IMPACT OF PORT SECURITY ON THE USERS AND PROVIDERS OF CONTAINER MARITIME TRANSPORTATION SERVICE

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Professor Dr. Paul T-W Lee, presently, Professor of Department of Logistics and Shipping Management, is Director of International Shipping Management and Logistics Research Centre, Kainan University. He is a leading shipping and port economist.

In the past following visiting scholar at the Faculty of Economics and Politics, Cambridge, he has taught at Korea Maritime University, University of Plymouth, Hong Kong Polytechnic University. He has written 3 books, edited over 12 volumes of Maritime Policy and Management, Korean Marine Transport Policy, Shipping and Logistics Journal, published more than 130 research papers. He has been supervisor of more than 10 PhDs and 20 MBAs in port and shipping fields.

His research, writings, speeches, talks and interviews on international media and TV have had an important bearing on central and local government policies. His another contribution is, as a founding member, to start and develop International Association of Maritime Association (IAME) launched 1992 and Asian Logistics Round Table (ALRT) launched in 2007, which promote research in the fields of shipping and port development, and maritime logistics.
Problems Defined

  - Oil and LNG from Middle East to North East Asia
  - Container cargoes bound for America from Asia
- How do they impact on maritime logistics in the context of supply chain management?
Major Obstacles in Global Cargo Movements

- Piracy
- Natural disasters:
  - e.g., Earthquake, Typhoon, Tsunami
- Security measures by USA since 9/11, 2001
  - e.g., C-TPAT(2001), CSI(2002), SAFE Port Act(2006)
- Potential obstacles
  - Territorial disputes in East Asia: Korea-Japan/ Japan-China/ Japan-Russia/ Korea-China/ Russia-China
Key Aims to Present

• To identify challenges associated with the impact of new U.S. security measures on international maritime logistics
• To address security issues and analyze these challenges caused by identified obstacles in global cargo movements
• A case study:
  • To present an empirical study on oil and LNG and container cargoes in case of disruptions of Malacca and Singapore Straights from a Korean maritime logistics viewpoint
Why energy and container cargoes taken for presentation?

- Oil and LNG are not simple fuel energy but energy that makes countries and military forces move.

  - President G. Bush signed the Act on Oct 13, 2006.
  - The Act was passed by US congress and ratified.
US President George Bush admitted during his 2006 State of the Union speech that, “Keeping America competitive requires affordable energy. And here we have a serious problem: America is addicted to oil, which is often imported from unstable parts of the world.”

US President George Bush focuses on energy security in Radio Address, Feb 23, 2002: “Passing my comprehensive energy plan is not just important for energy security, it is also vital to our economic security. Economic growth requires reliable and affordable energy, ……”
Asia’s Oil Import from Middle East
Asia’s LNG Import from Middle East

![Graph showing the trend of LNG import from the Middle East to China, Japan, South Korea, and Taiwan from 1990 to 2005. The x-axis represents the years from 1990 to 2005, with markers for each year. The y-axis represents the million tonnes oil equivalent. Each country's import trend is indicated by a specific line color and symbol.]}
Why does US regard sea-going containers as risky cargoes?

- 90% of the world cargo moves by container
- Containerized shipping is a major vulnerability, and the global economy depends upon it.
- Over 200 million cargo containers move between major seaports in the world each year
- In many nations, such as UK, Korea, Japan, over 90% of trade volume arrives or leaves by ship.
## Estimated Container Cargoes Bound for America

(unit: millions of TEU)

<table>
<thead>
<tr>
<th>Year</th>
<th>Trans-Pacific Route</th>
<th>Transatlantic Route</th>
<th>Total bound for USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asia → USA</td>
<td>USA → Asia</td>
<td>Europe → USA</td>
</tr>
<tr>
<td>2004</td>
<td>12.4</td>
<td>4.2</td>
<td>3.2</td>
</tr>
<tr>
<td>2005</td>
<td>13.9</td>
<td>4.3</td>
<td>3.3</td>
</tr>
<tr>
<td>% change</td>
<td>12.1</td>
<td>2.4</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Major Asian Container Ports Exporting to U.S. among Top 20 (as of March 2003)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Port</th>
<th>% of US container imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hong Kong</td>
<td>9.8</td>
</tr>
<tr>
<td>2</td>
<td>Shanghai</td>
<td>5.8</td>
</tr>
<tr>
<td>3</td>
<td>Singapore</td>
<td>5.8</td>
</tr>
<tr>
<td>4</td>
<td>Kaohsiung</td>
<td>5.6</td>
</tr>
<tr>
<td>6</td>
<td>Busan</td>
<td>5.0</td>
</tr>
<tr>
<td>7</td>
<td>Tokyo</td>
<td>2.8</td>
</tr>
<tr>
<td>10</td>
<td>Yantian</td>
<td>2.0</td>
</tr>
<tr>
<td>12</td>
<td>Nagoya</td>
<td>1.9</td>
</tr>
<tr>
<td>13</td>
<td>Kobe</td>
<td>1.6</td>
</tr>
<tr>
<td>19</td>
<td>Yokohama</td>
<td>1.5</td>
</tr>
<tr>
<td>20</td>
<td>Laem Chabang</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td><strong>43.2%</strong></td>
</tr>
</tbody>
</table>

Literature Review (1):
On the impact of security on maritime transport & supply chain

- Security challenges to global supply chain productivity [Lewis(2003)]
  - Quantitative impact on productivity of new container security initiatives (CSI, C-TRAT, 24hr rule) on mega-ports (e.g., Singapore, Shanghai)
  - Supply chains from the perspectives of user, provider, regulator and of operational firm level and policy level
Literature Review (2):
On the impact of security on maritime transport & supply chain

- Cost of Security for Sea Cargo Transport [Esera(2003)]
- Optimization Approaches for Efficient Container Security Operations at Transshipment Seaports [Lewis(2003)]
- Maritime Security –Challenges in Supply Chain Management and Design [White(2003)]
- Security in maritime transport: risk factors and economic impact [OECD(2003)]
Literature Review (3):
On the impact of security on maritime transport & supply chain

- Assurance of security in maritime supply chains [Barnes and Oloruntoba(2005)]
- Marine transport and crisis management: structural fragility and threat to sea lanes [Akimoto(2002)]
- Defending Sea Lanes Vital to a Nation’s Interests [Akiyama(2004)]
- Repercussions of Impeding Shipping in the Straits of Malacca and Singapore [Rimmer & Lee (2006)]
Literature review (4):
On the impact of security on maritime transport & supply chain

- Maritime Terrorism in Southeast Asia: Potential Scenario, Global Terrorism Analysis [Raymond (2006)]
- Initiatives to Enhance Maritime Security at Sea [Roach(2004)]
- Facing the Terrorist Threat in the Malacca Straits [Watkins(2004)]
- Natural disasters and terrorists on international trade flows [WTO Trade Report (2006)]
# Economic Impact of Security

<table>
<thead>
<tr>
<th>Source</th>
<th>Estimated cost</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navarro &amp; Spencer(2001)</td>
<td>$47 billion</td>
<td>In the immediate aftermath of 9/11, economic output loss in US</td>
</tr>
<tr>
<td>Walkenhorst &amp; Dihel(2002)</td>
<td>$75 billion</td>
<td>Global welfare losses caused by terrorist attacks</td>
</tr>
<tr>
<td>OECD(2003)</td>
<td>$58 billion</td>
<td>For USA alone, direct and indirect costs caused by terrorist attack at maritime transport</td>
</tr>
<tr>
<td>Ward(2004)</td>
<td>$146.8 -168.8 billion</td>
<td>Overall estimated costs borne by, among others, individuals and families, wage losses in NY, insurance costs, increased security costs, infrastructure costs, losses tax revenues &amp; tourism, government bailout spending on airlines</td>
</tr>
</tbody>
</table>
Impact of Major Obstacles on Global Cargo Movements

- Impedance of natural disasters and terrorists on international trade flows
- If terrorist risks persist, transactions costs of international trade will increase, mainly via:
  - higher insurance premiums
  - Deteriorated port efficiency by tightened security measures at ports
  - additional costs caused by specific security measures in maritime transport
Impact of Major Obstacles on Global Cargo Movements

- Port efficiency affected by increased security measures
  - an important impact on maritime transport costs
  - longer delivery times of container cargoes,

- Most the additional security costs are charged to shipping companies
U.S. Security Measures for Container Cargo (1)

1. **C-TPAT**: The **Customs-Trade Partnership Against Terrorism** (Nov. 2001)
   - An innovative, voluntary government/private sector partnership program
   - To build on the best practices of U.S. Customs and Border protection (CBP)/industry partnership to strengthen supply chain security
   - **C-TPAT Smart and Secure Container: 24-Hour Rule**
U.S. Security Measures for Container Cargo (2)

2. Container Security Initiative (CSI) : (Jan., 2002)
   - 50 CSI ports operating in the world as of 09/30/06.
   - Current CSI major ports operating in Asia:
     - Busan/ Kobe/ Shanghai / Tanjung Pelepas/ Hong Kong/ Singapore/ Kaohsiung

3. US Customs and Border Protection (CBP)
   - Under the new Dept of Homeland Security: March 1, 2003; CSI continues
4. Coast Guard Regulations for Ships and Facilities
   - Maritime Security Act – Requires compliance with IMO rules
   - International Ship and Port Facility Security Code (ISPS) by IMO
   - Ship and Facility Security Plans to be approved by port state
   - Non compliant vessels or vessels calling non-compliant facilities may be denied entry into U.S.

5. SAFE Port Act (October 2006)
SAFE Port Act (Oct. 2006)

  - Cargo inspections at foreign and U.S. Ports
  - Radiation detectors by the end of 2007 in US 22 largest ports, handling 98% of all cargo entering the country
  - DHS’ target to scan almost 100% container cargo by the end of 2007.
  - Testing technology for non-intrusive cargo inspections at selected foreign ports.
  - about $800 million budget annually for setting new requirements.
Existing Security Programs

Proprietary and Confidential
### Securing Security: Worldwide Initiative

<table>
<thead>
<tr>
<th>US-Led Initiative</th>
<th>International Initiative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Container Security Initiative (CSI)</strong></td>
<td><strong>International Maritime Organization (IMO)</strong></td>
</tr>
<tr>
<td>▪ Targeting and screening at “origin” (before loading)</td>
<td>▪ ISPS Code amendment to SOLAS Convention</td>
</tr>
<tr>
<td>▪ Use of technology – including “smart” containers</td>
<td>▪ Equivalent to C-TPAT for ports and vessels</td>
</tr>
<tr>
<td><strong>Customs-Trade Partnership Against Terrorism (C-TPAT)</strong></td>
<td><strong>World Customs Organization (WCO)</strong></td>
</tr>
<tr>
<td>▪ “Trusted” parties – secure origins and handlers</td>
<td>▪ Task Force on Security and Facilitation of the International Supply Chain (data for targeting plus C-TPAT for port hinterland)</td>
</tr>
<tr>
<td><strong>24-hour Advance Cargo Declaration (ACD)</strong></td>
<td><strong>ISO TC 8 (Technical Committee 8)</strong></td>
</tr>
<tr>
<td><strong>24-hour Advance Manifest Rule (AMR)</strong></td>
<td>▪ Establish standards for data, process and technology for marine cargo</td>
</tr>
<tr>
<td>▪ Trade Act of 2002</td>
<td><strong>Strategic Council on Security Technology (SCST)</strong></td>
</tr>
<tr>
<td>▪ Advance information to assist targeting</td>
<td>▪ Launched Smart and Secure Trade lanes (SST)</td>
</tr>
<tr>
<td>▪ Richly-funded set of intelligent freight technology</td>
<td>* SOLAS Convention: International Convention for the Safety of Life at Sea</td>
</tr>
<tr>
<td>▪ e-seal, intrusion detection, radiation and biological detection sensors, non-intrusive scanners</td>
<td></td>
</tr>
</tbody>
</table>
Discussion on Impact and Implications of SAFE Port Act (1)

- Selected Countries (Ports) by SAPE Port Act
  - Honduras, Oman, Pakistan, Southampton Port, Busan Port, Singapore + Volunteer Hong Kong
  - Radio detector installation in Busan Port in March, 2008
  - Testing results are to report to USA this year

- What is the impact of the SAFE Act on productivity and competitiveness of the users and providers of the global supply chain?
  - Negative or positive aspect?
Discussion on Impact and Implications of SAFE Port Act (2)

- Expected impacts of the SAFE Act on Busan Port
  - High installation cost → transferring to shippers
  - Lack of installation at terminals → processing congestion within the on-dock yards → lower port efficiency
  - In case of execution of the Port Bill → inter-port competition for transshipment cargoes for all the container cargoes bound for USA
CASE STUDY: Impacts of Security Disruptions in Straits of Singapore & Malacca on cargo movements

- 2006 US Congressional Budget Office Report:
  - Economic Costs of Disruptions in Container Shipping at Los Angeles and Long Beach for one week or three year halt

- In case of shutdown of Hong Kong and disruptions to container & bulk shipping, what will their impacts be on USA?

- From the Korean viewpoint of maritime logistics, we undertook this task by focusing on the Straits of Malacca & Singapore — shortest route from the Gulf to East Asia
## References to the Malacca Strait in Lloyd’s List Headlines, 1990-2006

<table>
<thead>
<tr>
<th>Year</th>
<th>Navigation %</th>
<th>Pollution %</th>
<th>Security %</th>
<th>Other %</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-94</td>
<td>31</td>
<td>18</td>
<td>20</td>
<td>34</td>
<td>100</td>
</tr>
<tr>
<td>1995-99</td>
<td>24</td>
<td>11</td>
<td>27</td>
<td>32</td>
<td>100</td>
</tr>
<tr>
<td>2000-04</td>
<td>11</td>
<td>1</td>
<td>76</td>
<td>13</td>
<td>100</td>
</tr>
<tr>
<td>2005-06</td>
<td>10</td>
<td>2</td>
<td>83</td>
<td>5</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Lloyd’s List (2006) Archives
## Potential Disruption Scenarios in Straits of MALACCA & SINGAPORE

<table>
<thead>
<tr>
<th>Action</th>
<th>Impact</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blocked by mines</td>
<td>Traffic stop by mines or threat of mines; delay of cargo; traffic congestion</td>
<td>Reroute via Sunda Strait or Lombok Strait</td>
</tr>
<tr>
<td>High-jacking &amp; blowing-up LNG tanker</td>
<td>Singapore Harbor would devastate Singapore; severe impact on global trade</td>
<td>Variable impact depending on cargo amount &amp; ship location; toxicity risk from chemical tanker</td>
</tr>
<tr>
<td>Surface-to-air missile &amp; similar attack</td>
<td>Impact on Singapore massive, not only because loss of life &amp; effect on economy but</td>
<td>Short of inspecting every ship little mitigation</td>
</tr>
<tr>
<td>Sinking vessels to disrupt shipping routes</td>
<td>Traffic blocked thru the Straits; severe disruptions in global trade, increasing logistics costs</td>
<td>Reroute via Sunda Strait or Lombok Strait; long time to reopen the Straits</td>
</tr>
</tbody>
</table>

Source: Raymond (2005); Rimmer and Lee(2006)
Questions Raised for the Case Study

- How would tanker shipping react to any impedance to vessel movements in the Malacca Straits?
- Would container shipping react any differently?
- How much additional costs would incur if tankers or containers were interdicted en route to & from Korean ports?
Methodology

- Brief literature review & search of Lloyds List archives to find possible reasons for impedance
- Analysis of distance, time & costs involved in tanker and container shipping diversion by case studies
- Questionnaire of shipping companies for management reactions to disruption
We use:
- Daily hire rate
- Price bunker fuel
- Insurance fee (hull & machinery & protection & indemnity) to calculate extra cost of Lombok diversion (single voyage)

<table>
<thead>
<tr>
<th>Route (Jubail-Ulsan)</th>
<th>Distance n.m.</th>
<th>Time hours (@15 knots)</th>
<th>Cost US$mn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malacca</td>
<td>12,426</td>
<td>828.4</td>
<td>2.700</td>
</tr>
<tr>
<td>Lombok</td>
<td>+2,532</td>
<td>+168.8</td>
<td>+0.276</td>
</tr>
</tbody>
</table>

Extra cost 20% up
MANAGEMENT OPTIONS

- Increase ship speed – 18 kts unbearable for most vessels, heavy on oil & costs
- Add extra tankers

Results: Each tanker makes 8.6 trips per year so that we need extra 24 vessels (US$673.1 mn).
Repercussions

- If Singapore closed VLCCs would have to bunker in Port of Fujairah (UAE)

- Unlike Straits of Hormuz alternatives if unlikely case of both Malacca & Lombok Straits blocked: could still go round Australia — add 80% to cost of journey
Container Ships

- Similar analysis using
  - Daily hire rate
  - Price bunker fuel
- Insurance fee to calculate extra cost of Sunda & Lombok diversion (single voyage)

<table>
<thead>
<tr>
<th>Route (Suez-Busan)</th>
<th>Nautical Miles</th>
<th>@20 kts hrs</th>
<th>6600 TEU $mn</th>
<th>8300 TEU $mn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malacca</td>
<td>14,860</td>
<td>562.8</td>
<td>2.82</td>
<td>3.20</td>
</tr>
<tr>
<td>Sunda</td>
<td>+1,117</td>
<td>+42.6</td>
<td>+0.21</td>
<td>+0.24</td>
</tr>
<tr>
<td>Lombok</td>
<td>+2,488</td>
<td>+97.8</td>
<td>+0.47</td>
<td>+0.54</td>
</tr>
</tbody>
</table>

Results: Sunda adds 7% & Lombok 17%
Management Options

- Companies surveyed do not see increased speed as practical option
- Will deploy extra ships

<table>
<thead>
<tr>
<th>Route (Suez-Busan)</th>
<th>Fixtures</th>
<th>Days</th>
<th>Total Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malacca</td>
<td>1200</td>
<td>24.3</td>
<td>29160</td>
</tr>
<tr>
<td>Sunda</td>
<td>1117</td>
<td>26.1</td>
<td>29160</td>
</tr>
<tr>
<td>Lombok</td>
<td>1026</td>
<td>28.4</td>
<td>29610</td>
</tr>
</tbody>
</table>

**Results:** Require additional 7 ships for Sunda & 14 for Lombok diversion to fulfill fixtures
Disrupting Mega-ports

- Cost calculations of diversion do not cover economic losses from disruption to global hub & spoke system
- Impacts difficult to gauge but Akimoto suggests 3% cargo value lost but 20% if mega-port like Singapore closed
- Rule-of-thumb calculations indicative but inadequate
- Contrary to CBO findings on Hong Kong paralysis of Singapore know ‘no bounds’
Company Responses (1)

- If Straits closed,
  - Hong Kong, Colombo, Shenzhen, Kaohsiung &, possibly, Laem Chabang consolidate

- If Straits navigable,
  - Port Kelang & Tanjung Pelepas accommodate good share but only Hong Kong could handle 25% Singapore throughput
Company Responses (2)

- Impact would be marked in Asia/Europe trade; raise cost slightly Asia/North America
- No diversion to smaller ports
- Switch to air transport
- Need to see containers in supply chains
Concluding Remarks (1)

- Identifying **Controllable and Uncontrollable Obstacles** in global cargo movements by logistics users

- Goal of global cargo movements from the view of users & providers of international supply chain (port, shipping, etc)
  - Efficiency and productivity of supply chain
  - Just-in-time and reliability
  - Competitive transaction and logistics **costs**
  - Safety and security
  - Welfare
Concluding Remarks (2)

- Establishment of a governance and monitoring system by International co-operation among the interested parties in logistics
  
  1. Minimizing negative impacts of security measures initiated by USA on international supply chain
  
  2. Internationally joint research on among academic institutions in collaboration with globalized companies
Concluding Remarks (3)

- Establishment of a governance and monitoring system by International co-operation among the interested parties in logistics (continued)

3. Sharing and exchanging experiences and knowledge to promote Global Movements of cargo, people, capital, technology, ……

4. Setting up a flexible team or organization comprising of several research institutes to tackle global issues
   - Asian Logistics Round Table launched in 2007
   - ALRT 11 members from Europe, North America, Australia, and Asia
Concluding Remarks (4)

- **SAFE Port Act** should reflect the followings for promoting global cargo movements and supply chain:
  - Safety, Advantage, Fastness, Efficiency (**SAFE**)
  - Prosperity, Opportunity, Reward, and Trust (**Port**)
  - Act now in co-operation with logistics users and providers! (**Act**)