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Analysis of Trade: Import of Apples in India

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ABSTRACT

Indian trade market is complex with strong segmentation in terms of apple varieties and their origin. The apples of the United States and China provided the backbone that facilitated the development of this market for import. The organisation of the sector was of low economic concentration in 2015, mainly for the varieties of Red Delicious, Fuji, Gala, Qinguan and Huaniu. Other varieties with high concentrations or niche markets are Cripps Pink, Pacific Rose, Evelina, Queen, Red Star, Granny Smith and Golden Delicious.

The purpose of this paper is to understand the structure of import of apples in India during the 2012-2016 period. The methodology is based on the Herfindahl-Hirshman Index (HHI) and the Foreign Trade Competitiveness Index (FTCI), whereas the congruence analysis is based on Pearson's correlation coefficients and the RV coefficient. We have also applied the dual multiple factor analysis (DMFA) to verify the changes made to the trade policy in leading businesses between two periods or scenarios.

An interesting case for teaching about commercial decisions and the need for intense and deep research on business movements is developed. A metaphor makes it easier to understand this situation: a calm sea with few waves does not mean that there is no underwater current. These currents must be discovered, as this information to make good business decisions.

Keywords: Country origin, Consignee, Varieties, Import, Trade, Apples.

JEL: C13, F14, Q17.

I

INTRODUCTION

India is a growing market for apples, sustained by economic growth and improved per capita incomes. Strong economic growth was expected to lead to a continued expansion of demand for apples from India (Deodhar *et al.*, 2006), and that was a correct view.

With a population of 1.33 billion, India is also a large and growing market of food products. Although India is the second largest producer of fruits and vegetables, the industry faces major challenges due to the lack of availability of fresh and high-quality fruits and vegetables. According to UN COMTRADE (2017), India is the fourth largest producer of apples, after China, the United States and Poland. The supply chain suffers from maximum inefficiency due to the involvement of many intermediaries and the lack of necessary infrastructure, such as cold storage, resulting

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in poor quality, huge surcharges and a lower share of the producer in rupees (Singh *et al.*, 2015). This market is one of the 10 most important in the world in terms of the volume of apple imports (Table 1).

TABLE 1. GLOBAL IMPORT OF APPLES

(*tonnes*)

Importing countries (1)	2012 (2)	2013 (3)	2014 (4)	2015 (5)	2016 (6)
World	8.271.496	8.556.453	8.122.961	9.522.854	8.807.207
Russian Federation	1.278.551	1.352.347	1.049.872	880.311	676.837
Germany	614.362	704.768	637.833	682.804	602.398
Belarus	145.674	180.494	414.655	731.082	598.987
United Kingdom	476.525	479.540	446.026	426.356	397.159
Egypt	221.771	96.974	15.227	434.449	353.594
Spain	223.047	239.415	247.167	232.268	249.985
India	186.368	194.335	204.570	193.692	246.808
Canada	202.609	233.596	222.140	212.350	238.782
Bangladesh	109.914	83.630	130.356	177.081	230.864
Mexico	235.893	274.978	235.502	306.402	212.678
Other countries	4.576.782	4.716.376	4.519.613	5.246.059	4.999.115

Sources: ITC calculations based on UN COMTRADE and ITC Statistics.

A recent study on fruit consumers in India concludes that if fruits are stored under adequate refrigeration, labelled to show the country of origin and sold at a price that reflects the presence of intrinsic factors such as taste and nutrition, perceptions would improve towards the purchase of imported fruits (Lê and Pagès, 2010). Research carried out on the fruit and vegetable supply chain in India suggests that there is inadequate supply chain management, a lack of cold chain infrastructure and a lack of food processing units (Pandey *et al.*, 2013; Chaudhary *et al.*, 2016). The local production of apples may present a problem for middle and high income group and hence, the preference for imported fruit (Balraj, 2016).

Fruit consumption in India is highly correlated with consumer income. The middle and lower-income groups are more likely to purchase bananas, while the high-income group prefers to buy bananas, mangoes, apples and oranges. The high-income group also has increased consumption of other fruits: pineapple and grapes (Kavitha *et al.*, 2016).

Two research studies analysed the price interrelationship in five large wholesale apple markets, namely, Ahmedabad, Bengaluru, Delhi, Hyderabad and Kolkata. The studies confirm the presence of cointegration, which implies the long-term price association between markets. Delhi is the determinant of the market price. A relevant fact to understand the interrelationship in the prices in the different markets is that price is a key factor for the consumer besides the quality (Beag and Singla, 2014; Wani *et al.*, 2015).

The year 2015 was a record global import year, with 9.5 million tonnes compared to 8.1 million tonnes in 2014. Sales growth from the United States and the relevance of the market in India drive this research to evaluate changes (Nair Ghaswalla, 2015). Comparing two different scenarios, it raises the question of whether there is

significant variation in the structure of the import business in India (Kathuria and Varinder, 2015). Having access to very detailed trade data, facilitates unprecedented research in the apple trade, with new methodologies to make the evaluation (Double Factor Analysis and Foreign Trade Policy Index); in addition to the traditional index as the Herfindahl-Hirschman to analyse the commercial concentration. Thus, the purpose of this paper is to understand the import structure of apples in India during the 2012-2016 period.

II

METHODOLOGY

The data were obtained from Port Nhava Sheva in India, compiled by Business Intelligence Observatory (www.cif-businessintelligence.com), for the years 2014 and 2015. Entry by this port accounts for 54 per cent of India's imports (46.7 per cent in 2014), with the following market share by country of origin: 63.4 per cent in United States; 76.5 per cent in Iran; 71.5 per cent in Italy; 64.6 per cent in Chile; 50.9 per cent in New Zealand; 38.5 per cent in China and 36.9 per cent in Afghanistan, among the main suppliers. The information updated to the present day in Port Nhava Sheva corresponded to the month of August 2016, for this reason we compared only data from 2015 in relation to 2014.

To determine the import structure of the apples sector we used the Herfindahl-Hirschman Index (HHI). The HHI measures the level of concentration in a given sector, is a well-known and commonly accepted indicator of market competition [1],

$$HHI = \sum_{i=1}^{n} \left(\frac{X_i}{X} 100\right)^2 \quad \text{....(1)}$$

where $\frac{X_i}{X}$= participation of the i-th company in the market; and n=number of firms in the sector.

On the basis of the EU Commission guidelines and HHI values, the given sector can be characterised as unconcentrated, moderately concentrated or concentrated (Deodhar *et al.*, 2006; Brezina *et al.*, 2016). Possible outcomes go from 0 to 10.000, this index reading based on USA regulations that is performed according to the following classification: HHI<1000 = low concentration level; 1000<HHI<2000 = moderate concentration level; and HHI>2000 = high concentration level.

The significance of the HHI approach can be appreciated by the number of articles that use it in different areas such as agribusiness export (Khaksar Astaneh *et al.*, 2014), consumer demand (Stablein *et al.*, 2011), internationalisation (Elango, 2011), new product development (Veflen and Sallis, 2010) and branding (Damoiseau *et al.*, 2011).

Analysing the changes in the strategy of purchases to suppliers (in the case of importers) is a good commercial indicator of competition. Similar to exports is

analysing the market share of each company. For this reason, the Foreign Trade Policy Index (FTPI) is used, adopting the model to analyse the competition in the exporting companies of a product (De Pablo Valenciano *et al.*, 2014). The objective of this methodology is to examine the changes between two scenarios in the import policy, and consequently, the index takes the "market share of a company in a country origin or region of import" as the numerator and the "import quota" of the country for that product as denominator [2].

$$FTPI = \left({}^{IP_{kij}}\!/_{\mathrm{M}_{kj}} \right) \Big/ \left({}^{IP_{ki}}\!/_{\mathrm{M}_{k}} \right) \quad \text{....(2)}$$

where IP_{kij}= import purchases of product 'k' by company 'i' in region of origin 'j'; M_{kj} = total import of product 'k' by region of origin 'j'; IP_{ki}= import purchases of product 'k' from company 'i'; and M_{k} = total import of product 'k';

If a company's share is higher than the average at the level of the importing country, this indicates that there are comparative advantages because the market share exceeds the average share and vice versa if it is lower. By combining FTPI and the trend of market share, we obtained the commercial policy map of the company analysed for a product (in our case apples) and a trend is learnt of the changes between regions of origin of imports. This helps us to understand the dynamics of the commercial changes in a country like India. This is an analysis of companies that market a product. This adaptation of the FTPI in a scientific article remains unpublished.

To analyse the commercial management, a data matrix was used for the years 2014 and 2015, containing the importing companies in the sector and the following variables as columns: immortalised volume by region of origin, average CIF price by region of origin, total volume imported and total average CIF price.

The congruence of the matrices makes it possible to analyse the consistency in the companies' behaviour during the same periods, which becomes a measure to assess the trade management at the company's level. Several approaches allow us to analyse the congruence of the companies' behaviour at different times. One of these approaches is the Pearson correlation of the elements outside the diagonal of a correlation matrix for 2014 and 2015. Another approach is the vectorial correlation coefficient (RV coefficient) that measures the similarity between symmetric square matrices. The range of possible values for each coefficient suggested ranges from -1 to 1, interpreted as a strong negative and positive relation respectively (Lee Rodgers and Alan Nicewander, 1988).

To supplement the coefficients described, the Dual Multiple Factor Analysis (DMFA) was applied, where the grouped structure of the data was taken into account, balancing their influence on global results (Lê and Pagès, 2010). In this paper, we compared two different time spans with the same variables on companies or

individuals, and this accompanies other recent research on the treatment of data of this kind (Abascal *et al.*, 2013). A cluster analysis is elaborated by employing the agglomerative method UPGMA (Unweighted Pair Group Method with Arithmetic Mean) with the same information used in the Dual Multiple Factor Analysis, (DMFA) in order to detect common groups in each one of the considered years (De Pablo Valenciano *et al.*, 2017).

III

RESULTS AND DISCUSSION

The results are presented from three different angles: first the organisational structure of the sector; second, the policy of suppliers of major importers; third, the global assessment of the commercial strategy of supply in importers.

Sector's Organisational Structure

The Indian apple import market has a low commercial concentration (analysing the entry of apples by the Port of Nhava Sheva), with less than 1,000 points. The main sources of commercial development of apples are from the United States and China. The number of consignees increased in 2015 for apples from North America (United States) and East Asia (China), as well as some new recipients from the Mediterranean (Italy) and the Middle East (Iran). The year 2015 was characterised by the increase in sales of the United States, with the decrease in the commercial supply of South America (Chile) and East Asia (China). In the context in which India increased its international purchases, it reduced the average CIF import price, especially in apples from the United States and Chile (Table 2).

TABLE 2. INDICATORS OF THE TRADE ORGANISATION BY COUNTRY OF ORIGIN

Country of origin (1)	2014 (kg) (2)	2015 (kg) (3)	2014 (USD/kg) (4)	2015 (USD/kg) (5)	2014 (Consignee) (6)	2015 (Consignee) (7)	2014 (HHI) (8)	2015 (HHI) (9)
United States	30.677.673	55.272.695	1,34	1,10	44	53	562	602
Chile	26.284.781	13.313.635	1,17	1,10	29	18	969	1.278
China	23.766.805	11.688.479	1,18	1,33	41	56	760	464
Italy	2.658.139	7.973.081	1,12	1,17	16	22	1.804	2.022
New Zealand	5.727.994	7.546.771	1,40	1,42	19	19	2.365	2.098
Belgium	958.460	2.848.806	0,83	0,88	4	6	5.604	6.944
Iran	892.524	2.372.688	0,90	0,90	6	10	3.274	6.322
France	1.567.508	975.974	1,04	1,21	9	17	3.831	956
South Africa	233.536	810.602	1,06	1,11	4	9	5.525	2.824
Afghanistan	376.611	767.044	1,01	0,83	4	2	3.707	10.000
Brazil		550.368		1,01		2		10.000
Poland	37.220	387.433	0,95	0,79	3	6	5.007	2.727
Canada	958.442	123.480	1,07	1,04	4	2	6.120	10.000
Argentina		41.814		1,03		2		10.000
Turkey	1.165.129	34.258	1,00	0,81	9	2	2.195	10.000
Total	95.304.820	104.707.126	1,23	1,14	65	93	568	630

Source: Own elaboration with information of Business Intelligence Observatory.

The dynamics of the organisation of importers is a feature of the Indian market, in addition to the increase of companies that market imported apples in 2015. About 45 new consignees and 17 operators or importers have withdrawn from the market; this explains the growth of 65 to 93 companies in the import of apples in India.

The varieties with the greatest organisational development for the sale of imported apples or low concentration (Table 3), are Red Delicious (origin United States, Italy and France) and Fuji (origin Italy and China); the peculiarity is that in 2015, the companies grew to sell Gala (origin New Zealand, France, Italy and South Africa), Qinguan (Chinese origin) and Huaniu (Chinese origin) apples. The increase in imports of Fuji apples from China facilitated the improvement of prices, while in the Qinguan and Huaniu varieties, new importers marketed these apples at a lower price than those in force in 2014. In Red Delicious apples from the United States, new importers were characterised by lower prices than those in force in 2014. In the Gala apple variety, the increase in imports by volume in New Zealand, France and Italy improved the average import price in 2015. The dynamics of the organisation of importers is explained by lower sales prices in some varieties and origins but also to sell apples of higher quality in other cases.

TABLE 3. INDICATORS OF COMMERCIAL ORGANISATION BY APPLE VARIETIES

Varieties	2014 (kg)	2015 (kg)	2014 (USD/kg)	2015 (USD/kg)	2014 (Consignee)	2015 (Consignee)	2014 (HHI)	2015 (HHI)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Red Delicious	54.513.593	69.067.766	1,25	1,09	49	58	600	607
Galas	10.323.867	14.286.461	1,18	1,24	29	37	1.350	999
Other apples	6.738.167	5.392.891	1,19	1,01	42	19	553	2.220
Fuji	12.029.966	5.167.519	1,30	1,66	30	38	696	703
Qinguan	5.681.064	3.578.510	1,01	0,94	23	32	2.743	736
Huaniu	3.838.780	1.973.706	0,91	0,81	20	20	1.269	894
Granny Smith	798.373	1.617.215	1,44	1,34	23	32	2.495	1.321
Evelina		564.858		0,86		2		10.000
Rose Pacific	224.385	497.273	1,72	1,74	8	6	2.291	7.302
Red Star	23.200	491.340	1,34	0,88	2	12	10.000	1.109
Queen	355.594	474.656	1,75	1,77	6	8	5.675	2.069
Jonagold	126.436	448.211	0,72	0,73	4	2	9.861	10.000
Modi	60.638	335.090	1,01	1,18	2	5	10.000	4.868
Golden Delicious	181.662	288.024	1,20	1,30	6	6	4.339	6.940
Jiguan	210.850	262.620	1,02	0,89	7	5	5.134	3.674
Jolyred	6.517	141.327	1,04	1,11	4	2	10.000	10.000
Cripps Pink	191.728	119.660	1,18	1,01	7	6	4.181	6.159

Source: Own elaboration with information of Business Intelligence Observatory.

Supplier Policy to Major Importers

The four largest importers in terms of purchasing volume have a market share of 35 per cent during the years 2014 and 2015 (IG International, DJ Exports, Aayush Impex and Gajumal Mulchand Fruit). These importers show significant changes in the dynamics of their supply strategy in 2015. The commercial regions to facilitate the analysis of supplier policy are North America (United States and Canada), Central

Europe (Belgium), the Mediterranean (France and Italy), Eastern Europe (Poland), the Middle East (Turkey, Iran and Afghanistan), Africa (South Africa), Oceania (New Zealand), East Asia (China) and South America (Chile, Argentina and Brazil).

IG International shows comparative advantage in the purchase of apples from Central Europe; its main supplier is North America, and it increased its supply from East Asia and Oceania in 2015. It also reduced its purchases of apples in the Middle East, Mediterranean and South America (Figure 1).

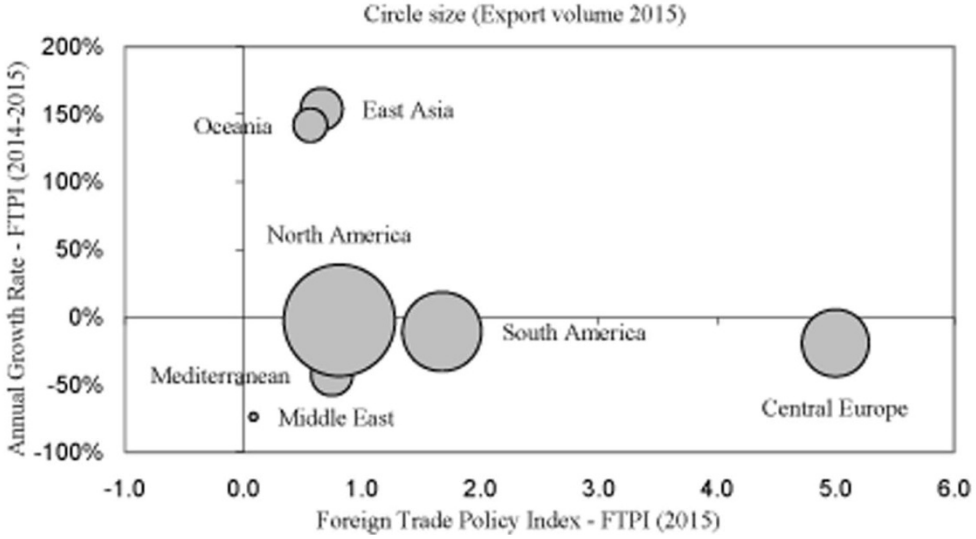

Figure 1. Supplier Policy in the Import of IG International.

DJ Exports has comparative advantage in the purchase of apples from the Mediterranean and Oceania, which are its main suppliers. In 2014, it increased its purchases in the Mediterranean and reduced the supply from North America (Figure 2).

Aayush Impex has comparative advantages in the purchase of apples originating in the Mediterranean and South America, but its main supplier is North America (especially the United States), with a significant increase in its market share in 2015 (Figure 3).

Gajumal Mulchand Fruit has comparative advantages in the purchase of apples from Oceania and East Asia; North America is its main supplier. Purchases in 2015 increased from Oceania, but it also had supply growth in North America (Figure 4).

Global Commercial Import Supply Strategy

The changes in the main suppliers may or may not have a global impact on trade structure, comparing 2015 with 2014.This will allow us to unveil the Dual Multiple Factor Analysis (DMFA).

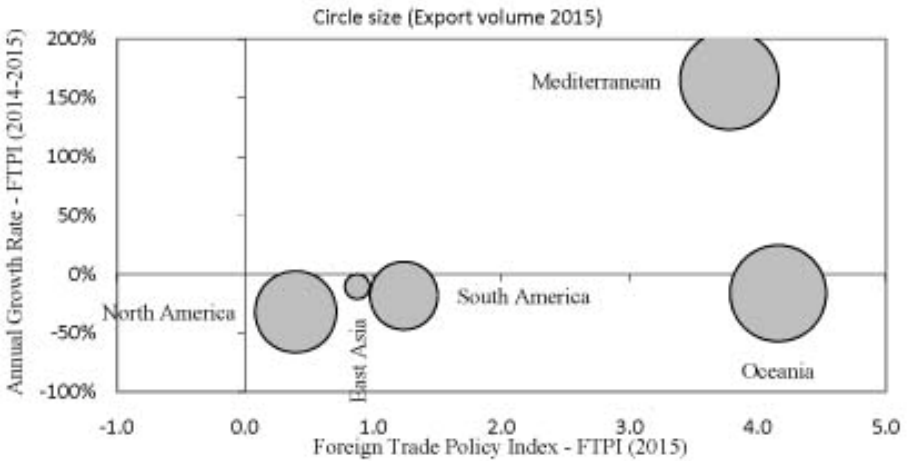

Figure 2. Supplier Policy in the Import of DJ Exports.

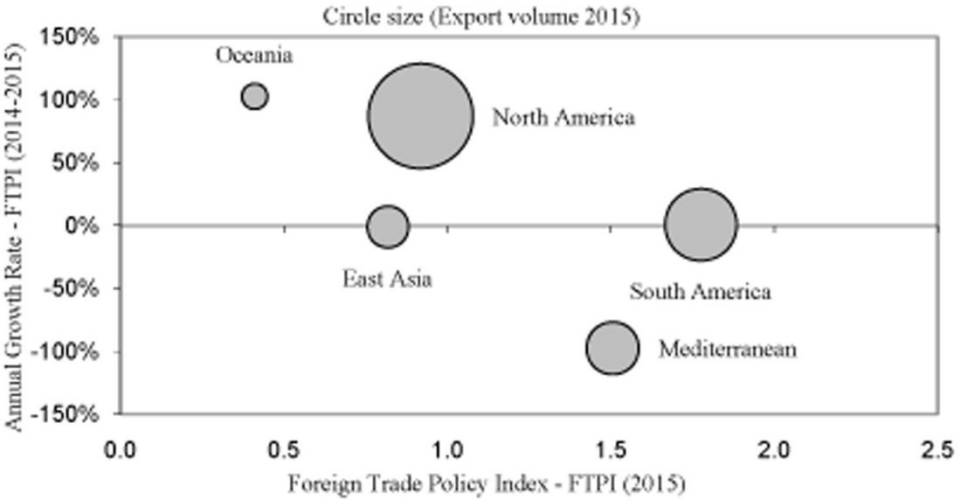

Figure 3. Supplier Policy in the Import of Aayush Impex.

The congruence of the data matrices considered for these time intervals has been evaluated by both the Pearson correlation coefficient (0.38) and the RV coefficient (0.71), which are within the established parameters and are interpreted as positive relationship between variables. Performed permutations based on simulations to estimate the likelihood of these occurring at random have shown that the probability obtained after 10,000 simulations was below 0.0001. Therefore, we rejected the hypothesis that the patterns obtained could be random, which points to a common underlying structure.

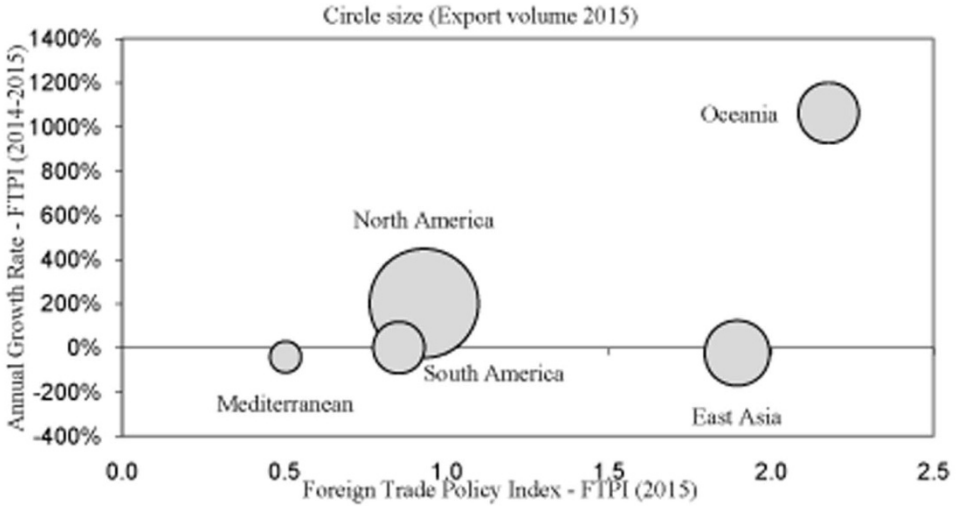

Figure 4. Supplier Policy in the Import of Gajumal Mulchand Fruit.

The DMFA result does not show significant changes in the variables analysed between 2014 and 2015 The variables are volume and import prices by region of the producing country (EA: East Asia, NA: North America, A: Africa, EC: Central Europe, M: Mediterranean, ME: Middle East, SAM: Eastern Europe and O: Oceania).

The analysis of the variables analysed in the DMFA indicated 43.01 per cent of the changes in the structure of the apple import model in India; additionally, the consensus variable "var" is visualized between both scenarios in relation to each scenario. The largest difference in the variables - import price and kilos - is at the source level in the suppliers.

The analysis of the main components in the consignors or importers between 2014 and 2015 makes it possible to visualise the significant changes between both scenarios (Figure 5). In the lower right quadrant is Aayush Impex (E3), which significantly reduced its purchases from China and Chile and replaced them with North American apples. Consignee I G International (E1) increased imports significantly from North America (United States) and from East Asia (China) but reduced imports from South America (Chile). Suri Agro Fresh (E6) increased purchases from North America but reduced trade operations in East Asia and South America. P.C. Foods (E16) increased its volume of international purchases only in North America.

The other interesting changes in the main components analysis occurred in the lower left quadrant, where Mahindra Univeg (E64) is a new importer with a greater supply of Italian apples of the Red Delicious variety. D.B. International (E20) and MGR Fruit PVT Ltd. (E21) concentrate on imports from North America and increased purchases of Red Delicious in 2015. The particularity of Sita Traders (E17) is that it reduced its international purchases by 90 per cent, leaving a small volume

from East Asia of the Huaniu variety. In relation to the upper left quadrant, LRK Global (E15) maintained its purchases between both scenarios, reduced the operation of Fuji from East Asia and compensated with imports of the varieties: Queen of Oceania, Red Delicious of North America and Gala from South America.

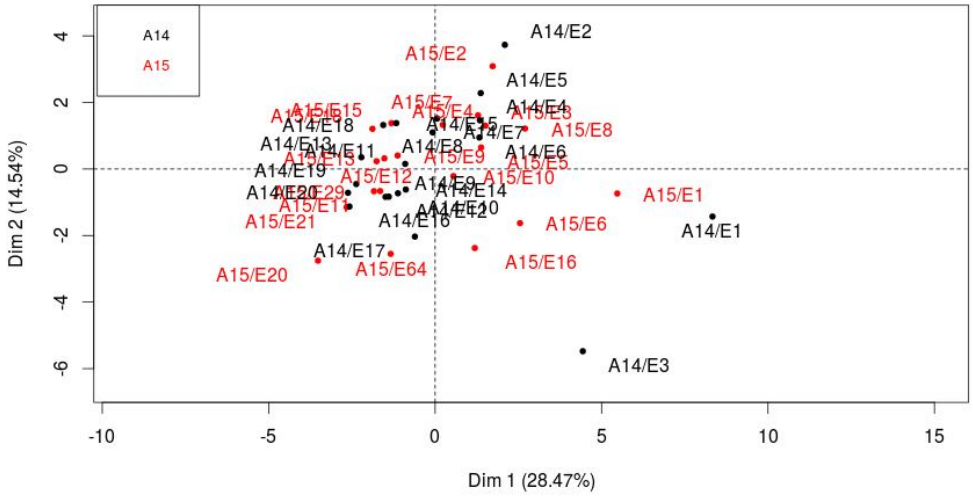

Figure 5. Variables Factor Map of Companies (dim 2015; dark 2014).

The complementary analysis through the tree diagram (Figure 6) displays six groups. The larger group, where most of the consignees are, presents small changes between the two scenarios (2014 vs. 2015) that overlap each other. This helps to understand the low level of change recorded globally in DMFA (Figure 1).

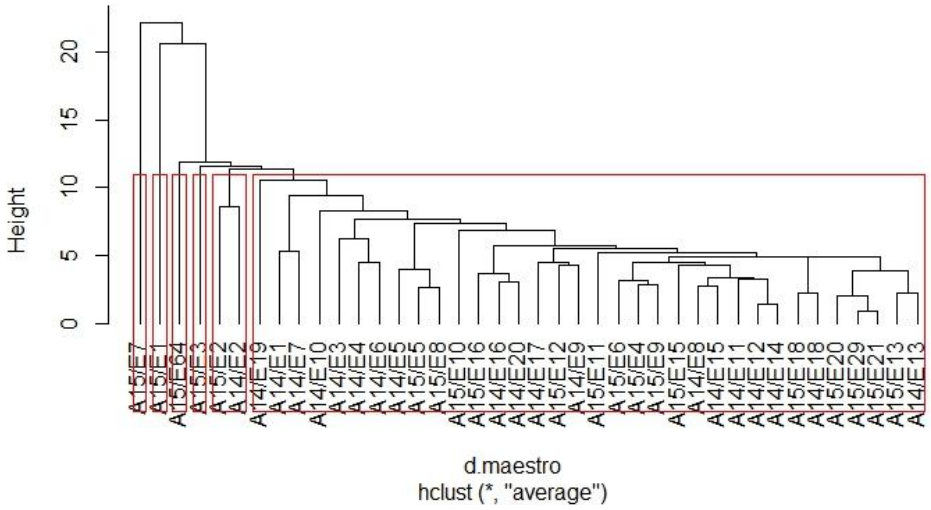

Figure 6. Tree Diagram Comparing the Consignee Strategy Import.

The consignee E2, which is a group (D.J. Exports), counts a complementary supply relationship from the Mediterranean and Oceania to the importation of North America. Rose Pacific is the variety purchased in Oceania, with reduced volume in Fuji and increased volume in Red Delicious.

The rest of the groups are for trading activities in 2015 that differ significantly, as in the case of E7 (Yupaa International), with purchases in the Middle East (Iran) of Red Delicious, in addition to being supplied with Galas from Eastern Europe (Poland). E1 (I G International) stands out for its strong purchase in Central Europe (Belgium) of Jonagold and Jonagored varieties, in addition to increasing commercial volume in East Asia with Huaniu and Qinguan varieties. E3 (Aayush Impex) is the company with the highest proportion of purchases of Red Delicious from North America, with a partial reduction of East Asian and East Asian Fuji.

IV

CONCLUSIONS

The market for imported apples in India has strong segmentation by variety and origin. Apples from the United States and China are the backbone that facilitate the development of this market, which has a low commercial concentration (Table 2).

The most important variety from the point of view of the consumer is Red Delicious, with a low commercial concentration; additionally, Fuji has a low commercial concentration in the analysed period. In moderate concentration with tendency to low concentration in 2015 one can make reference to Gala, Qinguan and Huaniu varieties. In the niche market with high commercial concentration are the Granny Smith, Evelina, Rose Pacific, Star Red, Queen, Jonagold, Modi, Golden Delicious, Higuan, Jolyred and Cripps Pink varieties (Table 3).

India is a complex model for the marketing of imported apples, with small structural change at the country level between 2014 and 2015 against a background of strong growth in world exports (Table 1). The complexity is the result of the interrelation of the monthly income of the importation, the varieties, the quality and the origin of the apples. Additionally, commercial logistics is a relevant factor according to the investigations.

However, all importers of apples show changes, which overlap each other. This explains that the general view of the country is of little change, in contrast to what occurs at the level of consignees or importers. The policy of the suppliers of the main importers confirm the important variations between scenarios during 2014 and 2015 (Figures 1, 2, 3 and 4).

Therefore, an interesting case develops to teach about commercial decisions and the need for intense and deep research on business movements. A metaphor makes it easier to understand this situation: a calm sea with few waves does not mean that there is no underwater current. These currents must be discovered, as this information

is necessary to make good business decisions. Public decisions that protect local economies also need this information for the development of efficient policies.

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