Peru’s Exports of Table Grapes to China: A Competitiveness Projection Model
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Abstract
Peru’s exports of table grapes have been through a process of constant and remarkable growing during the last years, which has place Peru among the worldwide top exporters of table grape. By the other hand is China as the main world’s consumer and remarkable importer of the mentioned fruit. Based on that, it is of great importance to study this industry focusing in the exports of table grapes, and the opportunity to strength the cooperation between Peru and China for the table grape business. Therefore this study aims to measure the competitiveness of table grapes, as well as the variables that affect it, the measurements were made through Vollrath’s index. After analysis it was confirmed the competitiveness of Peru’s exports of table grapes, having as its main determinants GDP, Production and Producer Price. It also showed the situation of China as a stable importer of table grapes.

Keywords: Vollrath’s Index, RCA index, Peru, Table Grapes, Production, Producer Price, Gross Domestic Product

1. Introduction
Peru’s economy has faced a steady growth for the last ten years, becoming in one of South America’s fast growing economies, reaching an average growth rate of 8% during the 2004 - 2012 period, mainly due to the boom of the sectors as mining and agriculture. Peru is widely recognized as one of the most diverse countries in the world, being center of origin of crops like potato and corn and with a deep tradition as an agricultural country. However, this diversity is not reflected in the national economy, where sectors like fishing represents only 1.5% of the national GDP and the agriculture 7.8%. There is, however, a dichotomy in the agriculture sector, because it employs 25.6% of the active population.

Worldwide consumption of fresh grapes reached 24.1 million tons in 2015. China is the largest consumer, with consumption of over 11 million tons in 2015. On the supply side, over the last decade, worldwide grape production has seen an upward trend, with a volume of 24.9 million tons in 2013. This is the result of improved production yields, particularly favorable weather conditions in some countries and continuous improvements in grape cultivation techniques. However, this growth was particularly driven by the emergence of new players in grape production and trade, such as South Africa and Peru.

In order to have a better idea of the global grapes market and to give context to the projection model, this research have included the main worldwide grapes producers. In the northern hemisphere, Italy and USA were chose, in the southern hemisphere; Chile and South Africa were considered, and because of its big market and big cooperation with Peru, China was considered also. These mentioned countries together account for 66% worldwide exports of table grapes (UN COMTRADE).

2. Objectives
The main objective of this research is to measure Peru’s competitiveness in the table grapes sector, using the Vollrath’s Index.

As secondary objectives, the research aimed to:
- Assess the variables affecting the competitiveness of Peru’s table grapes, in terms of technology, productivity, policy framework and advocacy, as well as internal and external factors that also affect the exports of Peru’s table grapes to China’s market.
Finally, this research aimed to be useful for the decision-making and planning of different actors in the grapes sector, such as grape growers, companies providing agricultural supplies, traders and companies operating in the sector, grapes importers and exporters, investors and institutions interested in the grapes market.

3. Theoretical framework and Background

3.1. Peru’s agriculture and grapes sector

To understand the importance and significance of Peruvian grapes exports to China is necessary to know the position of Peru in the global export business for agricultural products. In 2015, Peru exported USD 5.2 billion of agricultural products, with a surplus of USD 1.2 billion. Table grapes ranked first among the list of non-traditional category. The total export of Peruvian table grapes in 2015 was equivalent to USD 690 million, ranking Peru as the second largest exporter to the United States and the fifth largest global exporter (Commercial Office of Peru in New York).

Peru’s main trading partners play an important role in the economy. Firstly, in 2015 Peru has exported a total of USD 34.4 billion, being the main export destinations China with 21%, The United States with 15%, Switzerland with 8%, Canada with 7% and Brazil with 3.4%. In the same year, the total imports of Peru reached a total value of USD 38.2 billion, being the main suppliers China (22%), The United States (20%), Brazil (5%), Mexico (4.9%) and Chile (3.7%). It is possible to see that, for the last years, China and United States have been Peru’s most important trade partners. Please refer to appendix No. 1.

3.2. World’s table grapes sector

China is the largest consumer of table grapes, as for its domestic production and for the import of this fruit, with a consumption of over 11 million tons in 2015, followed by India and the European Union, with consumption of 2.7 million and 2.5 million tons respectively. The South American continent plays an important role as the main table grapes suppliers, being represented by Chile and Peru, it is also proper to mention that Brazil is considered an important consumer in the Latin American region, with approximately 1 million tons consumed in 2015 (USDA FAS). For details please refer to appendix No. 2 and 3.

Regarding the worldwide imports of table grapes, it has been also shown an increment compared to the last years, and in 2015 its imports are valued in USD 8.26 billion, which would be 4.18 billion tons (UN COMTRADE). The openings of new markets, free trade agreements and countries alliance, among other influences, have been the main reasons of the increment in the global imports, which has as main representatives in the European Union with 23% of the total imports, which is equivalent to 962 million tons, followed by United States and China with 20.7% and 9.6%. Please refer to appendix No. 4.

3.3. China’s grapes market

China is the world’s biggest table grapes grower and consumer, big part of its consumption is covered by the imports of table grapes which amount in 2006 was 43,000 MT and reaching in 2015 a total of 217,000 MT, by this big change we can see that, through the years, China has been consolidating its position as one of the main importers in the world. This growth was cause by many factors like opening of new markets and protocols for trading, signing trade agreements, growth of the production in the supplier countries, improvement in the searching tools to find export and import companies, easier and cheaper transportation, and so on. Although the constant growth has decreased in the last two years but we can say the table grapes has become more appreciated by Chinese consumers and gained a stable preference in the Chinese market.
4. Methodology

In order to assess the potential or already existing competitive advantage of Peru’s exports of table grapes to China, it was proposed a multiple regression model that considers dependent and independent variables that influence the competitiveness of Peru’s exports of table grapes.

This multiple regression model aims to analyze the main causes (independent variables) that affect the comparative advantage in Peru’s exports of table grapes (dependent variable). The analysis will allow the identification of those causes (used and disregarded variables), compare and predict the values of a variable, that is to say, it is possible to predict a behavior to an approximate degree.

To carry out a comparative analysis of the competitiveness, this research used the Vollrath’s index, and for this case we considered data from six of the more representative countries engaged with the table grapes business in the world (China, Peru, Chile, South Africa, United States and Italy), within a period of time of ten years (from 2006 to 2015).

During the data collection, we considered six independent variables that are believed to remarkably influence and affect the competitiveness of Peru’s exports of table grapes.

Regarding the independent variables, we considered the Producer Price, Production, GDP, Inflation, Cost of Export per Container and Yield, and as the main, dependent variable is the Revealed Comparative Advantage index (RCAgrapes), this index correspond to the main purpose of the study engaged with the exports of Peru’s table grapes to China.

Taking the RCA index as a starting point, and dependent variable, the multiple regression model aimed to quantify the influence of the economic variables on Peru’s exports of table grapes to China. This index is estimated through the Ordinary Least Square method (OLS). The OLS method was used because it is the most fundamental and highly used method to find estimations that include desirable statistical properties like unbiasedness, efficiency and consistency (Greene, W., 2012).

The process of the data and estimations was made using the software STATA 12.0. The preliminary estimated model is defined as follows:

\[ RCA_{grapes} = \beta_0 + \beta_1 \times PROD + \beta_2 \times PRODPRICE + \beta_3 \times GDP + \beta_4 \times INFLAT + \beta_5 \times CTEXPCONT + \beta_6 \times YIELD + \epsilon \]

Where RCAgrapes = Vollrath’s Revealed Comparative Advantage (competitiveness of exports of table grapes), PROD = Production of table grapes, PRODPRICE = Producer price of table grapes, GDP = Gross domestic product, INFLAT = Inflation, CTEXPCONT = Cost to Export (Per Container) and YIELD = Yield per Hectar. In turn all the \( \beta \), with i = 0, represents the influencing factor of each variable in Peru’s exports of table grapes, \( \beta_0 \) is the constant or intercept term in the equation and it represents the change of the competitiveness which is not explained by the other independent variables, finally, \( \epsilon \) represents the random error of the model. The definitions of each variable are as follows:

- **Revealed Comparative Advantage (RCA):**
  
  The calculation of the Vollrath’s revealed comparative advantage index applied to this study was developed considering five representative countries that are closely engaged with the table grapes sector (China, Chile, South Africa, The United States and Italy), for effects of comparison and have a certain knowledge of how competitive are Peru’s exports of table grapes, these five countries will represent the rest of the world, this allowed us to quantify, compare and evaluate the competitiveness. For the calculation of the RCA index it was required to collect data of exports and imports of table grapes from each country, mentioned data were obtained from UN COMTRADE (2017).

  Vollrath (1991) stated that Revealed Comparative Advantage Index establishes a clear difference between one specific good and the rest of the goods traded in an economy, and between a country and the rest of the country, it is a must to avoid double counting between products and countries. Additionally, it’s important to highlight that as this index requires data from exports and imports, the index also take into consideration the supply and demand of products, (Arias and Segura, 2004). This index will be expressed as following:

\[ RCA = CAE − CAI \]
Where CAE and CAI are the comparative advantage of exports and imports respectively.

This index will be calculated as following:

For this case it will be consider the following:
* Specific good: Peruvian Table Grapes
* Specific country: Peru
* Rest of the goods: Total amount of revenues minus the revenues from exports of table grapes
* Rest of the World: Composed by the most significant table grapes exporters (Chile, Italy, USA, South Africa and China as our target market)

This RCA index is comparable among products, so it means that the higher is the RCA of a product, its competitive position in the market will be better.

- **Production of Table Grapes (PROD):**
  In the theory of comparative advantage David Ricardo (1817) states that trade benefits countries that specialize in the production of goods with the lowest opportunity costs. Later Myrdal (1956) and Prebisch (1959) stated that a country will benefit if it specializes in the production of goods whose manufacture is intensive in its abundant resources and best results can be achieved by specializing in the production of labor-intense goods.

- **Producer Price of Table Grapes (PRODPRICE):**
  The variable defined as producer price is important to be consider during the measuring of the competitiveness, due to its fluctuation within the years and the countries covered in this research. The definition of producer price says that it is the prices received by farmers, producers or sellers for primary crops, live animals and livestock primary products as collected at the point of initial sale, in another words, prices paid at the farm-gate.

- **Gross Domestic Product (GDP):**
  According to the statistical concept and methodology, the gross domestic product (GDP) represents sum of value added by all its producers. Value added is the value of the gross output of producers less the value of intermediate goods and services consumed in production, before accounting for consumption of fixed capital in production. Total GDP is measured at purchaser prices. Value added by industry is normally measured at basic prices (The World Bank, 2017).

- **Inflation (INFLAT):**
  Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly (International Monetary Fund IMF, 2017).

- **Cost to Export per Container (CTEXPCONT):**
  Cost measures the fees levied on a 20-foot container in U.S. dollars. All the fees associated with completing the procedures to export or import the goods are included. These include costs for
documents, administrative fees for customs clearance and technical controls, customs broker fees, terminal handling charges and inland transport.

- **Yield per Hectare (YIELD):**
  It is simply defined as the harvested production per hectare for the area under cultivation. The harvested production means the production including on-holding losses and wastage, quantities consumed directly on the farm and market quantities, indicated in units of basic product weight (FAO, 2017).

5. Analysis and Results

5.1. Estimation of the Vollrath’s index: Following the fundamental premise that the countries show an optimal economic level when they are able to export those goods in which they have competitive advantages. Based on this premise, the results that we got after calculation show that Chile and Peru remarkably meet these conditions, consolidating their position as main world’s exporters of table grapes, Chile’s RCA index has been decreasing during the last years, while Peru’s RCA index has been significantly increasing. South Africa and Italy much below but still with a positive RCA index, which means that they are competing in the international market of table grapes, by the other hand China and USA are below these conditions, which although their considerable amount of domestic production but their competitiveness index still highlight their need for importing table grapes to satisfy their demand. The appendix No. 5 shows graphically the VCR index for all the countries considered for the study.

During the period 2006 to 2015, Peru has been keeping a positive RCA index (above “0”), which indicates that the country’s exports of table grapes are competitive. It was also corroborated that this index growth have gradually increased faster and higher than the other countries considered in this study, it is important to highlight that Peru’s GDP growth increased steadily, from USD 88.643 billion in 2006 to USD 189.212 in 2015 and In 2015 the production cost for one ton of grapes was 719.22 USD in Peru; USD 979.11 in China, USD 762.16 in Chile, and over USD 1,000 in United States, Italy and South Africa (FAO, 2017), therefore Peru possesses a higher expertise in the table grapes market.

By the other hand the countries with comparative disadvantage are the ones that import table grapes, which is the case of USA and China, for these countries the scenario is different and they cannot compete with the others, as their internal demand is higher than their production, also could be that the costs for producing are much higher than the ones for importing, as well as the opening of the Chinese market for new suppliers like the case of Peru after the Free Trade Agreement came into effect, among other factors. Showing China’s RCA index for exports of table grapes below “0” among the last years, confirm its role as main world’s consumer and importer of table grapes.

5.2. Estimation of the model: For the estimation of the model it was applied the method of Ordinary Least Square (OLS), which is the most fundamental and highly used method to find estimations.

Based on the preliminary estimated model, it was applied several observations which correspond to the variables included in the model. The next step in the process was to verify the goodness of fit of the estimated model, for the verification there were two statistics test, F-test and t-test, they were applied to determine the global of the model and the individual significance of the parameters, thus be able to confirm if they are significantly different from “0”. The process continued with more consistency tests, which allowed to us confirm that the residuals are normally distributed, not existence of multicollinearity or autocorrelation. Please refer to appendix No. 6, which shows the resulting model after analysis.
6. Difficulties

Due to the obstacles to collect the data of exports and imports for all the world’s countries, it was decided to select a special group of countries with different characteristics and important role in the table grapes field.

It was decided to exclude seven variables due to some difficulties as poor correlations, statistically insignificant data, low relevance, etc. Among the excluded independent variables we had: market price, GDP deflator, real exchange rate, and tariff rate.

7. Conclusions

After the calculation of the RCA index and incorporate it to the resulting model as the dependent variable, we conclude that Peru is highly competitive in the exports of table grapes, showing a constant growth from 2006 to 2015.

Although being considered the first table grapes exporter of table grapes, Chile has showed a decrease in its competitiveness since 2013.

China’s RCA index among the considered period (2006 to 2015) were always below “0”, which shows that China’s table grape scenario is not competitive for export this fruit, on the contrary China is a remarkable importer of table grapes.

8. Recommendations

It is strongly recommended that governments from Peru and China keep strengthening their bonds, especially in the agricultural filed, table grapes sector to be more specific, thus they can find a mutual benefit, Peru as main supplier of table grapes for the Chinese market, and China to expand its suppliers range, being able to successfully satisfy its domestic demand.

As the constant growth of Peru’s table grapes exports competitiveness strongly depends on variables as, Production and Producer Price, the Peruvian government should increase the support and promotion of training programs, through the Association of Table Grapes Producers (PROVID), this could help to maximize the efficiency of the producers, strength their abilities and correct their weaknesses involved in the production and the costs needed for it.

9. Bibliography

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10. Appendix

Appendix No. 1

Appendix No. 2
Appendix No. 3

The world’s fresh table grape importers (estimates for 2015/16 by USDA FAS)

Appendix No. 4

RCA Index for Selected Exporters/Importers of Table Grapes

Source: Self elaboration - Appendix No. 5

Appendix No. 6