Oligopolistic Structure in the Japanese Pistachio Import Market

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INTRODUCTION

Historical data during the period of 1982-2008 shows that the pistachio market in the world had changed from a monopoly by Iran to a duopoly formed by Iran and the U.S. Iran dominated the world markets in 1980’s, but a dramatic change occurred in the 1990’s and U.S. pistachio gradually penetrated the international markets. Japan, one of the traditional markets for Iran’s pistachios, is a good example of this change in the market. According to Japan’s customs’ statistics, a dramatic decline in Japan’s total import affected Iran more than other exporters. Japan’s total import from Iran dropped from almost 7500 tons in 1995 to 240 tons in 2010; meanwhile the U.S. experienced a steady increase in total export quantity.

This research investigates the empirical question whether the Japanese pistachio import market is best characterized by Cournot or Bertrand duopoly competition, or some other form of game, using normalized likelihood ratio statistics for the model comparison.

MODEL and DATA

• Model

Six non-nested models were estimated for which price was the strategic variable in the first three models and quantity in the remaining models. Considering two different strategic variables of quantity and price, full information maximum likelihood (FIML) resulted in different estimates. Having proper game-specific nonlinear-equation restrictions enabled us to form six alternative models. The likelihood ratio (LR) statistics is used for model selection.

• Data

Annual data on Japan’s import of pistachios from Iran and the US is used from 1988 to 2010, a total of 23 years of observations. Total value of import data for each country of origin is obtained from Japanese customs dataset and the unit prices are computed from this information. Data on exchange rates is obtained from research and statistics department in the Bank of Japan. Japan’s per capita GDP is obtained from IMF International Financial Statistics.

EMPIRICAL RESULTS

• Key to notation

1. The models are: M1-Bertrand; M2-Stackelberg with Iran price leadership; M3-Stackelberg with U.S. price leadership; M4-Cournot; M5-Stackelberg with Iran quantity leadership; M6-Stackelberg with U.S. quantity leadership.

2. A negative sign implies that the model in the column is preferred to the model in the row.

• Estimation Results

Table 1: Normalized LR Statistics

<table>
<thead>
<tr>
<th></th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>0.17</td>
<td>-0.3</td>
<td>4.94**</td>
<td>0.02</td>
<td>-1.3</td>
</tr>
<tr>
<td>M2</td>
<td>-0.26</td>
<td>12.56**</td>
<td>-0.47</td>
<td>-0.53</td>
<td></td>
</tr>
<tr>
<td>M3</td>
<td>5.41**</td>
<td>0.09</td>
<td>-1.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M4</td>
<td>-11.91**</td>
<td>-4.90**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M5</td>
<td></td>
<td></td>
<td>-0.37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Significant at the 5% level

CONCLUSION

According to the statistical methods used, the price models fit the data better than quantity models. The model which best fits the data was Stackelberg with the U.S. quantity leadership (M6). In that situation, the U.S., as the leader, plays a game similar to capacity accumulation game, and then it would increase investment to force Iran to restrict its own quantity, leading to a greater market share for the U.S.

Production costs and product differentiation can play a significant role in decisions for strategic interactions. According to van Damme and Hurkens (1999), leadership of a country can be continued as long as the production costs of the follower are higher than the leader. The U.S. is much more productive and advanced technologically, and has a much higher yield per acre than Iran (Zheng, et al., 2012). Thus, Iran, by reducing its relative production costs, and/or using product differentiation could potentially regain the lost market share in the Japanese pistachio import market.

Overall, since under general conditions in Stackelberg games quantity competition is less competitive than price competition (Dastidar 2004), there is a possibility of collusive behavior in this market structure.

REFERENCES