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ON THE COMPETITIVENESS OF MEXICO'S DRY CHILI PRODUCTION

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Summary

Mexico has become the sixth-largest dry chili exporter in the world and the largest chili (Capsicum annuum L) exporter, showing not only its production capacity but also giving it a decisive advantage over its main competitors. The aim of this paper is to describe the competitive structure and dynamics of chili exportations in Mexico over the period 1993-2008. In order to compare the export growth performance with the performance of similar exporter countries, we look at the behavior of the Revealed Export Advantage index and the Constant Market Share Analysis. For all countries included in the analysis, the study considers the U.S as the objective market due to the current dry chili export market participation. The result suggests that Mexico occupies an important place in the global production but not a leadership place in exportations of dry chili at worldwide level.

Key words: *competitiveness, exportation, capsicum annuum L, Mexico.*

JEL: *F14, N70, Q17*

Introduction

The agricultural sector has been demonstrated to contribute to improve the behavior of many economic activities, and at the same time it figures prominently in the development strategy of the countries. The participation of agricultural activities on economies is a system to enforce international trade competitive advantages, this fact is particularly interesting given the global economy where competition across manufactured products is generated by a high value-added supply chains. Most of this competition, based on the know-how, involves agricultural products that allow producers to capture greater value than would normally be secured through conventional commodity channels.

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The above ideas raise interesting research questions, especially in countries such as Mexico where agriculture is one of the main economic activities. Moreover, agribusiness activities in the countryside provide an opportunity to farmers and other stakeholders to realize higher and more stable income. The agribusiness activities also provide a secure and safe food supply to people, filling the first requirement of any sovereign state. In doing so, a broad view of the production process could be analyzed by identifying strengths and weaknesses, and becoming an important tool for analysis of agricultural activities.

According to the Mexico's Agri-food and Fisheries Information Service (SIAP), the country is the biggest exporter of green chili in the world and the sixth largest one of dry chili. Among the main customers of dry chili we can mention the U.S., Japan, Germany, Canada and the UK (SIAP, 2010). The long tradition of Mexico's chili consumption and production started during the Mesoamerican context, and nowadays chili could be considered as one of the main sources of feed in the country. In view of this, it is necessary to recognize the strong impact of this product on the production structure of Mexico, particularly in employment generation, foreign exchange earnings, market access in potentially important markets and agricultural value chains.

In Contreras (1999) the competitive advantage in production and exportation of avocado is analyzed during the period 1986-1997, the author concludes that Mexico shows growing revealed comparative advantages in this product especially due to the important growth in the exports to France. In a similar study, Ayala et al. (2008) analyze the competitiveness of Mexican bean in trade openness context, despite the large production their results suggest that at macro level the competitiveness was negative due to the overvalued exchange rate, favoring the dumping of imports in local markets. Finally, using technology levels, production costs, profits and prices, in Reyes et al. (2006) is pointed out the performance of the dry chili production system in the state of Zacatecas, Mexico. The authors found that as property size and technology application increase, yields per hectare were bigger and profitability increased as well.

Although there are some previous studies that have addressed competitiveness issues for agricultural products in Mexico, there is a lack of evidence related to the dry chili in the international market. The combination of the previous features leads us to suggest as a main hypothesis of the paper that Mexico is losing competitiveness on its capacity to increase the exports of dry chili. On the other hand, we assume that China and India have been raising their comparative advantage in dry chili exports. However, we think that the important geographical position of Mexico as a neighbor of the U.S. and the increasing demand in spicy products are strong opportunities for develop the agri-food industry, especially regarding commercialization of many chili varieties.

Following the focus on trade openness, the aim of this paper is to analyze the dynamic of chili exports in Mexico in comparison with its main competitors over the period 1993-2008. Using the Revealed Export Advantage index (RXA) and the Constant Market Share Analysis (CMSA) this study outlines competitive advantages of the product where dynamic could be attributable to the characteristics of the region (competitiveness

effect). The results allow decision-makers to construct a rich understanding of the supply chain process.

Methodology

To capture the degree of specialization of a country, the RXS allow us to estimate revealed advantages of a country taking into account various characteristics. The concept of "revealed" export advantage was introduced by Liesner (1958) but redefined and popularized by Balassa (1965). Formally, the RXA of product *a* in country *i* is given by $RXA_{ai} = \left(\frac{x_{ai}}{x_{ni}}\right)/\left(\frac{x_{ar}}{x_{nr}}\right)$ where x_{ai} is the export value of product *a*, x_{ni} is the value of total exports (minus product *a*), x_{ar} is the world's export value of product *a* (minus country *i*) and x_{nr} is the total world's export value (minus product *a* and minus country *i*). On the basis of this index, a country is defined as being specialized in exports of a certain product if its market share in the product is higher than the average or equivalently, if the weight of the product of the country's exports is higher than its weight of the exports of the reference area. A country reveals comparative advantages in products for which this indicator is higher than 1, showing that its exports of those products are more than expected on the basis of its importance in total exports of the reference area.

The second level of analysis consists in exploring causes of changes in exports. In doing so, the CMSA allow us to investigate trade trends and laws in order to determine those factors affecting country's export-performance. The CMSA model was first used by Tyszynski (1951) for trade in industrial products where the basic model determines a country's share in the reference market. In basic CMSA the change in a country's exports is made up by the sum of three effects: scale effect, competitive effect and second-order effect. Formally, these effects are determined by:

$$\Delta q = S_0^j \Delta Q^j + \Delta S^j Q_0^j + \Delta S^j Q^j \quad (1)$$

where *q* is the quantity of exports, Δ express the change in the variable over a discrete period of time, *S* represents the proportion in the market of a specific country and *Q* contains the volume of exports by the group of competing countries that export to the reference market. The indexes *j* and 0 represent the reference market and the beginning of the period, respectively. Specifically, this study considers U.S. as the reference market due to its importance in imports, consumption and economic growth.

The first term in the right-hand side (scale effect) of equation (1) is the average of growth in dry chili exports if individual market shares are constant. If the effect is positive, growth in the product's demand will affect positively the variation of exports. The second term (competitive effect) can be interpreted as the average growth in dry chili exports if imports are fixed. The negative or positive sign indicates the loss or gain in competitiveness during the period of analysis. Finally the third term (second-order effect) reflects the average correlation between export growth and market share growth. However, the scale effect and competitive effect in the basic model can be further decomposed to provide insights

into whether they are due to the general growth in all markets or due mostly to the growth in some markets. This decomposition at the second level have been used for the case of Mexico with the intention to analyze the exports of avocado, fruits and vegetables, and strawberries, respectively, the extended technique have been used by Contreras (1999), Avendaño (2008), and Ávila-Arce and González-Millán (2012). Formally, the change in a country's exports is given by:

$$\Delta q = S_t^0 \Delta Q_j + (S_j^0 \Delta Q_j - S_t^0 \Delta Q_j) + S_t \Delta Q_j^0 + (\Delta S_j Q_j^0 - \Delta S_t Q_j^0) + \left(\frac{Q_t^1}{Q_t^{0-1}}\right) \Delta S_j Q_j^0 + \left[\Delta S_j \Delta Q_j - (Q_t^1 / Q_t^{0-1}) \Delta S_j Q_j^0\right] \quad (2)$$

where 1 represents the end of period *t*.

Hence, a total of six effects can be obtained from (2): 1. Growth effect $(S_t^0 \Delta Q_j)$: is the change in exports that occurs when an exporter's share remains constant. 2. Market effect $(S_j^0 \Delta Q_j - S_t^0 \Delta Q_j)$: is the change in exports that is observed if the exporter maintains its initial participation in the reference market during the period. 3. Pure residual effect $(S_t \Delta Q_j^0)$: represents the part of the change in exports that is attributable to changes in general competitiveness. 4. Static structural residual effect $(\Delta S_j Q_j^0 - \Delta S_t Q_j^0)$: measures the change in exports attributed to changes in competitiveness in the reference market. 5. Pure second-order effect $\left((Q_t^1 / Q_t^{0-1}) \Delta S_j Q_j^0\right)$: measures changes in an exporter's share in the reference market and changes in global demand. 6. Dynamic structural residual effect $(\Delta S_j \Delta Q_j - (Q_t^{1-1} / Q_t^{0-1}) \Delta S_j Q_j^0)$: contains the interaction between an exporter country's share in the reference market and the changes in its level of demand.

Finally, we produce a Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis in order to identify the advantages, difficulties, but also areas of opportunity that can benefit producers. The intention of the analysis is to enhance their competitive qualities reflected in their export qualities.

Results

Figure 1 shows the dry chili export capacity of Mexico over the period 1993-2008, despite the significant fall in recent years, the export trends (tonnes and value) are positive. However, due to the downward trend since1999 it is difficult to know how to interpret Figure 1. The RXA and CMSA will provide us important information about the competitiveness behavior and thus, being able to know if the downward is attributable to competitive reasons.

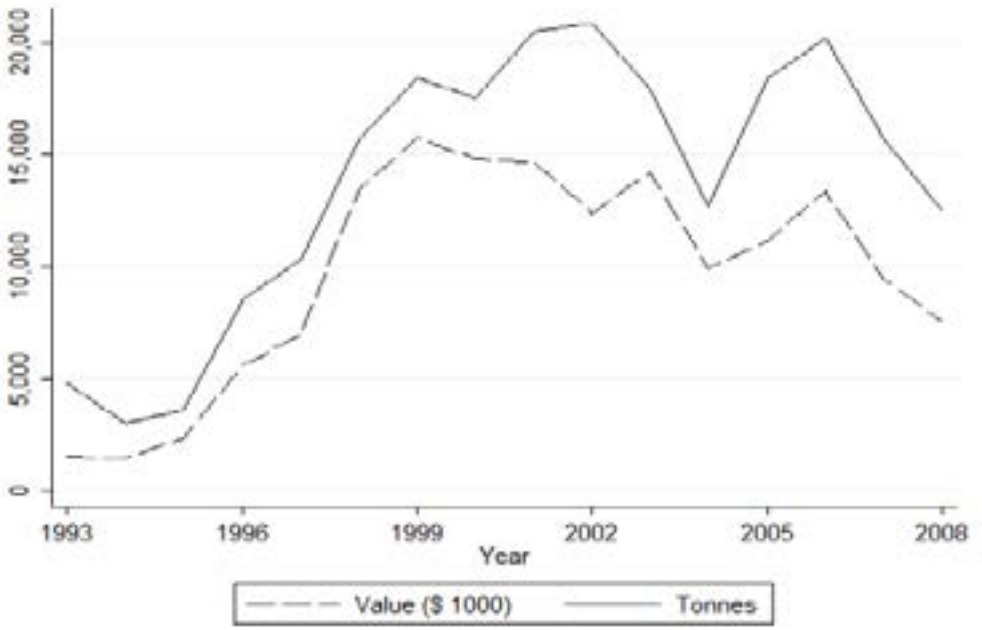
Considering all the varieties such as fresh and dried, the evolution of Mexico's chili exports has been even more encouraging. The dynamic growing of Mexican chili exports is showed in Figure 2, though, the relative weight of the dry chili on them have been really low, it is possible to appreciate a constant growing trend.

In addition, it is important to note that Mexico has been one of the countries most involved in the production of chili, especially considering in all its varieties. Regarding to the export levels (tonnes and value), the country has ranked between the eleventh and eighth place on

the list of major dry chili exporting economies. During the period 1993-2008, the countries that have occupied the first three places according to its export levels have been China, India and Spain. The result is particularly interesting since we can easily identify the main competitors to Mexico.

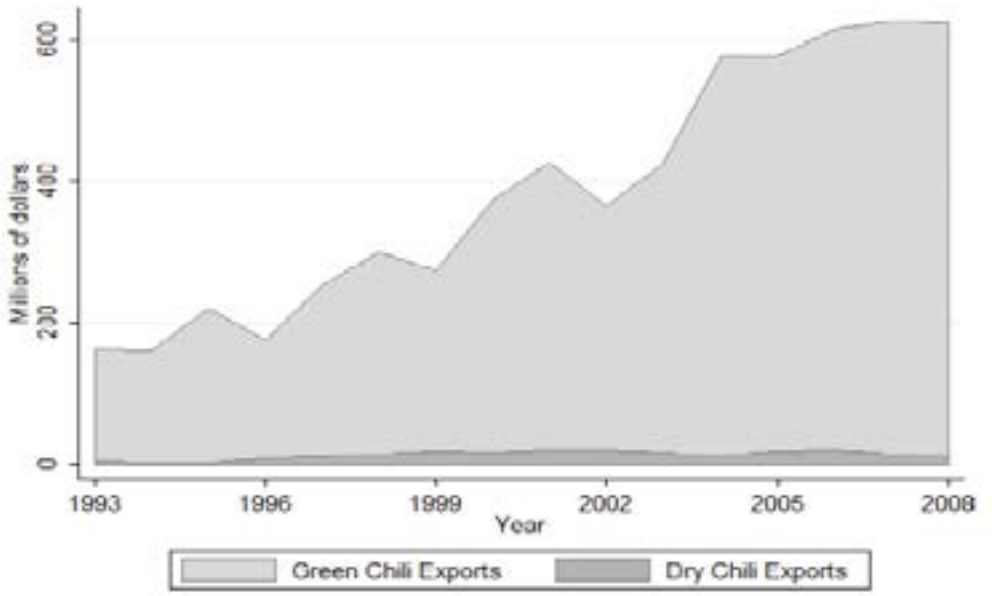
Extending the Mexico's comparative and competitiveness analysis, Table 1 shows the relative advantage derived from calculating the RXA of dry chili. We may expect that high levels of exportation volumes will correspond to high values on the index. However, the index behavior depends also in the relative weight of chili on the structure of agricultural trade industry. As a result, although China was the main producer in 1993, 1998 and 2003, India's economy reported the highest values on the RXA with exception of the year1998.

Figure 1. Mexico dry chili exports, 1993-2008



Source: Author's own elaboration based on data from the website of the Statistics Division of the Food and Agriculture Organization of the United Nations (FAOSTAT).

Figure 2. Mexico chili's total exports by variety, 1993-2008



Source: Author's own calculation based on data from FAOSTAT website.

In the case of Mexico, it is remarkable that during the whole period the country reported values on the index lower than one, therefore, the result could be interpreted as a lack of comparative advantage, possibly explained by the large proportion of green chili (and other agricultural products) in exports. However, this result is not a detriment to the competitive qualities of the dry chili production because the dynamic behind exports can reflect a positive trend once we disaggregate its main factors.

Table 1. Revealed Export Advantage: Major dry chili producers, 1993, 1998, 2003 and 2008

Year	China	Spain	India	Mexico
1993	1.75	1.32	2.32	0.54
1998	2.31	1.29	2.07	0.72
2003	2.75	0.76	3.08	0.53
2008	3.92	0.71	4.32	0.21

Source: Author's own calculation based on data from FAOSTAT website.

In Table 2 the detailed results of the CMSA are presented. From the magnitude of the exports change only Spain shows a negative variation, implying that with the exception of this country, the change in exports is attributable to a significant increase in demand. Despite in the case of Mexico, the effect of the change in exports is positive, its magnitude

is very low compared with China or India. Nevertheless, the reading of Table 2 should be done carefully. The second level of decomposition shows a high relative market effect in Mexico, explained by fixing U.S. as the weight of target market. The intuition behind this high-value of the market effect in Mexico can be somewhat related to the advantages of the geographical proximity to the U.S. market, the important number of trade agreements and the lower transportation costs compared with its competitors.

Table 2. Market share effect of Mexican dry chili exports, 1993-2008

Indicator	China	India	Spain	Mexico
Exports change	6181.06	6,463.51	-13.37	353.56
First level of decomposition Δq				
Scale	5,422.44	5,342.70	37.60	284.63
Competitiveness	318.97	298.85	-40.23	15.23
Second order	439.66	821.95	-10.74	53.70
Second level of decomposition Δq				
Growth	3,724.01	3,401.30	46.60	46.83
Market	1,698.43	1,941.40	-8.99	237.79
Second order	137.97	1,697.84	-62.53	10.74
Static structural residual	181.00	-1,398.99	22.30	4.49
Pure second order	554.95	1,549.69	-27.06	56.59
Dynamic structural residual	-115.29	-727.74	16.31	-2.88

Source: Author's own calculation based on data from FAOSTAT and EUROSTAT FAS-USDA.

Under this scheme, it is clear that Mexico is underutilizing existing natural opportunities to capitalize on competitive sales at least as far as the export capacity is concerned. Furthermore, in Mexico are grown over a hundred varieties of chili concentrated in 22 groups of green types and 12 groups of dry types, the varieties of jalapeño, poblano, serrano or bell pepper are the most consumed (SIAP, 2010). This natural advantage allows investors to earn higher returns by taking advantage of Mexico's strengths in chili production.

Table 3. Production and commercialization strategies for Mexico's dry chili/SWOT Analysis

STRENGTHS	WEAKNESSES
• Mexico occupies an important place in the international green and dry chili´s markets. • Increasing trend in exports (volume and value). • Stability on sales to the U.S market. • Stable revealed export advantage where the market is able to handle a large volume of trades without causing large shifts in price.	• Weak path in exports (volume and value). • Low share of participation overall total export volumes. • There is a short window opportunity of access to Southeast Asia's market and also a strong competition by India and China. • Weak upward trend in the revealed export. • Due to the evolution of the yield per hectare and total cultivation area, it is possible to infer the existence of problems related to low technology and poor quality levels. • Low value added.
OPPORTUNITIES	**THREATS**
• By exploiting the high demand for chili and improving the logistics distribution supply chain it is possible to increase in the participation rate of dry chili among the total exports (all varieties). • Mexico can take the place of Spain as an attractive source of dry chili supply, and moreover, to become a strong competitor to Peru in the U.S. market. • Important weight of the market effect. The result is largely explained by the increase in exports due to both, fixed U.S. as the main destination market and the large number of free trade agreements. • To promote greenhouse production in order improve quality levels, increase production and promote the early harvest. • Add value to the commodity before export. • Design a strategy with the intention of exploiting the benefits of its high nutritional value. • Be able to exploit the large number of chili varieties. • Take advantage of the U.S. Hispanic market. • The possibility to develop insecticides based on chilly with innocuous proprieties.	• The increasing participation of China and India in world dry chili exports. • Mexico could be displaced from the U.S. market. • China and India show an important component of the growth factor in exports volume, highlighting its competitiveness through comparative advertising countries. • The Market distortions generated by the large number of intermediates. • The producer's vision of export process is still limited.

Source: Author's own elaboration based on previous results.

Finally, Table 3 presents the SWOT analysis of the dry chills production in Mexico. It is important to remark that despite the low magnitude in the market effect (in comparison with China or India) the Mexican product has great potential to become a successful export item due to the size of the U.S. market and its high consumption.

As derived from the SWOT results, it appears that Mexico has a privileged geographic location, not only because it possess extensive areas where the climate and ground composition favor the cultivation of chili in all its varieties (fresh and dried), but also because its proximity to the U.S. market. The regional and natural advantages place Mexico in a unique category relative to the rest of the producers. Thus, there exist a real opportunity in order to increase the exports and promote competitive processes in the supply chain, especially in the value-added issues.

Therefore, the country has the potential to develop export strategies taking into account the geographical proximity to U.S. and the large Hispanic consumer segment in that country where chili occupies a central place in their diet. Finally, the intensification of international economic competition has been derived in savings in transport costs, and global mobility of capital, inputs and products. But at the same time, the new market conditions have nullified in somehow the advantages of location opening possibilities for distant producers such as China or India.

Discussion

The results derived from this paper show present competitiveness indicators for one of the most popular Mexican agricultural products. The competitiveness indicators are consistent with the comprehensive diagnosis presented in Ayala et al. (2008) about the loss of competitiveness on the Mexican agricultural sector during 1980-2009. Hence, according to the authors, represents a serious threat due to the implications that the agricultural sector has on the rural population welfare.

Considering the approach of Taylor (1997) the loss of competitiveness of Mexico in the dry chili exports can be partially explained by the sector internal conditions, in particular on its technological-productive structure. Moreover, the findings on the poor performance of competitiveness are consistent with the study of Gómez-Oliver (2008) where the author notes that the problem of low competitive capacity is multidimensional possibly explained by the low investment rates and the insufficient support from the government on the countryside. In addition, similar studies (Schwentesius et al., 2011, Avendaño, 2008) where other agricultural products are considered, suggest that Mexico requires a restructuring policy instruments applied to promote development in rural areas, especially regarding to the development of management skills, organization competencies, and technological innovation process.

This document is limited to describing the evolution of Mexico's dry chili exports by disaggregating its determinants. Thus, one of our main objectives is to derive regulatory elements in order to capitalize on opportunities for agricultural producers and local governments. In spite of this scenario, some alternatives to deal with, we can found the technical improvement of chili's production process, the adoption of new cultures in greenhouse cultivation, inspection and treatment of plants, and the added value with

respect to the traditional commodity (e.g. the production of sauces or chili powder for retail sale, snack manufacturing and Mexican cuisine). It is also relevant to consider possible small cultivation areas in order to reduce production cost, generate increasing returns to scale and obtain a higher level of productivity from ground optimization process. Furthermore, we should note that it is necessary to capitalize the advantages of international trade about Mexican chili products. Dry chili could take an important place in exports, especially to U.S., and also boost its competitiveness against the onslaught of Asian and South American producers.

In general, the current scenario provides some difficulties for the development of Mexican dry chili's production and trade. Policy measures to encourage producers to continuously improve and to invest in the development of their organization, their workers and their technical structure, may be recognized as a possibility to address the current limitations on exports. The improvements in these areas added to the natural advantages in production should lead to more effective and efficient trade, especially considering the current possibilities of export to U.S. The outlook, therefore, remains optimistic due to the market opportunities. Finally the country has several veins of opportunity that could place Mexico as production and trade leader of chili in all its varieties.

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