RESEARCH NOTE: AN INVESTIGATION OF AVOCADO TRADING IN EUROPE

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Increasing world trade opportunities led to a rapid growth of exotic fruit exports to Europe. Their population has shown increased consciousness of health and nutritional values associated with fruits and vegetables. The European market for avocados is mainly supplied by five producing countries, namely Israel, South Africa, Spain, Mexico and Kenya. It has been found that these countries export their avocados to a small number of countries. This regional concentration even increased over time. Most of the avocados designated for Europe go to France. The intra- and inter-industrial trade and trade intensities have been investigated by means of different coefficients. The investigation showes that the consumer education and promotion will play an important role in the future to meet the growing expected supply.

Toenemende internasionale handelsgeleenthede het tot 'n vinnige groei in uitvoere van eksotiese vrugte na Europa gelei. Die Europese bevolking is toenemed meer gesondheidsbewus en besef al hoe meer die voedingswaarde van vrugte en groente. Die Europese mark vir avokados word voorsien deur vyf lande, naamlik Israel, Suid-Afrika, Spanje, Mexiko en Kenia. Daar is bevind dat die uitvoere na 'n klein aantal invoerlande gaan en dat streekskonsentrasie oor tyd toegeneem het. Die meeste van die avokados bestem vir Europa gaan na Frankryk. Intra- en inter-industriële handel en handelsintensiteite is bepaal met behulp van verskeie koeffisiënte. Die ondersoek toon dat verbruikeropvoeding en promosie in die toekoms 'n belangrike rol sal speel om die vraag na avokados te stimuleer.

1. Introduction

During the last decade, increasing world trade opportunities led to a rapid growth of exotic fruit exports to Europe. To date, the avocado, still known as an exotic fruit, is consumed at a rate of 0.5 kilogram per capita. In 1992 a total of almost 105,000 tons or about 140 million ECU of avocados have been imported into the European market. In terms of values, this is equal to about 10 percent of the total European banana imports.

In order to investigate the profile and development of the avocado trade in the European Unit (EU), it is important to analyse the trade matrix. This is done by analysing the structure and development of inter- and intra-industrial trade and by investigating to which extent the ex- and imports are regionally concentrated or diversified. Trade flows between the most important avocado traders within the EU and the determining factors of avocado trade are examined.

2. The European avocado trading

Several different coefficients have been calculated for identifying the main basic trends of the avocado inter- and intra-industrial avocado trade. The base for the calculations is given by a trade matrix of the bilateral trade streams existing on the world market. The data has been taken from national and international statistics[1].

First, the inter-industrial trade has been investigated with the help of the Gini-Hirschmann coefficient (Burmester, 1990)[2]. The more a country has concentrated its exports on a region, the higher the Gini-Hirschman coefficient. If the avocados are only exported to one country, then the coefficient will reach 100. Corresponding, a low Gini-Hirschman coefficient indicates a high diversification of the exporting country. If the export volume is equally distributed to 'm' destinations, the coefficient will be 100 divided by the square root of 'm'. Assuming that there are 12 exporting countries, the coefficient will be 29.

Avocados within the EU are mainly supplied by five producing countries, namely Israel, South Africa, Spain, Mexico and Kenya. The sequence of the countries reflects their relative importance. From the view of the exporters, the following trends are shown in Table 1.

The coefficients indicate relatively high regional concentration of avocado-exports over time. Israel has reached a Gini-Hirschman coefficient of 95 in the nineties which means that the avocado exports are designated to almost only one country. This is also true for Spain and Mexico. Kenya and South Africa are comparatively more diversified. However, in all the listed countries, regional concentration has increased over time.

A reason for this concentration may be that exporters are increasingly faced by a demand for larger batches of uniform supply and more continuous deliveries. These requirements have to be fulfilled by those exporters which can supply such customers and thereby reduce organizational bottle-necks. The increased size of avocado imports has led to an intensification of trade relations, i.e. a few big volume avocado exporters are preferred to many small volume exporters from developing countries. This again is shown by results of Table 1.

A common European market connected with a relatively high per capita income results in growing product differentiation and thus, intra-industrial trade is induced among the EU member countries. The intra-industrial trade coefficient IIT[3] (Grubel and Lloyd, 1975) has been calculated for identifying the main trends in intra-industrial trade, namely between the major avocado trading EU countries: France, the Netherlands, the United Kingdom and Germany.

Table 1: Regional concentration of avocado-exports, 1984-1992

Year	Gini-Hirschman Coefficient				
	Spain	Kenya	South Africa	Mexico	Israel
1984	87.0	57.5	67.0	-	75.9
1988	88.2	52.6	71.9	76.1	62.2
1989	83.7	54.9	78.1	69.8	85.0
1990	86.5	56.0	84.6	76.3	95.6
1991	92.0	42.9	75.6	93.6	90.6
1992	87.4	73.7	67.8	93.6	94.5

Table 2: Trade coefficients for the intra-industrial trade with avocados, 1980-1992

Year	France	Netherlands	United Kingdom	Germany
1984	3	53	8	0
1988	7	82	13	0
1989	10	73	26	0
1990	25	88	36	0
1991	23	87	6	0
1992	17	87	2	0

Where the trade coefficient is 0, there are either only imports or exports registered for a country. A coefficient of 100 indicates that the import volume is equal to the export volume. A coefficient of 50 means: Given an export surplus, one third of the export volume will be imported, and not 50 percent as might be assumed.[3]

It can be seen that the Netherlands have reached relatively high trade coefficients with values of almost 90 percent. This means that a relatively high share of the import volume is re-exported again. In fact, the Netherlands re-export about 75 percent of their total avocado import volume.

On the contrary, it can be stated that Germany having reached a coefficient of 0 over time, is a pure avocado importer. A similar result can be observed for the United Kingdom since 1991. From 1988 to 1990 however, significant re-exports of avocados have also been identified for the United Kingdom.

France has reached values of up to 25 percent, indicating substantial import volumes compared to re-export volumes. The re-exports of France amount to only 10 percent of its total imports. A slight decrease of the trade coefficient has been observed for the last few years, being equal to an increase of export volumes relative to import volumes. In real volume, France re-exported up to 1,000 tons in the middle of the eighties, while at the beginning of the nineties, only 5 years later, the export volume even exceeded 10,000 tons. The re-exports from the Netherlands with trade coefficients of almost 90 percent did not even reach half that volume. Until the end of the eighties, the Netherlands still used to be the major supplier for selected West-European avocado markets. Now, France has become the major distributor of avocados within the EU.

3. Avocado trade intensities

From the above, high concentration in avocado trade with France playing a major role as an importer and a distributor, has been identified. Little is however said about the intensities of trade relations between individual countries and their developments. In this section, the structure of trade intensities is presented and specific focus is given of the important role France is playing in the market. Furthermore, some aspects of recent changes with regard to avocado production in the EU are given.

For analysing bilateral trade intensities, different methods can be used, i.e. the Markov Model describing probabilities of changing market shares (Wilson *et al*, 1987), the Constant Market Share analysis to determine relative market shares (Richardson, 1971), the Iterative Proportional Fitting Procedure (IPFP) and the Delta Coefficient of which the latter two measure the trade intensity.

From the above methods, the IPFP-coefficient has been chosen to present the trade intensities between the most important avocado trading partners, because the structure of trade is best analysed with this method (Becker, 1988).

An IPFP-coefficient bigger than 1 indicates relatively intensive trade relations between the importing and the exporting country while a coefficient smaller than 1 indicates the opposite trend.[4]

Average coefficients for the years 1990 to 1992 have been calculated for the most important EU countries being involved in avocado trade (Table 3). It can be seen that Germany has very intensive trade relations with re-exporters of avocados, namely the Netherlands and France.

Table 3: IPFP measurements of EU avocado importers and exporters, 3-years-average (1990-1992)

Export country	Import country			
	Germany	Netherlands	France	United Kingdom
France	2.36	1.25	0.00	0.46
Netherlands	3.33	0.00	0.60	0.29
Spain	0.57	0.99	1.85	1.44
Kenya	1.70	1.61	0.59	0.99
South Africa	0.36	2.28	1.15	1.21
Mexico	0.01	1.97	1.40	1.08
Israel	0.49	0.20	2.75	1.33
United Kingdom	0.00	1.61	0.29	0.00
Other	0.17	0.56	0.36	2.18

Geographic closeness might be the reason for these relatively high trade intensities. Besides the above, Kenya is a close trading partner for Germany. The Netherlands however dispose of close trading relations especially to South Africa and Mexico followed by Kenya and the United Kingdom. Worth mentioning is also France as an exporting trading partner of the Netherlands in avocado trade. France has very close relations with Israel. Further partners in avocado trade are Mexico and South Africa. Within the EU, only Spain has gained some importance. The United Kingdom has intensive trade relations with countries summarized under the term "others" which include the USA, Brazil, Canary Islands, Jamaica and Australia. Apart from Spain, the non-EU-countries Israel, South Africa and Mexico are of some relevance in avocado trade for the United Kingdom.

It can be summarized that each of the listed EU countries (Table 3) shows preferences regarding to close trading partners. Some of the intensive trade relations are based on geographic closeness while others exist for traditional reasons. From the above it is clear that France plays a major role in the avocado market. This is the reason why further analysis only discusses France and not the Netherlands, the United Kingdom or Germany.

Special emphasis must be put on France playing a crucial role in avocado trade. Different coefficients have been calculated for presenting the trade relations between France and other main trading partners. The results are summarized in Table 4.

For each country, the first line (trade) indicates the development of trade volumes in absolute terms. The other lines describe different coefficients which will be explained below.

The **alpha-concept** sets the bilateral trade flow in relation to the total world trade. Probability statements about the relative importance of each single import or export flow can be made. However, this concept contains relatively little information about the trade structure. Additional information is needed about the total export or import volume of a country in order to be able to estimate the relative importance of each single flow.

The next two concepts calculate market shares:
The **beta-concept** sets the bilateral imports or exports of a country in relation to the total imports or exports of that country. Thus, statements can be made about the relative importance of an individual exporting country for the importing country. By this standardization, the importers are put on an "equal importer basis" since the interconnections are only measured on the import side.

The **gamma-concept** is equal to the beta-concept, however referring to the export side. Information about the relative importance of individual importing countries for the exporting country is given. The exporters are put on an "equal exporter basis".

All three concepts are one-sided oriented and can be summarized to the **delta coefficient**[5] which is defined as the ratio between actual bilateral trade and the trade which would occur if source and destination were statistically independent. Like the IPFP, a coefficient bigger than 1 indicates relatively intensive trade relations between an importing and exporting country, while a coefficient smaller than 1 indicates the opposite trend.

The alpha-, beta-, gamma- and delta-coefficients can be interpreted as traditional and very popular methods for analysing trade flows. However, Becker (1988) determined that the delta coefficient is not suited to measure trade intensities over time, because they are not all distributed over the same range. He proposed the IPFP method.

The **IPFP coefficient** can be interpreted as the relatively bilateral trade intensity. The method calculates the ratio between the iteratively determined "normalised" trade flow and the iteratively determined "normalised" flow which would occur if the source and destination countries were statistically independent. The latter can be interpreted in the same way as the delta coefficient, but has the advantage that they can be compared with one another, and can therefore be used to analyse the development of the structure of trade (Becker, 1989) of exotic fruit with the example of avocados in the EU. For a detailed discussion of the IPFP method, revise Becker (1988).

The following two coefficients have been calculated on the basis of the IPFP method:
First, the **beta* coefficient** has been developed. It indicates the relative importance of an individual exporting country for an importing country like the beta-concept but its calculation is based on the IPFP method.

Table 4: Development of trade intensities between France and other countries over time, 1975-92

Export country	Measure-ment	Avocados for France								CV[1]
		1975	1980	1984	1988	1989	1990	1991	1992	
Spain	Trade[2]	0,00	1552	5136	12800	8556	15377	14144	17003	0.65
	Alpha	0.00	0.02	0.07	0.16	0.11	0.20	0.18	0.22	0.64
	Beta	0.00	0.07	0.10	0.25	0.12	0.20	0.19	0.23	0.57
	Beta*	3.31	16.51	23.89	27.19	19.02	22.31	20.99	18.33	0.38
	Gamma	0.50	0.72	0.86	0.88	0.83	0.86	0.91	0.86	0.16
	IPFP	0.30	1.48	2.07	2.45	1.71	2.01	1.88	1.65	0.35
	Delta	0.00	2.36	1.28	1.35	0.87	0.86	0.93	0.90	0.58
	Gamma*	6.08	29.71	43.03	48.94	34.24	40.16	37.60	33.00	0.35
South Africa	Trade	3026	6755	4277	12915	22292	17638	16700	14245	0.53
	Alpha	0.04	0.09	0.06	0.17	0.29	0.23	0.22	0.18	0.52
	Beta	0.20	0.29	0.08	0.26	0.30	0.23	0.22	0.19	0.29
	Beta*	20.60	13.38	6.44	15.72	17.03	13.41	8.61	16.47	0.32
	Gamma	0.59	0.64	0.59	0.68	0.76	0.84	0.72	0.63	0.12
	IPFP	1.85	1.21	0.58	1.41	1.53	1.21	0.77	1.48	0.31
	Delta	3.11	2.11	0.88	1.04	0.80	0.83	0.74	0.65	0.20
	Gamma*	37.00	24.12	11.60	28.24	30.62	24.12	15.48	29.64	0.31
Israel	Trade	9996	11556	31387	9184	18455	30760	32672	27224	0.45
	Alpha	0.13	0.15	0.44	0.12	0.24	0.40	0.42	0.35	0.45
	Beta Beta*	0.68	0.49	0.60	0.18	0.25	0.39	0.43	0.36	0.37
		29.20	23.93	9.58	9.68	21.66	35.18	38.81	17.81	0.44
	Gamma	0.75	0.82	0.74	0.58	0.85	0.96	0.95	0.94	0.15
	IPFP	2.63	2.69	0.86	0.87	1.95	3.17	3.49	1.60	0.43
	Delta	3.97	2.70	1.10	0.89	0.89	0.99	0.97	0.98	0.69
	Gamma*	52.80	53.82	17.24	17.40	38.99	63.33	69.84	32.04	0.43
Mexico	Trade		465		5996	6221	8117	7235	8577	0.77
	Alpha		0.01		0.08	0.08	0.10	0.09	0.11	0.77
	Beta		0.02		0.12	0.08	0.10	0.09	0.12	0.72
	Beta*		29.86		18.72	8.34	12.12	20.31	14.26	0.53
	Gamma		0.92		0.75	0.67	0.74	0.93	0.93	0.60
	IPFP		2.68		1.68	0.75	1.09	1.83	1.28	0.73
	Delta		3.02		1.14	0.70	0.74	0.95	0.96	0.94
	Gamma*		53.75		33.69	15.01	21.82	36.56	25.67	0.74
Kenya	Trade	70	207	490	1294	1194	1252	2022	4010	0.90
	Alpha	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.05	0.91
	Beta	0.00	0.01	0.01	0.03	0.02	0.02	0.03	0.05	0.80
	Beta*	5.87	1.31	1.47	5.12	4.37	4.11	5.25	10.37	0.60
	Gamma	0.25	0.37	0.39	0.41	0.42	0.44	0.59	0.72	0.30
	IPFP	0.53	0.12	0.13	0.46	0.39	0.37	0.47	0.93	0.56
	Delta	1.32	1.21	0.58	0.62	0.44	0.45	0.61	0.75	0.42
	Gamma*	10.60	2.34	2.64	9.22	7.86	7.38	9.46	18.66	0.56

1 CV: coefficient of variation as indicator of instability
2 Trade volume in tons

Second, the **gamma* coefficient** equally considers the export side and can be compared with the gamma-concept. Finally, the **coefficient of variation** (CV) has been calculated for each value line. Being a relative measure, it allows the comparison of variations of characteristics with different means to illustrate the importance of continuity.

Considering for example the trade relations between South Africa and France compared with other countries, the following statements can be made:

South Africa is one of the main avocado exporters to France with an export volume of about 14,000 tons in 1992. Since 1975, the export volumes of South Africa increased significantly with a peak in 1989. Since then, until 1992, a continuous decline of exports, due to drought, can be observed.

Similarly, the alpha coefficient indicates that with a probability of almost 20 percent, a unit of the considered trade will go from South Africa to France. Compared with other exporting countries, the exports developed rather steadily and the alpha coefficient varied relatively little over time with a coefficient of variation reaching a value of 0.5. For Kenya for example, a variation coefficient of 0.9 has been calculated indicating relatively strong variations of the export volumes over time. However, export volumes in absolute terms must be considered too, because the export volume of Kenya is on a manifold lower level than the one from South Africa so that relatively little variations already affect the results significantly.

The beta coefficient also reaches a value of almost 20 percent in 1992, but with a much lower variation (CV: 0.29) than the alpha coefficient. This means that the relative importance of South Africa as an exporting country for France varied less than the development of the avocado export volumes over time. A deviation between the alpha- and beta-coefficient can also be found for most of the other countries, however less distinct.

The value of the beta* coefficient, being of a similar meaning as the beta-concept but being calculated on a different basis to compare changes over time, indicates a slightly higher variation for South Africa and Israel.

For the other exporting countries, the opposite can be identified. It cannot be concluded that the CV of the beta* coefficient is generally lower or higher than of the beta coefficient. However, considering the calculation process of the beta* coefficient based on the IPFP, it is assumed that its CV gives a more realistic picture of the situation.

The gamma and the gamma* coefficients can be interpreted simultaneously to the beta and beta* coefficients while the delta coefficient is comparable with the IPFP.

Finally, the development of the IPFP coefficient is of interest. Considering trade intensities over time, the following conclusions can be drawn:

Trade relations between France and South Africa used to be quite intensive over time, neglecting some cuts like in 1984 and 1991. A similar trend can be observed for Israel and Mexico. Trade intensities with Spain and Kenya are still slightly lower than 1, but they increased in the last decade until 1992. The trade intensities of Spain are very high and its role in the avocado trade will be discussed in the next section.

4. Conclusion

The consumption of avocados is mostly influenced by economic growth, cultural factors and nutritional knowledge. The European population has shown increased consciousness of health and nutritional values associated with fruits and vegetables.

The demand for avocados within the EU is mainly supplied by five producing countries, namely Israel, South Africa, Spain, Mexico and Kenya. It has been found that these countries export their avocados to a small number of countries. This regional concentration even increased over time. Most of the avocados designated for Europe go to France. Worth mentioning are also the United Kingdom, Germany and the Netherlands.

Until the end of the eighties, the Netherlands still used to be the major supplier for selected West-European avocado markets. Now, France has become the major distributor of avocados within the EU.
Since the beginning of the eighties, Spain entered the avocado market as a producer. Since then, the production in Spain increased significantly. Today, Spain has become a major actor in the avocado markets. In the past three years, Spain's contribution to the supply of the European consumer was 20 percent and it imported, especially from France, more than one percent of the EU avocados in its own off-season. Besides France, Spain's second partner is the United Kingdom. Trade with other countries is very limited. From the IPFP analysis for Spain (not presented), it is evident that the Spanish trading intensities increased towards France, while those to the United Kingdom decreased. In the long run, Spain is expected to strengthen its position as an avocado grower and exporter. Depending on the development of future demand, other countries will likely to be more or less affected by the increasing supply from Spain.

Due to the wider interest in healthier eating, i.e. fruit and vegetables, it is expected that consumption of all fresh fruit will grow, but it seems likely that an increasing proportion of this will be accounted for by exotic's including avocados. In fact, the avocado already belongs to the basic fruit sortiment. Supposing that the growing production of avocados will continue, the avocado prices are likely to decrease in the future. However, the expected slightly lower price will not lead to an increased *per capita* consumption, but is dependent on market information. Many consumers still feel uncertain as regards ripeness and use of the fruit. Therefore, to stimulate the demand, avocado promotion will play an important role in the future.

Notes

1. European Community, Eurostat, Brussels, diverse years. FAO, Trade yearbook, Rome, diverse years. Interfel, Bilan 1992 - Fruits et légumes. Supplément à Fel actualités hebdo., Paris 1993. ZMP, ZMP Bilanz-Obst, Bonn, diverse years.

2. The Gini-Hirschman coefficient is defined as follows:

$$G_i = \left[\sum_{i=1}^{n} \left[\frac{X_{ij}}{X_{i.}} \right]^2 \right] * 100$$

with
X_{ij} = Exports from country i to country j
$X_{i.}$ = Total Export volume of country i
i = 1...n

3. The intra-industrial trade coefficient IIT is defined as:

$$IIT = \frac{[(X_i + Y_i) - |X_i - Y_i|]}{(X_i + Y_i)} * 100$$

with
X_i = Export volume of the product i
Y_i = Import volume of the product i

4. Further details as regards the calculation and the importance of different coefficients will be given in the following paragraphs. It should be noted however, that the IPFP coefficient is no measure of absolute values but of relative trade intensity.

5. The delta coefficient summarizes the alpha-, beta- and gamma-coefficient as follows:

$$\delta_{ij} = \frac{\beta_{ij} * \tau_{ij}}{\alpha_{ij}}$$

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