Potential Economic Benefits of El Niño/La Niña Forecast on the Fishery Sector

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Abstract

The purpose of the poster is to show the potential economic benefits of El Niño/Southern Oscillation (ENSO) forecast on the fishery sector targets mackerel in offshore area in Taiwan, the Chileno and Peruvian fishmeal targets herring, anchovy, and larval anchovy, and the Taiwanese tuna purse seine fishery targets oceanic highly migratory skipjack in the south-western Pacific Ocean. Three hypotheses were proposed earlier, and this paper uses an empirical study to identify the potential economic impact of ENSO on fish biology, marine environment, and fisheries economics in the long run.


2. The simulation result shows that 14 months after the beginning of a strong El Niño, the biomass index would drop by 13.2% during the current January, to major fishing season.

3. (Conclusion remarks)

Based on the results of a fishing fleet catch survey, the monthly average catch can be calculated by controlling the catch to the average catch. Two series of average catch can be obtained, one by setting NINO 1.2 to be 20% higher than NINO 0.0 and the other by removing the higher value for July to January, 13 months preceding the fishing season. The ENSO and AC NINO represented scenarios and without the presence of ENSO effect. It shows that about 14 months after the strong El Niño has occurred the number of fishing days is 10.4% higher, i.e., if there are fewer than expected, fishing days tend to respond to ENSO.

A year without the ENSO effect, the actual monthly average landing per fleet during September to January is 86.41 metric tons, and the simulated monthly average catch is 98.28 metric tons. A strong El Niño can be observed in the annual average of the total catch.

1. 2. A Welfare Analysis of ENSO Forecasts in the International Trade of Fish Meal: An Application of Static and Spatial Equilibrium Model, American Agricultural Economics Association Annual Meeting: August 5-9, 2001, Chicago, IL. (Funded by National Science Council, Taiwan, R.O.C., 2001)

Chile and Peru were the two major fishmeal export countries in 1996, their fishmeal export accounted for the total world exports. Based on experience of the 1997-1998 El Niño, Fish Fig. 5 shows that both the catch of pelagic fish in Chile and Peru experienced almost 60% reductions in 1998 with respect to 1997.

Table 1: Welfare Decomposition of the International Trade under Strong, Weak ENSO and Normal Scenarios

<table>
<thead>
<tr>
<th>ENSO Condition</th>
<th>Scenario</th>
<th>Export Price</th>
<th>Inland Price</th>
<th>Export Quantity</th>
<th>Inland Quantity</th>
<th>Export Value</th>
<th>Inland Value</th>
<th>Total Value</th>
<th>Export Exporters</th>
<th>Export Importers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong ENSO</td>
<td>$35.00</td>
<td>$32.00</td>
<td>1.13</td>
<td>1.25</td>
<td>42.12</td>
<td>46.96</td>
<td>31.08</td>
<td>57.44</td>
<td>17.75</td>
<td>-1.31</td>
</tr>
<tr>
<td>Weak ENSO</td>
<td>$32.00</td>
<td>$29.00</td>
<td>1.15</td>
<td>1.27</td>
<td>44.86</td>
<td>50.72</td>
<td>31.86</td>
<td>57.88</td>
<td>16.10</td>
<td>-1.76</td>
</tr>
<tr>
<td>Normal ENSO</td>
<td>$30.00</td>
<td>$27.00</td>
<td>1.17</td>
<td>1.29</td>
<td>47.60</td>
<td>53.48</td>
<td>33.12</td>
<td>60.00</td>
<td>13.90</td>
<td>-2.06</td>
</tr>
</tbody>
</table>

The strong ENSO scenario is based on previous experience in 1997-1998. The weak ENSO scenario is based on average values of the two ENSO years. The normal ENSO scenario is based on average values of the two ENSO years.

The percentage of the total value decomposition that went to the catch in Peru and Chile was 32.9%.

4. The total ENSO benefit for the ENSO year 1998 was 13.9 million US dollars.

The simulated welfare decomposition of the international trade of fish meal under strong ENSO scenario is 15.9 million US dollars, 13.9 million US dollars, and 9 million US dollars for Peru and Chile, respectively, in Table 1, Fig. 4 and 6. By comparing the real social welfare under the strong ENSO in 1998 with the Normal scenario in 1996, the Chinese, Russian, and US, which is about 50% and 25% of the social welfare in 1996. Before the ENSO, the major anchoveta catchers concentrated at centers of synopsis along the Peru coast in the ENSO years, while anchovies concentrate south of 175°W in the Chilean waters, out of the reach of the Peruvian fisheries. The fishermen in Peru suffered heavy economic losses, and the fishermen in Chile had to try being in other catch during the fishing season in 1997/1998, but not the fishermen in Chile.

5. An Impact Evaluation of La Niña on the International Trade of Skipjack Purse-seine Fisheries (Funded by National Science Council, Taiwan, R.O.C., 2001)

Following 1998/2000 La Niña, the tuna purse-seine fisheries in the south-west Pacific Ocean under South Pacific Commission (SPC) had experienced reproduction and a 50% price drop in the major market in Thailand.

The skipjack catch per day to the historical low during 1997/1998 La Niña phenomenon, but raised during 1998/2000 La Niña phenomenon, as shown in Fig. 8. Based on the import price in Banagkik, Fig. 8 shows the monthly import price experience a 33% reduction from US $2.50 per ton in August 1998 to US $2.20 per ton in October 1998 before and after La Niña and the prices of Skipjack for the same period (Fig. 8). The import price of Skipjack per day had a 33% drop in Thailand, such as shown in Fig. 10.

Exploratory analysis of the skipjack landing is positively influenced by catch per day time trend significantly, but negatively influenced by the sea surface temperature in area NINO34.

Equation (2) shows the monthly import price in Thailand was negatively influenced by the import quantity and supply availability.

6. Deforestation of the landscapes and other phenomena

The strong ENSO scenario is based on previous experience in 1997-1998. The weak ENSO scenario is based on average values of the two ENSO years. The normal ENSO scenario is based on average values of the two ENSO years.