winners, small losers, large losers. eee) Most large exporters increased their market share, but very successful groups were also found among small exporters, especially in the fruit/ vegetable market. eeee) Both, border rejections as well as STDF investments did not reflect a particular structure related to market share development of individual countries.*

Keywords: Food Safety, SPS, Developing Countries, Cluster Analysis, Competitiveness.

1 Introduction

In the current debate about better market access for and the competitiveness of developing countries' agricultural exports two common perspectives are prevailing. The one is the "standard as a barrier" perspective, and the other is the perspective of developing countries as "standard takers". Both points of views imply that developing countries have to adjust to developed countries standards and that they thereby are the specific "losers" of higher standards in agricultural trade. While the number of WTO notifications underlines the latter perspective (only one third of the sanitary and phytosanitary (SPS) notifications come from developing countries) little empirical evidence exists about the former. In literature standards are commonly seen as a trade impeding factor for developing countries' exports. Several case studies analyze the impact of higher SPS measures on trade flows of individual developing countries export sectors [1, 21, 12, 5, 6]. However, little research exists which could lead to a more differentiated perspective of the impact of higher SPS measures among the group of developing countries. Recent literature [21, 9, 18] starts to resolve the strict perspective of standards as a trade barrier. More emphasis is put on the heterogeneous effects of standards which can act like a catalyst and like a barrier at the same time. The effect depends mainly on the ability of the individual country to comply with the standard and to prove this compliance to its trading partners. But which are the countries that perform well and which countries end up to be even more marginalized?

The objective of the paper is to shed more light on the question which countries might be positively or negatively affected by higher SPS measures. Hence, the paper analyses the development of exports of 73 developing countries to the OCED countries (which were perceived as the most important standard setters) between two time spans – before and after the implementation of the SPS Agreement. The analysis concentrates on two commodity groups that are strongly influenced by standards - fruit/ vegetable and

meat. As the number of SPS notifications as such is likely a conservative indicator of the effects of SPS measures on trade flows [18] two indicators were chosen and tested for their ability to reflect the increasing importance of standards on developing countries' export performance. First, rejections each country faced for its agricultural exports at the EU and the US borders and, second, the investment in the food safety sector by the Standard and Trade Development Facility (STDF), which aims at strengthening developing countries' SPS capacity.

Even though standards are only one aspect among multiple factors influencing trade performance of developing countries we put them in the focus of the interpretation of the analysis of the trade data.

The paper has the following structure. Overall, it is divided in two major blocks. The first part describes the standards environment starting in section 2 with a general overview of sanitary and phytosanitary measures and the WTO Agreement on Sanitary and Phytosanitary Standards. Following, section 3 explores the development of SPS measures in the agricultural trading environment looking at the development of SPS notifications to the WTO, WTO trade concerns and WTO disputes related to SPS measures as well as border rejections of the EU and the US and STDF investments in various developing countries. The second major part of the paper is the empirical exploration of developing countries' export performance of their fruit/ vegetable and meat products to OECD countries. Section 4 provides a description of the methodology and the data. Section 5 starts with a brief description of general trends in agricultural trade, followed by a detailed discussion of the results of the two cluster analysis. In section 6, the results of the cluster analysis are related to border rejections and investments of the STDF. In section 7 conclusions and a future outlook are drawn.

2 Sanitary and Phytosanitary Measures, what are they, why are they imposed and how are they regulated?

Sanitary and phytosanitary measures are a sub category of non tariff barriers (NTB).[1] They are applied as *regulations and standards governing the sale of products into national markets that have as their prima objective the correction of market inefficiencies stemming from externalities associated with the production, distribution, and consumption of these products* [17:3]. SPS measures consequently have the objective to prevent the entry of products into domestic markets which fail to meet required standards and to protect domestic suppliers and consumers interests. The SPS Agreement defines SPS measures as regulations *adopted by a nation to protect human, animal, or plant life and health from certain enumerated biological and toxicological risks* [17:5].[2]

SPS measures show a heterogeneous nature, as they consist of various laws, decrees, regulations, requirements and procedures which are related to food safety. SPS measures differ among countries because of different tasks, diets, income levels and perceptions influencing the tolerance of a population towards food safety and agricultural health risks [9].

The intention to create an international agreement mainly came from the general development of international trade negotiations. As tariffs had to be lowered and the use of other traditional trade barriers was eliminated there was a concern that technical measures such as sanitary and phytosanitary measures could be used in order to replace traditional protectionist measures [10]. As a consequence, their use and application was regulated in the SPS Agreement. The agreement is now in force for developed countries for 10 years, for developing countries for 8 years and for least developed countries for 5 years. The SPS Agreement allows governments to implement border measures relating to human, animal and plant life or health on the level of sanitary and phytosanitary protection it regards appropriate. Nevertheless, the agreement tries to minimize the trade distorting effects of any SPS measure by encouraging countries to use international standards as a base for their policies.[3] Two main principles of the SPS Agreement are 1)

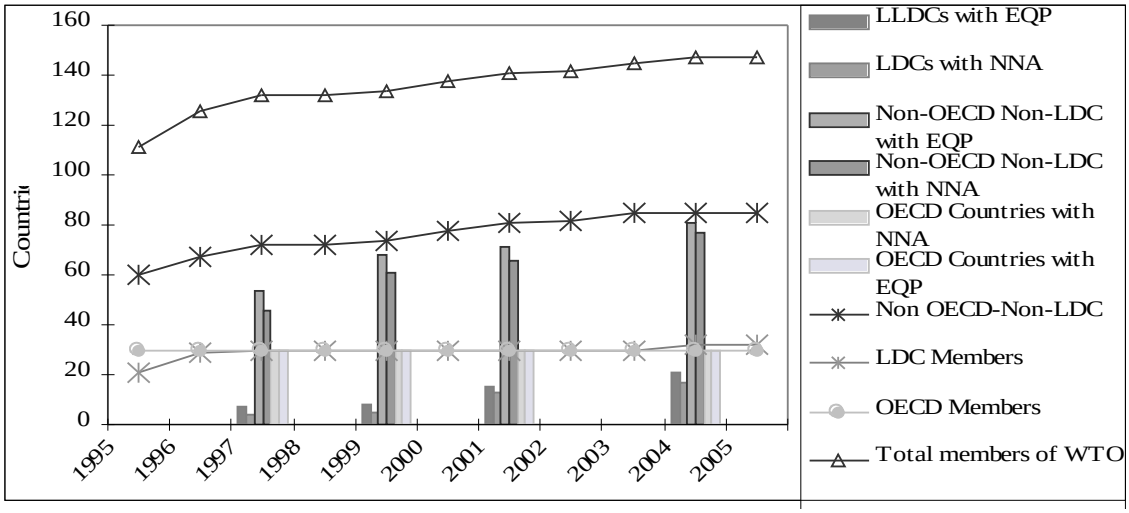
[1] Hillman (1996) defines non tariff barriers as *all government measures, other than tariffs or customs taxes which restrict or distort international trade between domestic and imported goods and services*.

[2] All other measures of food regulations and standard are defined as technical barriers to trade and regulated in the Agreement on Technical Barriers to Trade (TBT).

[3] The international standard setting organizations are the Codex Alimentarius (on food safety), the International Office of Epizootics (on animal health and zoonoses), and the Secretariat of the

the principle of justification and 2) the principle of transparency. The principle of scientific justification implies that SPS measures which are stricter than the international guidelines have to be based on scientific justifications. The principle of transparency obligates that trading partners have to be notified of all changes in SPS measures which could affect trade either in a positive or in a negative manner. Countries have to establish national Enquiry Points, where trading partners have the possibility to receive information concerning all food safety regulations of the country and national notification authorities which are in force to implement all notification procedures required in the SPS Agreement. Figure 1 depicts the number of WTO members among LDCs, DCs and OECD countries (shown as lines). The bars depict the number of those countries which notified either an Enquiry Point (EQP) or/and a Notification Authority (NNA).

Figure 1. Compliance of WTO Members with Transparency Requirements



Source: Own illustration, [23, 24, 25, 27, 29, 30]

As can be seen in Figure 1, all OECD countries reported an Enquiry Point and a Notification Authority by 1997. In contrast, it took a much longer time period for many developing countries especially for the LDC countries to comply with the transparency requirements of the SPS Agreement. In 2001, 25 out of 140 members, including 15 LDCs had not jet registered an Enquiry Point and 32, including 17 LDCs had not registered a Notification Authority. In 2004, only 4 developing countries had not registered an Enquiry Point but still 11 LDCs had not jet fulfilled the requirement. Still, 23 developing countries had not registered a Notification Authority including 15 LDCs. In May 2005 139 out of 148 members (94%) had notified their Enquiry Point and 130 (87%) had identified their national Notification Authority [30]. Even though developing countries had a longer time span to implement the requirements of the agreement one other reason for the time lag of developing countries in fulfilling the SPS Agreement however might be found in their rare participation in the SPS Committees meetings. Until 2001 43 developing countries did not attend to any of the official meetings [13].

The SPS Agreement pays attention to the specific situation of developing countries in particular with respect to its implementation periods and in the obligation of developed countries to provide technical assistance to developing countries. The SPS Secretariat circulated two questionnaires among developing countries in the years 1999 and 2001 regarding the needs of developing countries for technical assistance. In September 2002 the Standards and Trade Development Facility was established [4] to coordinate the efficient use of resources in SPS related activities and thus enhance developing countries' SPS capacity.

There has already been five years experience with the SPS Agreement when the Doha round started in 2001 in Qatar. The new negotiations had been supposed to take especially developing countries' needs into account. Even though SPS measures had such a high relevance for international agricultural trade and developing countries in particular had large concerns about these measures affecting their trade competitiveness

International Plant Protection Convention (on plant health).

[4] The STDF was established by the Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE), the World Bank, the World Health Organization (WHO) and the World Trade Organization (WTO).

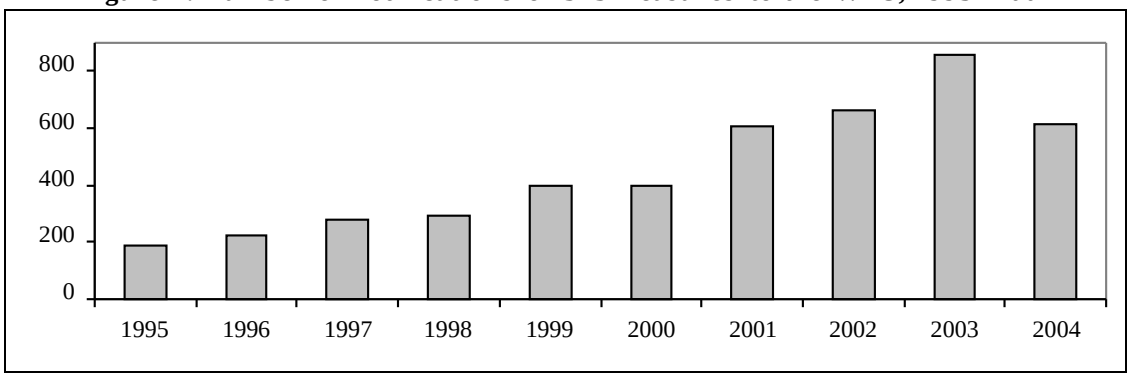
neither the SPS nor the TBT Agreement have been accepted as a matter of negotiation on the agenda. Josling et al. (2003) explore that developing countries claimed a more stringent application of the agreements in particular with §9, which specifies the duty of developed countries for technical and financial support to developing countries in complying with the requirements of the agreement and to adapt their agricultural export sector to the required SPS measures.

3 The Evolution of SPS Measures in the Agricultural Multilateral Trading System

This section explores the extent to which food and agricultural products are subject to SPS measures and other technical measures regulating food safety concerns. The increasing importance of SPS measures can be read from three types of WTO mechanisms: notifications, trade concerns [5] and dispute settlements. Additionally, border rejections and STDF investment express the importance of food safety for agricultural trade flows.

A total amount of 4375 notifications has been circulated since the release of the SPS Agreement (as of May 2005) not including corrigenda, addenda and revisions [30].

Figure 2: Number of notifications of SPS measures to the WTO, 1995- 2004



Source: own illustration, [26, 28, 30]

Figure 2 depicts the increasing annual number of notifications since the implementation of the agreement. Annual notifications more than tripled, from less than 200 notifications in 1995 to a total number of 617 in 2005. Only 59% of all members notified at least one notification since 1995 and nearly half of all notifications over the last ten years came either from the US or from the EU[30]. While in 1995 nearly all notifications came from the OECD countries developing countries now contribute at least one quarter to today's SPS notifications [13].

Between 2000 and 2003 more than 50% of the notifications were reported in the area of food safety (the major share are notification of maximum residue levels). Second ranks the issue of danger to human health from animal or plant carried diseases followed by plant protection and animal health [28, 29, 30].

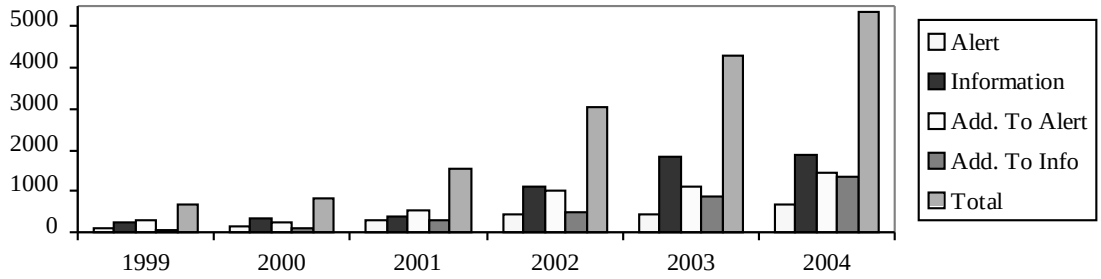
Second, the increasing importance of SPS measures for international trade is depicted by the number of trade concerns raised within the SPS committee meetings. Trade concerns make it possible for countries to attract attention and initiate discussion about a particular concern. Since the implementation of the SPS Agreement altogether 204 trade concerns were raised until 2004 [30]. Only 56 trade concerns have been reported to be resolved in the total period. More than 40% of the trade concerns where related to animal health and zoonoses, followed by 29% for plant health and 27% for food safety. During the indicated period 143 times developed countries raised specific trade concerns, followed by 101 cases of developing countries trade concerns. Only two least-developed countries raised specific trade concerns [31].

Third, in cases where negotiations have not succeeded in resolving trade disputes the WTO dispute settlement procedures are invoked. The panel judges the compliance of a specific SPS measure with the SPS Agreement. More than 300 disputes have been raised under the WTO dispute settlement system, of which 30 referred to the SPS Agreement [30]. In 20 panels both countries have been OECD countries. Only in two cases no OECD

[5] Trade concerns are trade problems between members which are discussed within the SPS committee. They can be solved bilaterally without using the official dispute settlement of the WTO.

country was involved. From the total amount of 30 SPS disputes 12 have been raised to a panel. In all dispute panel cases OECD countries are involved [30].
Fourth, the increasing importance of food safety is reflected in border rejections. Information about border rejections related to food safety and health concerns is rare. Generally, data are only available for the EU and the US and unfortunately do not specify value or volume of the rejected quantity. Data for the EU are available since 2001 but for the US only for 2005/06.
The EU border rejections where available since the introduction of the Rapid Alert System for Food and Feed (RASFF), which was implemented in 2001. The RASFF collects two different types of information. First, alert notifications which relate to products which are already on the market and which present a risk to the consumer. Second, information notifications relating to products presenting a risk to the consumer but are not (yet) on the market or for which the risk is limited.

Figure 3: EU information exchanges 1999- 2004



Source: own illustration, [14, 15, 16]

Like depicted in Figure 3, the number of total information exchanges increased strongly from 698 in 1999 to 5562 in 2004 [16] . In 2004 more than 63% of the alert notifications originated within the EU, while 79% of the information notifications originated in third countries. The number of alert notifications rose during the time period from only 97 in 1999 to 691 in 2004. Additionally, information notifications increased during the same time from 263 to more 1897. The product group with highest numbers of alert or information notifications during the time between 2000 and 2004 was nuts and nut products with in average 404 notifications per year, followed by fish, crustaceans and mollusks (392), meat (173) and fruits and vegetables (161) [14, 15, 16]. The most often notified third countries between 2002 and 2004 are Iran with 1049 notifications and China with 443 notifications, followed by Brazil (326), India (290), Thailand (275), Indonesia (147) and Argentina (99) [14, 15, 16].
For US border rejections data availability is even more limited. An Import Refusals Report (IRR) only exists since March 2005 [6]. Also, the IRR does not include certain meat and poultry products. Nevertheless, Henson and Jaffee (2004) underline that border rejections for food and feed increased tremendously in the US. The most important agricultural product groups for border rejections are fishery and seafood products followed by fruits and vegetables. From the available data, the most often notified country in the fruit/ vegetable sector (including only the group of non OECD Countries) is by far Mexico with 886 notifications, followed by the Dominican Republic with 366 and China with 357 notifications. With a large gap these countries are followed by India (153), Thailand (78) and the Philippines (65). Similarly to the EU border detentions most notifications come from very few countries. The US notifications include with Bangladesh only one LDC country and only three countries from Sahara or Sub- Saharan Africa (Ghana, Cameroon and Ethiopia).
To provide an order of magnitude in which world trade with agro- food products is affected from border detentions Henson and Jaffee (2004) estimate an amount of $ 3.8 billion for the time period between 2000- 2001 (the estimate is based on official data and consultations with private traders). Even though they underline that this estimate is probably an overestimation as the authors have assumed similar levels of rejection for developed countries and developing countries it still provides a rough idea.
Finally, as a last indicator donor investment in food safety issues is explored. The STDF is at the same time a financing and a coordination mechanism. It provides grants for

[6] Border rejections on agricultural products fall under the responsibility of the US Food and Drug Administration. Data about US border detentions were published on the FDA's homepage in a monthly scaling [20] in the Import Refusals Report (IRR).

developing countries in order to comply with SPS standards and hence increase or maintain their market access. Until August 2003 (which is the last online update of the STDF database) funding was granted to 151 different developing countries, 46 of them are LDCs. Only three LDCs did not receive a grant, Somalia, Haiti and Timor Lesté.
The total grants amounted to more than $ 8.5 billion. Kenya is with more than $ 3 billion by far the top receiving country of STDF grants, followed by Iran (649 million), Pakistan (410 million) and the two LDC countries Nepal (371 million) and Bhutan (386 million). Nevertheless, 25 LDCs rank on the end of the countries list with total grants lower than $ 20 thousand.
In chapter 6 data on border rejections and STDF investments will be analyzed in relation with the export performance of countries.

4 Methodology and Data

The previous sections explained the importance of standards. The remaining part of the paper empirically analyses patterns of developing countries' performance in agricultural exports and possible links between export performance and standards.
The analysis is based on trade data of 73[7] developing countries taken from the PC-TAS data base[8]. To describe the development of developing countries' trade performance and its relation to standards, data on export values of two commodity groups for two time spans is collected: meat and fruits/ vegetables in the years 1993-1995 (before the SPS Agreement) and 2002-2004 (after the SPS Agreement). Exports to OECD countries are selected since these countries are seen as "standard setters"[8]. The sectors of meat and fruit/ vegetable are chosen because these markets are highly affected by standards. For reasons of better data quality, imports of OECD countries from each developing country are used to describe developing countries' exports.
For the statistical analysis, four variables have been developed describing the export performance of the individual country[9], the "average", the "ratio", the "difference" and the "coefficient of variation". All of them are explained as follows:
In a first step, the average export values of the individual country are calculated for two time periods 1993-1995 and 2002-2004. In a second step, two variables are calculated from the average trade values: the "ratio" and the "difference". The ratio takes into account the average value of exports for the respective commodity group in 1993-1995 and 2002-2004. It describes the dynamics of export performance without taking into consideration the absolute level. However, it must be noted that the ratio is sensitive to the absolute volume of trade, since e.g. a doubling of exports starting from a very low initial value is much more likely to occur. The second variable, therefore describes the difference between the average value of exports for the respective commodity group in 1993-1995 and 2002-2004. It takes into account the absolute level of exports. Thus especially large countries' relatively small percentage changes in export value are captured better, if looking at the absolute value. Finally, the coefficient of variation is calculated for the period 2002-2004 to gain an idea about the stability of exports of a country. It would be interesting to compare the variability in the two time spans, but the variable has several missing values in the first period, if single years are not reported and therefore would reduce the sample.
These variables will be used to group countries according to their export performance in a cluster analysis (compare section 5). The method of cluster analysis can be used for an exploratory, empirical classification of objects according to their similarity. The objective of the cluster analysis in this paper is to identify patterns, or groups, of developments in export performance across countries. The analysis is conducted for the

[7] 84 developing countries – more than half of all - were not included in the analysis because of a lack of data.
[8] In this respect, it would be interesting to compare the development of exports from South to North with those from South to South, or from South to "East", thus in countries, where standards are not as strict. However, this was not analyzed due to lack of adequate data.
[9] Missing data in PC-TAS were treated as such. An alternative would be to treat no trade records as a trade volume of 0 for the respective pair of trading partners. In our approach any country with missing data in all years of the first time span or less then two observations in the second time span is excluded from the analysis. We do not hurt statistical requirements since we do not deal with a random sample anyway (which is not required for cluster and factor analysis). However, we slightly overestimate the average trade value and slightly underestimate the variation in trade volumes for countries that had no records in single years of the analysis. This only affects very small countries. Nevertheless, it has the effect, that only 17 LDCs were included in the analysis.

two commodity groups separately. Of the available cluster algorithms this paper uses the Ward method to determine the number of clusters and the K-Means algorithm for the final partition. Clusters will finally be interpreted and labeled.
To this point, analysis is restricted to the trade performance of developing countries to OECD countries. A positive development of the trade performance in meat and fruits/ vegetables is interpreted as an indication of successful adjustment to the requirements posed by standards - or at least a compensation of losses arising from them. However, data interpretation has to occur carefully since trade performance has several determinants – a general positive trend observed in world trade, agricultural growth in developing countries, price and trade policies, the ongoing trend of liberalization, as well as naturally volatile production and trade volumes – and cannot be fully attributed to the effect of standards.
To get a clearer idea about relations with standards, additional information on border rejections and donor investments are collected (compare section 3). This information not only captures the general increase in importance of standards, but allows to differentiate between countries: Which countries have more rejections and investments?
Available data on border rejections only provide a broad picture (compare section 3). They are limited either in terms of yearly availability (for the EU they are only available since 2001) or in terms of the reported categories (data are either classified according to the products country of origin or according to the product group). Since EU rejections are heavily determined by meat and fruit/ vegetable rejections it seems appropriate to take the total number of rejections notified by country into account [10]. In the analysis we use the unweighted border rejections from the EU and the US. Meaningful weighting is complicated since no information on quantities rejected is available and the product groups differ or might be very specific (e.g. nuts in Iran). When looking at results for rejections weighted by the export quantity of fruits and vegetables no very clear results were found.
The value of investments from STDF (find explanation in section 3) in US$ is employed in the analysis, again not weighted with regard to the trade volume. STDF investments are limited to those countries that receive foreign aid at all so in a developing country sample it can be used without a systematic bias. It does not reflect, however, national or private investments in the upgrading or setup process of the national safety and quality management.

5 Export performance of developing countries in meat and fruits/ vegetables - patterns of winners and losers

Before turning to the formal analysis as described above, we will briefly introduce general developments in agricultural trade.
Even though the share of agricultural products in total merchandise trade is shrinking, international exports in agricultural and food products almost doubled between 1993 and 2004. The traded value increased from nearly 340 billion to more than $ 600 billion [4]. The share of developing countries' agricultural exports in world trade is with around 30% relatively constant in the last decade. The average share of meat and fruit/ vegetable products in total agricultural trade is 17.8% and 9.5% during that period [4].
The markets for fruits/ vegetables and meat have a specific importance for many developing countries. Especially fruits and vegetables have additionally to their economic importance a high social relevance due to their labor intensity. The average share of developing countries in these two markets ranged from 35 to nearly 40% market share in fruit/ vegetable products and around 16- 18% for meat products with a slight upward tendency since 1998.
Both sectors are dominated by only very few major players. In the fruit/ vegetable sector Mexico and China already count for 30% of all OECD third country imports in the average of the years 2001- 2004. This is 5% more than during the time period between 1993 and 1998. Mexico and China are followed by another ten countries with an export share between 10 and 2%. This group supplies more than 50% of the OECD imports. All other developing countries have a share of less than 2% on total fruit/ vegetable exports to OECD countries.

[10] The only other groups which are not included in the analysis, but are important sectors for rejections, are fish and seafood products. With respect to the very low quality of data fish and seafood products have not been included in the analysis.

Within the meat sector the structure is even more concentrated. Only Brazil supplies 38% of the total OECD imported meat in the period between 2001 and 2004. Brazil increased its import share within the last 10 years by more than 12%. From the other three top players China and Argentina lost tremendously within this period and only Thailand managed as well to increase its export share. These four countries alone supplied 83% of developing countries' total export to the OECD in the last decade. No other country has an export share of more than 5%.

In the following cluster analysis the paper goes more into detail with this analysis. Which countries are winners or losers concerning their export performance? The analysis begins with the cluster analysis of the fruit/ vegetable sector and continues with the analysis of the meat sector. In general, it has to be noted that for both sectors, for the chosen variables (as described in chapter 4) the data does not have a perfectly clear cluster structure.[11] However, of the available data we regard them to be the best indicators of export performance. The exploratory nature of cluster analysis possibly contradicts our assumptions about categories like "winners" and "losers" – their might be groups which are "similar" in terms of the distance measure in cluster analysis (in our case the squared Euclidian distance), but are somewhat difficult to interpret, since they comprise of both slight losers and slight winners. Since the cluster analysis requires choices of the user at different steps, we put emphasis on distinguishing "losers" and "winners" as clearly as possible.

The cluster analysis for fruits and vegetables was performed as follows:

Four variables where considered for clustering: 1) the average value of exports (in 2002-2004), 2) the difference of the export values between the two periods, 3) the ratio between the two periods, and 4) the coefficient of variation. For the cluster analysis the total sample of 73 fruit/ vegetable exporters was split in two groups, small and large exporters. This decision is based on two different reasons. First, the "average" and the "difference" are highly correlated and therefore not suitable for cluster analysis. This finding alone indicates to a pattern of more successful, large exporters, or at least a systematic proportional increase in exports. In addition, the variable "average" is strongly right screwed with few large exporters and many rather small exporters. As a consequence the variable "average" was excluded from the cluster analysis and, instead, the sample was split by the threshold of an average of $ 500,000 thousand according to the observed distribution. Furthermore, "Thailand" was excluded from the group of large exporter countries since it was found in the single linkage clustering as an outliner and treated as an additional cluster.

Cluster analyses were conducted separately for the two samples. To gain an idea about the potential number of clusters the Ward procedure was used; the final number of clusters was determined giving higher priority to "difference" and "ratio" than to "coefficient of variation". Based on these criteria, a 5-cluster-solution for the group of 59 small exporters, and a 3-cluster-solution for the group of 13 large exporters were chosen. These solutions were further checked for homogeneity[12]. The country grouping is displayed in Table 1. Clusters are numbered consecutively for each group, starting from 1 for the small exporters and starting from 10 for the large exporters.

Table 1: Cluster membership – fruit and vegetable exports

[11] This became clear from instabilities of solutions using the K-Means algorithm depending on which of the different clustering variables had a higher contribution to the clustering (this can be read from the F-value, calculated by ANOVA to estimate how strongly each variable contributes to the classification). Giving higher priority to a certain variable cannot be forced in a cluster analysis (unless variables are given different weights), but we considered the F-values in the choice of the number of clusters in the way that the "difference" and the "ratio" should have a higher contribution to the classification than "coefficient of variation".

[12] Clusters are „completely homogenous" according to the criteria that variance within clusters should be smaller than variance between clusters for every single variable[2] except for cluster 3 of the "small exporters", which has a high variance for the variable "coefficient of variation". Again, we are less interested in this particular information, and therefore accept the solution.

Division of sample	Cluster number	No. of countries	Countries
Small vegetable exporters	1	18	Bahrain, Burkina Faso, Dominica, Gambia, Guinea, Guyana, Indonesia, Islamic Rep. of Iran, Jamaica, Malaysia, Mauritius, Panama, Saint Lucia, Saint Vincent/Grenadines, Sri Lanka, Venezuela,
	2	7	French Polynesia, Nigeria, Saudi Arabia, Togo, Trinidad and Tobago, Uganda, Zambia
	3	4	Barbados, Mozambique, Nepal, Qatar
	4	24	Bangladesh, Belize, Benin, Bolivia, Cuba, El Salvador, Fiji Islands, Honduras, Jordan, Republic of Korea, Lebanon, Madagascar, Malawi, Nicaragua, Niger, Oman, Pakistan, Paraguay, Senegal, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Zimbabwe
	5	6	Cote d'Ivoire, Cameroon, Dominican Republic, Egypt, Ghana, Kenya
Large vegetable exporters	10	1	Peru
	20	9	Argentina, Brazil, Colombia, Costa Rica, Ecuador, Guatemala, India, Morocco, Philippines
	30	3	Chile, China, Mexico
Outlier	100	1	Thailand

Source: own calculation

According to the particular characteristics of the groups which can be read from the averages of the three clustering variables in each cluster each group got a specific label which is displayed in Table 2. To complement the interpretation the "average" value of fruit and vegetable exports in 2002- 2004 is displayed.

Table 2: Cluster labels – fruit and vegetable exports

Cluster No.	Cluster label	Examples	No. of countries	Mean of clustering variables			Descriptive
				Difference (million $) 02/04-93/95	Ratio 02/04/93/95	Coefficient of variation 02/04	Average[a] (million $) 02/04
3	Very small exporters, strong losers, instable	Barbados, Mozambique	4	-2150	0.4	0.85	145
2	Very small exporters, strong winners	French Polynesia Uganda	7	6398	4.4	0.26	6258
4	Small exporters, winners	Bolivia, Madagascar	24	11935	1.9	0.24	16229
1	Small and medium exporters, losers	Panama, Malaysia	18	-16693	0.8	0.19	19481
5	Medium exporters, winners	Kenya, Ghana	6	102857	2.0	0.19	237522
10	Large exporter, very strong winner	Peru	1	375310	3.2	0.22	543993
20	Large exporters, winners	Costa Rica, Morocco	9	427361	1.6	0.11	1050800
100	Large exporter, looser	Thailand	1	-239517	0.8	0.19	1128955
30	Very large exporters, strong winners	China, Chile	3	1577467	1.8	0.16	3985954

[a] Median

Source: own calculation

Clusters are arranged by the median of the average trade value. Albeit this variable was not entered in the clustering, it is used as additional information to describe the clusters. The overall growth of agricultural exports was taken into consideration when interpreting the cluster. Thus when comparing the country ratios to the ratio of all exports of developing countries to the OECD, a ratio of fruit/ vegetable exports in 2002-04 compared to 1993- 95 above 1.4 indicates an increase of exports above the average.
All clusters are discussed in detail as follows:
Cluster 3 (very small exporters, strong losers, instable): Cluster 3 consists of four very small exporters with an average trade value of fruit/ vegetable exports in the second period in thousand $ (hereafter "average") below 10,000 (e.g. Barbados, Mozambique). It is characterized by strong losses (an average ratio of only 0.4) and strong instability of export values in the second period. This country group can clearly be labeled as "losers".
Cluster 2 (very small exporters, strong winners): The second group of seven very small exporters (including e.g. Uganda and French Polynesia) is characterized by strong

relative gains in export value, with an average of quadrupling the export value between the two periods. Nevertheless, these gains take place at a very low level which is depicted in absolute terms of "difference". Strongest gains in export value were experienced by French Polynesia.

Cluster 4 (small exporters, winners): A large group of 24 small to medium exporters (average below 100,000 [13], including e.g. Bolivia and Madagascar) is found that in average experienced gains in exports above the benchmark ratio of 1.4. All countries increased their exports in this time span.

Cluster 1 (small and medium exporters, losers): The second large group of 18 countries is a rather heterogeneous group both, in terms of the average of exports and in terms of the difference. It is small to medium exporters that all faced losses of their exports compared to the benchmark ratio of 1.4. All countries except Guyana and Mauritius have a ratio below 0. This implies not only relative losses of the market share of these countries but even a decrease of exports in total values. Medium exporters in this group (average between 200,000 and 410,000) with considerable losses of export values (ratio between 0.82 and 0.89) are Iran, Indonesia and Panama. Smaller exporters (average below 50,000) with losses in this group are Venezuela, Malaysia and Gambia.

Cluster 5 (medium exporters, winners): A small group of six mainly African countries is medium- sized exporters (average 100,000 to 400,000) that faced strong gains in their export performance. Strongest gains are experienced by Ghana which more than tripled its exports; other examples are Kenya and Egypt.

Cluster 10 (large exporter, very strong winner): Peru clearly stands apart from the rest of the countries with strong gains in exports (almost tripled) yet being the smallest exporter (average of around 550,000) of the group of large exporters.

Cluster 20 (large exporters, winners): Cluster 20 is the largest cluster of the group of large exporters. Its average gains in exports are above the developing countries' average of 1.4. Most successful in terms of "ratio" in this group are Guatemala, Argentina and Costa Rica. At the lower end (in terms of ratio slightly below 1.4)) are Morocco, Brazil, and the Philippines.

Cluster 30 (very large exporters, strong winners): This cluster includes the small group of the largest and, at the same time, in total values the most expanding exporters. It consists of the three countries China, Mexico, and Chile. These countries almost doubled their exports on a very high level.

Cluster 100 (large exporter, loser): Thailand, is the only large exporter showing strong losses on a very high level. Since it is the only large country showing this tendency it was found as an outliner and requires a specific analysis.

Overall, from the cluster analysis of developing countries according to the development of fruit/ vegetable exports, it became evident that very different patterns can be observed. Some general trends are (1) all large countries are winners, except for Thailand. (2) Within the group of small and medium exporters we find a larger group of winners (37 countries) than of losers (22 countries). We find the same diverse structure within the group of the LDCs. From the total group of 15 LDCs which were included in the analysis of the fruit/ vegetable sector 5 LDC are in groups of losers, while 10 of them are found in groups of winners whereof three even belong to a group of very strong winners. (3) We find rather stable exports in the second time span especially when comparing the coefficient of variation to that we will observe in the meat market. Principally it can be stated, that even though the market of fruits and vegetables is highly dominated by some major players, various small countries tend to increase their market share within the last decade. This implies that at least, SPS measures in the sector did not have a negative effect in terms of strengthening the competitiveness of large producers and impeding the competitiveness of small ones.

The cluster analysis for meat was performed slightly different. Again, the group was split into large exporters and small exporters although the sample is smaller for meat exports (n=46) since a large proportion of developing countries does not export meat to the OECD at all, or only in single years. Including the "coefficient of variation" in the cluster analysis led to rather heterogeneous clusters regarding the "ratio". In general, the coefficient of variation in meat exports is much higher than for fruit/ vegetable exports indicating to a higher instability in this market. To find a clearer pattern of winners and losers, this variable was dropped and only the "difference" and the "ratio" were used for clustering. This was a rather pragmatic decision. In the group of 40 small exporters, we chose a 5- cluster- solution, the group of only six large exporters was described by three

[13] Except for Korea (285,000) and Honduras (340,000).

clusters. Again, all clusters are homogeneous. Cluster memberships are displayed in Table 3.

Table 3: Cluster membership – meat exports

Division of sample	Cluster number	No. of countries	Countries
Small meat exporters	1	4	Cote d'Ivoire, India, Malaysia, Philippines
	2	6	Costa Rica, Dominican Republic, Guatemala, Honduras, Mauritius, Paraguay
	3	2	Republic of Korea, Zimbabwe
	4	4	Algeria, Fiji Islands, Morocco, Mozambique
	5	24	Bahrain, Bangladesh, Belize, Cameroon, Colombia, Domenica, Ecuador, Egypt, El Salvador, Indonesia, Islamic Rep of Iran, Jordan, Lebanon, Nicaragua, Niger, Pakistan, Panama, Peru, Saudi Arabia, Syrian Arab Republic, Tunisia, Uganda, United Arab Emirates, Bolivar Rep. of Venezuela
Large meat exporters	10	1	Argentina
	20	3	Brazil, China, Thailand
	30	2	Chile, Mexico

Source: own calculation

Like in the analysis for fruits and vegetables each cluster got, according to the particular characteristics of the groups a specific label which is displayed in Table 4. To complement the interpretation the "average" value of fruit and vegetable exports in 2002- 2004 and the coefficient of variation are also displayed.

Table 4: Cluster labels – meat export

Clust. No.	Cluster label	Examples	No. of countries	Mean of clustervariables		Descriptive	
				Difference (million $) 02/04–93/95	Ratio 02/04/93/95	Coefficient of variation 02/04	Average (million $) 02/04
5	Very small exporters, losers	Egypt, Ecuador	24 (21[a])	-96[a]	0.4[a]	0.68[a]	61[a]
4	Small exporters, winners	Morocco, Algeria	4	1068	3.0	0.58	1768
1	Small to medium exp., strong winners	Cote d'Ivoire, Malaysia	4	2845	7.8	0.54	3264
2	Medium exporters, extremely strong losers[b]	Costa Rica, Paraguay	6	-20060	0.1	0.73	4893
3	Medium exporters, extremely strong losers[b]	R.o. Korea, Zimbabwe	2	-66838	0.1	0.10	6484
30	Large exporter, strong winner	Chile, Mexico	2	247270	14.1	0.28	278042
10	Large exporter, loser	Argentina	1	-235568	0.7	0.25	538587
20	Very large exporter, winner	Brazil, Thailand	3	591835	1.9	0.20	1206907

[a] Median, [b] as the two groups show many similarities they have the same label. Nevertheless the difference is much larger in cluster 3.

Source: own calculation

Again clusters are arranged according the "average". Like in the cluster analysis for fruits/ vegetables the variable is not included in the cluster analysis but still is important for the interpretation of the results. The group of small exporters includes one cluster of very small exporters. The meat exports of all countries analyzed increased with a ratio of 1.6 comparing the two time spans which again is taken as the benchmark against which to label cluster "loser" or "winner".

Cluster 5 (very small exporters, losers): Among the group of small meat exporters (cluster 1- 5), cluster 5 is with 21 countries the largest cluster. It consists mainly of very small meat exporters. Their average trade value of meat exports in the second period in thousand US$ (hereafter "average") is below 500 and their ratio of exports is 0.4. Thus the cluster can be labeled as "very small exporters, losers". Examples of this cluster are Egypt and Ecuador. However, three countries do not fit well in the cluster: Indonesia and Nicaragua with averages of about 25,000 and 50,000. Both are rather stagnating with a

ratio slightly above and below 1. In addition, Tunisia with an average of about 3500 and a moderate increase of its exports (ratio 1.4).[14]

Cluster 4 (small exporters, winners): Cluster 4 groups four small meat exporters with strong gains in export values. The ratio has a value of 3.0. Nevertheless, their coefficient of variation is still relatively high with 0.54. Morocco is the largest exporter of this cluster, the other countries being very small meat exporters. This is also depicted by the "difference" which has only an amount of 1054. Examples for the cluster are Morocco and Algeria.

Cluster 1 (Small to medium exporters, strong winners): This cluster consists of small to medium exporters (Malaysia being the largest exporter). The cluster is characterized by an extremely high ratio of 7.8, which implies very strong gains of these countries within the last period. Nevertheless, the coefficient of variation is with 54 still relatively high. Country examples of the cluster are Cote d'Ivoire and Malaysia.

Cluster 2 (medium exporters, extremely strong losers): Cluster 2 includes six medium-sized meat exporters, mainly from Middle America, that faced extremely sharp losses of exports. The group is characterized by a ratio of only 0.1 and a "difference" of more than -20000. Due to the sharp drop, in the period 2002- 2004 these countries are rather small meat exporters Most stable, only halving its exports among this group is Costa Rica. The other countries almost completely lost their share in exports (e.g. Honduras). The group is as well characterized by a high coefficient of variation (0.73). However, the results of the cluster must be interpreted very carefully, since during this period “El Niño” strongly affected central American countries.

Cluster 3 (medium exporters, extremely strong losers): the cluster shows several similarities to cluster 2. It groups the two countries Rep. of Korea and Zimbabwe. The two countries were medium or even large exporters (average of about 70,000) in the first period, but exports dropped sharply. The cluster as well shows a ratio of 0.1 and a "difference" of nearly -67000. The coefficient of variation is with 0.10 relatively low. Nevertheless, it must be noted as well, that especially Zimbabwe went through a politically very instable period which implied, that it had almost a complete breakdown of its agricultural export structure.

Cluster 30 (large exporters, strong winners): the cluster includes the two large exporters Chile and Mexico. Among the total group of large exporters they are the smallest ones. However, the two countries show with a ratio of 14.1 the strongest gains of the total sample. With 28.0 they have a relatively low coefficient of variation.

Cluster 10 (large exporter, loser): this cluster includes the only exception of the large country exporters. Argentina is the only large country which shows losses on a very high level. With a ratio of 0.7 and the high losses, especially in absolute terms, as it is depicted in the "difference" Argentina stands clearly apart as a strong looser.

Cluster 20 (very large exporters, winners): Brazil, Thailand and China (in this order) are the largest exporters. On such a high level of exports a ratio of 1.9 implies tremendous gains in total terms.

Overall, from the cluster analysis of developing countries according to their meat exports to OECD countries the meat sector is found to be more difficult for developing countries participation. This became evident by three reasons: 1) the total number of countries which participate on the market and thus have regular data on trade flows is relatively low. 2) the market is very much dominated by only six large countries. Except for Argentina all large countries even increased their export share. 3) from a sample of 46 countries 30 countries are found in "loser" clusters. Only 8 small to medium countries are located in "winner" clusters. In the meat sample only 4 countries are LDC countries. There from only Mozambique is covered in a cluster of very large winners. All other LDC countries are found in cluster 5, the small loser cluster. The tendency of the sector to be dominated by very few large countries seems to be even straightened by higher food safety and quality measures.

What are finally the differences between the two sectors? Table 5 depicts in a cross-tabulation which countries are winners or looser either in one of the sectors or even in both. As the sample of the meat sector is smaller that of the fruit/ vegetable sector the table includes a raw labeled "no cluster".

Table 5: Cross- tabulation of „losers“ and „winners“ in the meat and the fruit/ vegetable market

[14] We find these countries remaining in this group even when going up with the number of clusters up to nine clusters (compared to the chosen number of five clusters).

		No cluster	Meat loser / winner		Total
			loser	winner	
FV loser / winner	Loser	12	7	4	23
	Winner	15	26	9	50
Total		27	33	13	73

Source: own calculation

Only 7 countries of the 46 countries which were considered in both cluster analyses, are losers in both, in the meat and the fruit/ vegetable market. Only 9 countries are winners in both markets. 30 countries are winner in one market and loser in the other market. Overall it can be seen, that the meat sector contains more losers than the vegetable market. Only 4 countries are winners in the meat market while being loser in the fruit/ vegetable market. However, 26 countries are winners in the vegetable market while being loser in the meat market. The cross- tabulation depicts nicely the different structures and developments in the two sectors. While in the fruit/ vegetable sector the participation of developing countries or even LDC countries tends to increase and many small countries extended their market share the development of the meat sector tends to go into a complete different direction. The participation of developing countries on the market tends to decrease tremendously. Furthermore, the table shows the tendency of developing countries to be specialised in their export market. The fact that out of the sample of 46 countries only 9 countries are winners in both, the fruit/ vegetable and the meat market underlines this impression.

6 Export performance and standards – some indicators?

In the former section the cluster analysis grouped countries according to their export performance in the meat and the fruit/ vegetable sector. While some countries performed well and expanded their exports at least in one of the two sectors other countries lost their market share. Do countries which perform well rather show a low rate of border rejections? Is higher STDF investment associated with better export performance? Or is the money particularly invested in countries with a weak export position? Can, at all, the number of rejections and STDF be interpreted as indicators of a country's compliance with the importers' demands?
First, the results of the cluster analysis are put in relation with the border rejections of the EU and the US. Second, winner and loser groups are put in relation with the investment of the STDF. It is analyzed whether the cluster groups show any similarities within or differences between clusters.

Table 6: Border detentions of the cluster groups in the fruit and vegetable sector

No	Cluster label	Rejections EU[a]				Rejections US[b]			
		N	Mean	Min	Max	N	Mean	Min	Max
3	Very small exporters, strong losers, instable	4	0.50	0	1				
2	Very small exporters, strong winners	7	4.86	0	25	4	2.5	0	5
4	Small exporters, winners	24	9.21	0	46	13	12.3	1	34
1	Small and medium exporters, losers	18	73.28	0	1049	7	11.7	1	38
5	Medium exporters, winners	6	32.67	2	83	4	103.3	4	366
10	Large exporter, very strong winner	1	14	-	-	1	34		
20	Large exporters, winners	9	96.56	1	326	8	51.5	13	153
100	Large exporter, looser	1	275	-	-	1	78	-	-
30	Very large exporters, strong winners	3	172.67	15	443	3	419.0	14	886

[a]Mean EU border detentions for the years 2002- 2004, [b]US border detentions for 2005/2006
Source: own calculation, with data from [14, 15, 16, 20]

Table 6 depicts the mean, minimum and maximum border rejections for each cluster in the fruit/ vegetable sector. The table has to be interpreted carefully since it compares (due to data constraints) two different timeframes of border rejections for the EU and the US. Furthermore, rejections from the EU also include other product groups than

fruits and vegetables. Nevertheless, rejections on fruits and vegetables are among the most important components of total EU rejections. Since no other country specific data are available Table 6 might at least give a rough idea. This implies two possible scenarios. First, large exporters might show higher rejections due to the larger quantity exported. Second, larger exporters might show particularly low rejections since they are already well adapted to the food safety requirements of their trading partners.

Even though the picture presented in Table 6 is diverse, it shows a tendency of large exporter clusters having a higher average amount of border rejections. Nevertheless, the structure within the groups is heterogeneous. As an example, cluster 30 (very large exporters and strong winners) includes two countries with very high border rejections (Mexico with 886 rejections from the US and China with 357 rejections form the US and 443 from the EU) but at the same time, Chile shows only 14 border rejections from the US and 60 from the EU. This is a difference in the number of rejections that can be explained neither by the differences in the exported quantities, nor by differences in export dynamics. Instead, it illustrates very different export strategies regarding standards.

As another example, cluster 100 depicts the rejections of Thailand, the largest exporter with losses in market share in the fruit/ vegetable market. The number of 275 rejections from the EU is relatively high. However, its rejections are only one third those of China's, which extended its exports.

Table 6 depicts a diverse picture also for small exporter cluster groups. They all display very low rejections, independently of whether they belong to a winner or a loser cluster. The only very small exporter with slightly higher rejection is Nigeria with 25 rejections from the EU. All other exporters of the cluster groups 3 and 2 note rejections between zero and four. Nevertheless, the very low level of rejections of these countries is rather an indicator for their low export orientation than for their good food safety management systems.

Cluster 4 (small and medium exporters, losers) shows the largest difference between the minimum level of rejections with 0 and the maximum level with 1049 (yet this cluster is also the most heterogeneous one concerning export quantity). This large amount of rejections stems from the Islamic Republic of Iran. According to Henson and Jaffee (2004) most of the rejections from Iran are due to stricter aflatoxin[15] standards of the EU. Iran experienced strong problems in respecting the aflatoxin level in recent years and its exports of edible nuts have declined from some $452 million in 1996 to less than $210 million in 2002 [9:32]. Iran is followed by Indonesia with 147 EU rejections. All other exporters of the cluster group have very low to no rejections.

Finally, the question from the beginning of this section whether countries which perform well on the export market have lower border rejections has to be answered with no. As depicted in Table 6 the picture of border rejections is very heterogeneous and seems not to interrelate with an increasing or decreasing export ratio. However, it has to be admitted, that the level of the analysis is relatively broad. It would consequently be interesting if there would be a correlation between the export performance and the border rejections on single product level. In principle, results of Table 6 can be interpreted in two ways, first, the countries show a high level of border rejections because of their high level of export orientation (this would be supported by the cluster 30) and small countries tend to show little rejections because of their low participation on the market and a possible export concentration on products with a lower sensibility according to food safety requirements (this would be supported by cluster 3 and 2).The second perspective could be that some large exporters show high border rejections even though they have such a strong exporting focus. Examples for large exporters with high border rejections are China and Mexico, while large exporters with low border rejections are e.g. Brazil and Chile. Anyhow, border rejections are always an indicator for the inability of a country to comply with the importing countries requirements. Thus, border rejections imply that the country loses parts of its export gains and possibly does not exploit its export potential. This could steam from two different reasons. First, countries with a high level of border rejections might, although they have a very strong export orientation, show some weaknesses in their food safety and quality management systems. Second, the countries might export products which faced a particular increase in food safety measures within the last years. As a consequence the exporting country has to adopt the new requirements. Consequently, the country faces within the period of

[15] Mycotoxins are toxic by-products of mold infestations, affecting as much as a quarter of global food and feed crop output.

compliance higher border rejections. Unfortunately, since very few data is available it is not possible to analyze country specific data over a certain timeframe.
Following, Table 7 depicts the investment of the STDF in different countries. The table considers, both, the fruit/ vegetable and the meat cluster. It separates the countries in "loser in both commodity groups", "winner in both commodity groups", "winner in one commodity group", and "loses in the fruit/ vegetable sector; not included in the meat sector". Again, emphasis is put on both, the differences between groups, but also homogeneity within groups.

Table 7: Investment of the STDF

Loser or winner	Investment STDF			
	N	Mean	Min.	Max.
Loser in FV, not included in meat cluster analysis	12	39344286	0	371000000
Loser in both commodity groups	7	137902383	0	649015510
Winner in FV, not included in meat cluster analysis	15	257078792	0	3087299085
Winner in 1 commodity group	30	49221982	0	410139450
Winner in both commodity groups	9	60600394	270	273073960

Source: own illustration, investment data [19]

Table 7 depicts a very heterogeneous picture of STDF investments between as well as within the groups. Consequently, no clear order of investment can be found. The table depicts, that those countries which were winners in the fruit/ vegetable market, but not included in the analysis of the meat market have with investments of $ 257 million in average the highest total amount of investment. Nevertheless, the picture within the group is extremely divers. The high total amount of investment of this group is very much determined by the high investments in single countries. Kenya e.g. received a total amount of more than $ 3 billion and thus is an exceptional case for the total group of developing countries. Within the group it is followed by Nigeria and Zambia which received investments of around $ 300 million. In the same group e.g. Ghana and Malawi receive amounts between $ 20 and 30 thousand and Madagascar or Trinidad and Tobago hardly receive any investments.
The group which ranks second on the level of STDF investments is, with an average amount of $ 137 million the group of countries which are losers in both sectors. Again, this value is strongly influenced by single countries, especially Iran (that received about $ 650 million) and Mauritius (316) while Venezuela, Panama, Bahrain, and Mauritius received less than $ 25 thousand.
Third rank winners in both sectors. Within the group the structure is again very divers. While Morocco and China received investments of around $ 270 million, other countries, e.g. like Brazil or Chile of Côte d'Ivoire received only around $ 20 thousand. Similar situations are found for the three other groups.
Coming back to the question from the beginning of the section, it can be summarized, that neither in terms of export performance nor in terms of export quantity it seems to exist a specific order of STDF investments. Rather, averages are dominated by extremely high investments in few countries, with no clear pattern of losers (Iran) of winners (e.g. Kenya), small (Nepal) or large (China, Morocco) exporters is prevailing.

Overall, it must be noted that none of the questions of the beginning of the section was answered positively. The two indicators chosen do not provide a clear picture of a countries export performance within a trading environment which is largely determined by grades and standards. For border rejections it is rather the case that well performing countries with a large export orientation show particularly high rejections even though one might think that these countries are already very well adapted to the international food safety requirements. Nevertheless, the total amount of rejections gives an idea of how important rejections are for some countries and that large amounts of trade losses occur because of border rejection. The STDF investment underlines this finding, since the total investment of the STDF in individual countries is tremendously high, taking into consideration, that e.g. Kenya received around $ 3 billion from the STDF while the total GNI in 2004 was slightly more than $ 14 billion or that of Nepal with an GNI of $ 6.5 billion and with STDF investments of nearly $ 400 million [22, 19].

7 Conclusions

The objective of the paper was to shed some more light on the question how developing countries perform in a trading environment which is determined by the increasing importance of food safety and quality standards. The first part of the paper described the increasing importance of public standards within the trading system. The paper tried to turn away from the traditional assumption of higher SPS notifications implying higher barriers of trade. As a consequence it had a closer look on border rejections and on the investments of the STDF to reflect countries' ability to cope with the international food safety requirements. The second part of the paper analyzed the export performance of 73 developing countries and grouped them accordingly to their export performance. Finally, US and EU border rejections and STDF investments were related to the results of the cluster analysis to gain an idea about the relevance of standards for the market share development of particular countries.

Overall it can be stated that the simple generalization of developing countries being a group of losers in these new developments is false. The closer look of the analysis of the paper explored that developing countries are a very heterogeneous group which shows various different tendencies of market share development. In addition, the analysis showed that it is not appropriate to title small exporters categorically as losers and large exporters as general winners. Especially in the fruit/ vegetable sector various small and very small exporting countries managed to increase their market share. The sector seems to imply the potential to participate in the positive market development for small and large exporters alike. Nevertheless, it can be generalized, that most of the large developing countries exporters extended their market shares, sometimes even tremendously. A slightly different picture was found on the meat market. The five large exporters extensively increased their market shares while many small and medium exporting countries lost. However, two clusters of small and medium winner were found as well.

The analysis of border rejections from the US and the EU which were related to the results of the cluster analysis of the fruit/ vegetable market in section 6 showed somehow diverse picture. Large exporting countries tend to show much higher border rejections than small exporting countries. The analysis takes only border rejections of developing countries into consideration. However, the highest rate of border rejections appears between OECD countries. This might on the one hand not be astonishing because of the larger trade volumes, nevertheless, it also points to persisting failure to cope with international food safety requirements even of those countries which have a long exporting tradition. Nevertheless, the structure within clusters is heterogeneous. Higher average rejections of particular cluster groups are often determined by few countries with high rejections.

The STDF investment show similar findings as investment structures within cluster groups differs tremendously. Total investment of the STDF in individual countries is enormous high, while other countries in the same cluster show low or non investment.

Both, border rejections as well as STDF investments did not reflect a particular structure related to market share development of individual countries. However, this could change in further research on single product level with better data availability.

Remains the question what makes a country being a winner or a loser? Which specific characteristics does a country have to fulfill to extend its market shares when value chains are increasingly integrated, spot markets lose relevance and specific food safety and quality requirements of the different trading partners are the major determinants in selling products? This question is particularly interesting for small exporting countries which managed to extend their market shares. This very interesting part of the analysis should be subject to further research. It would be interesting to analyze the importance of FDIs for a better capability to satisfy the new market requirements. Furthermore, single country survey would be interesting to understand the differences as well as the favoring or impeding factors of the compliance strategies of winners and losers.

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