Challenging traditional beliefs
A reflection on the state and strategies of the liner shipping industry

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Universidad de los Andes, Bogotá, Colombia

- Established in 1948
- Purpose: to form an academic elite to improve Colombia’s competitiveness and development
- Goal: by 2025 to be a leading university and reference in Latin America for higher education
Universidad de los Andes in numbers

181,172 m² construidos
163 laboratorios
39 programas de pregrado

176 salones generales
16 doctorados

14,600 estudiantes de pregrado, 4,600 estudiantes de posgrado
62 maestrías
25 especializaciones
661 profesores de planta, 71% con título doctoral y 26% con título de maestría

163 laboratorios
176 salones generales
16 doctorados

2,000 equipos en salas de informática
66 profesores en formación doctoral
502,000 títulos de libros en bibliotecas
143 grupos de investigación registro Colciencias

113 bases de datos especializadas
1 biblioteca general, 5 satélite

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The Business School (Facultad de Administración)

• Mission to educate and train leaders through the appropriation and generation of knowledge for innovation and sustainable development of organizations and society

• International accreditations
  – The Association to Advance Collegiate Schools of Business (AACSB),
  – European Foundation for Management Development (EQUIS)
  – Association of MBAs (AMBA)
Supply Chain Management & Technology Area

- Design, management, and improvement of supply chains of goods and services
- Modelling and optimization tools for decision making under the three pillars of sustainability (economic, social, environmental)
- Supply chain strategies
- Maritime and port logistics
- Technology in the supply chain
- Humanitarian Logistics
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biopsy of current environment

the liner shipping market

emerging challenges
biopsy of the current environment

a - new markets and changing geographies of trade
b - uncertainty and volatility
c - the state of "globalisation"

the liner shipping market

a - (dis)economies of scale "how big is beautiful"
b - concentration and competition – local and regional challenges of a global phenomenon

emerging challenges

a - policies
b – regulation
c – future research
context

- the uneven nature of economic development point to the enduring power asymmetries between different places and actors within the global space economy (Storper and Walker, 1989)

- particularly powerful actors choreograph the transnational flows of knowledge, people and capital that characterize the contemporary global economy (Beaverstock et al., 2000; Sassen, 2001).

What is the relationship between organizations, power, space and place in the current environment?

(How) does the current environment alter traditional concepts and strategies in the liner shipping sector?
It's pretty amazing that our society has reached a point where the effort necessary to extract oil from the ground, ship it to a refinery, turn it into plastic, shape it appropriately, truck it to a store, buy it, and bring it home is considered to be less effort than what it takes to just wash the spoon when you're done with it.
systems’ interaction

Source: Cullinane and Wilmsmeier, 2010
„It is when a thing is beginning to disappear that the concept appears. Take globalization: if there is so much talk of it, as obvious fact, as indisputable reality, that is perhaps because it is already no longer at its height and we are already contending with something else.“
globalisation

- the integration process of economic inter-state relations and ultimately globalisation involves:
  - lifting of restrictions, harmonization of regulations to facilitate trade developments, the expansion of multilateral cooperation, technology transfer, improving accessibility of international financial exchange

- globalisation
  - beginning in the 1980’s
  - explosion in the 1990’s
  - maturity in the 2000’s
  - decline in ?
defining globalisation

• “the expansion and acceleration of flows: goods, services, information, ideas, values ... and the frenzy of travel (tourism, temporary or permanent emigration).” (Paliu-Popa, 2008)

• involves three steps: internationalisation, transnationalisation and globalisation (problèmes économiques, 2002)

• “regional groupings in the evolution of the contemporary world” (ASE Bucharest, 2004)

• “the phenomenon of globalisation is the integration of the world economy in strong growth both with markets for goods and services and the capital” (IMF, 1997)
illustrating globalisation

- science and technology
- global marketing
- global financial system
- communications infrastructure
- worldwide institutional framework

- economic globalisation is a gradual integration of national economics in a process that continues to diminish the importance of boundaries for the development of economic activities
- expanding to world level of economic relations and creating an international business environment stimulate the global process and the globalisation process itself

- internationalisation of economic activities is not a new phenomenon
- internationalisation is the body of methods, techniques and tools put at the service’s strategic approach of the enterprise to work in different nations
trade, production and GDP indices, 1975–2014 (1990=100)

a changing geography of trade

• the crisis (2009) has emphasized the importance of South–South links (trade and investment).
  
  • Example:
    – trade from China to Africa increased, while at the fourth Forum on China–Africa Cooperation, 11/2009, China doubled its initial commitment made at the 2006 summit and pledged $10 billion in new low-cost loans to Africa over a three-year period.

• Greater inter-regional integration could also take place through outsourcing and commercial presence.
  
  • Example:
    – Chinese industry is likely to move up the value chain, opportunities may emerge for other developing regions such as Africa, with Chinese lower-value manufacturing companies being relocated in Africa along the lines of Chinese resource development and construction enterprises.

• Examples:
  – Brazil is importing gas from the Plurinational State of Bolivia;
  – South Africa is the main source of remittances to Mozambique and a destination for Mozambican exports;
  – the Russian Federation is an emerging destination for exports from Cambodia, Ethiopia and the United Republic of Tanzania;
  – India is expanding its links with many African countries, both through foreign direct investment (FDI) and trade.

• South–South and North–South ties, as well as links between developing countries and economies in transition, are expanding through trade and investment channels.

These developments, and the role to be played by some countries and regions, have important implications for seaborne trade demand, flows, structure and patterns.
variation of international trade
(volume)

Source: CEPAL, Bulletin Maritimo 57, based on DSB data
what is next?

• globality
  – everything is moving and constantly relocating
  – everyone is competing with everyone, everywhere for everything

• “manyness”
  – necessity to apply different goals, different success indicators, different strategies, different competencies, different processes, different marketing and different distribution channels on different markets because each market passes the development stages in different periods and with different growth rates.
how is China’s meat consumption related to the Americas’ (future) logistics challenges and potentials?

Source: based on OECD data 2015
global maritime trade

Source: Wilmmsmeier based on UNCTAD various years and Hoffmann 2007
indices for global container, tanker and major dry bulks volumes, 2005–2015 (2005=100)

Source: UNCTAD secretariat, based on Review of Maritime Transport, various issues; and on Clarkson Research Services, Shipping Review and Outlook, spring 2010.
participation of developing countries in world seaborne trade, selected years

Source: Wilmsmeier based on UNCTAD 2015
global container trade, 1996–2016

TEUs and annual percentage change


Note: The data for 2015 were obtained by applying growth rates forecasted by Clarkson Research Services in Container Intelligence Monthly, May 2015.
container transport growth, CAUSES

- Organic growth: related to globalisation; third party hiring; reduction of trade barriers, free trade treaties, etc.

- Technological change growth: by technological substitution, that is the shift in the way of transporting bulks

- Induced growth: transhipments, trade imbalance and empty containers
global containership fleet growth vs throughput growth: 2000-2017

Source: Author based on Alphainer (2016)
biopsy of current environment

the liner shipping market

emerging challenges
biopsy of the current environment

a - new markets and changing geographies of trade
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eerging challenges

a - policies
b – regulation
c – future research
cellular container vessels

- containers
- “cells” in holds
- “ballast” for stability
- “generations”
- Possibly: “geared” with gantries or other handling equipment
# Container Ship Evolution

<table>
<thead>
<tr>
<th>Generation</th>
<th>Time Period</th>
<th>Name</th>
<th>LOA (m)</th>
<th>Draft (m)</th>
<th>TEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>1956-1970</td>
<td>Converted Cargo Vessel</td>
<td>135</td>
<td>&lt;9</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Converted Tanker</td>
<td>200</td>
<td>&lt;9</td>
<td>800</td>
</tr>
<tr>
<td>Third</td>
<td>1980-1988</td>
<td>Panamax class</td>
<td>250-290</td>
<td>11-12</td>
<td>3000-4000</td>
</tr>
<tr>
<td>Fourth</td>
<td>1988-2000</td>
<td>Post-Panamax</td>
<td>275-305</td>
<td>11-13</td>
<td>4000-5000</td>
</tr>
<tr>
<td>Fifth</td>
<td>2000-2004</td>
<td>Post Panamax Plus</td>
<td>335</td>
<td>13-14</td>
<td>5000-8000</td>
</tr>
<tr>
<td>Sixth</td>
<td>2004-2013</td>
<td>“OOCL Shenzen to Emma Maersk Class”</td>
<td>397</td>
<td>15</td>
<td>8000-15500</td>
</tr>
<tr>
<td>Seventh</td>
<td>2013 -</td>
<td>Triple-E Maersk Class</td>
<td>400+, b=59m</td>
<td>15+</td>
<td>18000+</td>
</tr>
</tbody>
</table>
container vessel evolution

November 2014
CSCAL Globe
19, 100 TEU.
length: 400.0 m
beam: 58.6 m
summer draft: 16 m
January 8, 2015
Tonnage: 197,362 DWT
Length: 395.4 m (1,297 ft)
Beam: 59 m (194 ft)
Capacity: 19,224 TEU
OOCL Hong Kong

- 2017
- Ultra Large Container Vessel (ULCV) OOCL Hong Kong,
- Orient Overseas Container Line, popularly known as OOCL,
- LOA: 399.87
- capacity at 21,413 TEU.
- Breadth: 58.8 meters
- Draft: 15m
- Samsung Heavy Industries (SHI)
- 197,317-DWT

Source: oocl.com
how big is beautiful?

For comparison:
- Suez Canal: 164 km
- Panama Canal: 77 km
- Golden Gate Bridge: 2.7 km (53x)
Economies of scale characterizes a production process in which an increase in the scale of the firm causes a decrease in the long run average cost of each unit. Economies of scale can be enjoyed by any size firm expanding its scale of operation. The common ones are:

- purchasing,
- managerial,
- financial,
- marketing

Each of these factors reduces the long run average costs (LRAC) of production by shifting the short-run average total cost (SRATC) curve down and to the right.
average container ship costs per TEU transported

Source: Stopford 2008

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## technological advances

<table>
<thead>
<tr>
<th></th>
<th>GJERTRUD MAERSK</th>
<th>Hanjin Green Earth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft (m)</td>
<td>15</td>
<td>15,5</td>
</tr>
<tr>
<td>Breadth (m)</td>
<td>42,8</td>
<td>48,4</td>
</tr>
<tr>
<td>LOA (m)</td>
<td>367</td>
<td>367</td>
</tr>
<tr>
<td>Service speed (kn)</td>
<td>25</td>
<td>24,6</td>
</tr>
<tr>
<td>Reefer points</td>
<td>900</td>
<td>1000</td>
</tr>
<tr>
<td>Nominal TEU</td>
<td>9074</td>
<td>13102</td>
</tr>
<tr>
<td>TEU@14tons</td>
<td>7668</td>
<td>9000</td>
</tr>
<tr>
<td>Year built</td>
<td>2005</td>
<td>2013</td>
</tr>
</tbody>
</table>
Capacity analysis requires knowledge of capacity and utilization. Utilization, or the degree to which equipment is currently being used, is expressed as a percentage:

\[
\text{Utilization} = 100 \times \left( \frac{\text{Average Output Rate}}{\text{Maximum Capacity}} \right)
\]
## economies of scale – where is the end?

<table>
<thead>
<tr>
<th>utilisation</th>
<th>14,000</th>
<th>16,000</th>
<th>18,000</th>
<th>21,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>100%</td>
<td>97%</td>
<td>91%</td>
<td>89%</td>
</tr>
<tr>
<td>95%</td>
<td>105%</td>
<td>101%</td>
<td>96%</td>
<td>94%</td>
</tr>
<tr>
<td>90%</td>
<td>110%</td>
<td>106%</td>
<td>101%</td>
<td>98%</td>
</tr>
<tr>
<td>85%</td>
<td>117%</td>
<td>112%</td>
<td>106%</td>
<td>103%</td>
</tr>
<tr>
<td>80%</td>
<td>123%</td>
<td>119%</td>
<td>112%</td>
<td>109%</td>
</tr>
<tr>
<td>75%</td>
<td>131%</td>
<td>126%</td>
<td>119%</td>
<td>116%</td>
</tr>
</tbody>
</table>

Reference vessel: 14,000 TEU @ 100% capacity utilization

Source: author based on DNV, 2014
Is liner shipping a mono or multi-output business?

The products of the regular liner shipping market cannot only be differentiated by the type of containers. Shashikumar (1995) “liner shipping is a multi-product [or multi-service] industry [since it is able to] carrying many different types of cargo” (page 5).

Jara-Diaz (1982) reflects that each origin-destination relation should be considered a market of its own and therefore for a service that provides transport between various origin and destination pairs, each pair can be defined as an individual product.

Therefore differentiation by:
1. the type of product (e.g. dry or reefer) and,
2. the origin destination function in relation to each of the offered products.

Translating this to the liner shipping industry means that for the same type of container moved between different pairs of ports on the same services, each one should be considered a different product.
economies of scope

• Economies of scope exist when it is cheaper to produce two products together (joint production) than to produce them separately.

• context:
  - For example, it may be less costly to provide shipping service from point A to points B and C with one ship than have two separate ships, one to point B and another to point C.
  - Similarly, a steer produces beef and hide and it may be inefficient to breed steers separately for beef and for hide.

• While many factors such as technology may explain economies of scope, of particular importance is the presence of common input(s) and/or complementarities in production.

• Firms may often endeavour to exploit economies of scope in order to produce and offer multiple products at lower costs.
Defining economies of scope in liner shipping

The average output rate and the capacity must be measured in the same terms (time, customers, units, or dollars). The utilization rate indicates the need for adding extra capacity or eliminating unneeded capacity.

The new difficulty in calculating actual economies of scale lies in defining the effective capacity, where the effective capacity is defined by the ratio of effective reefer and effective standard container capacity.

- **effective reefer capacity:**
  - The maximum output that a vessel can sustain under normal conditions. This is a maximum of reefer slots and up to a maximum of the vessel's power generation is its effective reefer capacity. On some vessels reefer slot capacity might be higher than the effective reefer capacity. The effective capacity will significantly be influenced by the type of transported reefer product, as a significant difference exists in terms of energy consumption between frozen and chilled cargo.

- **effective standard capacity:**
  - The maximum output that a vessel can hold without risking its stability and navigability of the vessel. Empty reefer slots can be used by standard containers, and thus alter the overall effective capacity for standard containers.

- In conclusion, the nominal TEU capacity of a vessel is at best a very rough indicator for potential scale economies as it ignores key structural, economic, and operational factors.
Economies of scope

Given the existence of two products in one unit does not allow for calculating simple economies of scale.

Economies of scale are related to economies of scope, and exist if the firm achieves savings as it increases the variety of goods and services it produces.

Economies of scale are usually defined in terms of declining average cost functions, economies of scope are usually defined in terms of the relative total cost of producing a variety of goods and services together in one firm versus separately in two or more firms.

The mathematical abstraction can be described as follows:

1. \(TC (Q_x, Q_y)\) = total cost to a single vessel producing \(Q_x\) of good X and \(Q_y\) of good Y
2. \(TC (Q_x, 0)\) = total cost to a single vessel producing \(Q_x\) of good X and zero of good Y
3. \(TC (0, Q_y)\) = total cost to a single vessel producing zero of good X and \(Q_y\) of good Y

Then a production process exhibits scope economies if:

\[
TC (Q_x, Q_y) < TC (Q_x, 0) + TC (0, Q_y)
\]
Example: economies of scope

- Considering a vessel with an effective capacity of 6000 TEU and 1200 reefer slots, the latter equivalent to 2400 TEU of reefer capacity (1 slot = 1 40’foot reefer container).
- Total general vessel operating costs: 1.000.000
- Additional average costs per used dry TEU: 2
- Additional average costs per used reefer slot (2 TEU), principally energy consumption and cost for monitoring of container: 10

<table>
<thead>
<tr>
<th></th>
<th>( Q_x )</th>
<th>( Q_y )</th>
<th>( TC )</th>
<th>avg. unit cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>only dry container service</td>
<td>6.000</td>
<td></td>
<td>1.012.000</td>
<td>169</td>
</tr>
<tr>
<td>only reefer service</td>
<td></td>
<td>2.400</td>
<td>1.024.000</td>
<td>427</td>
</tr>
<tr>
<td>mixed 100% utilization</td>
<td>3.600</td>
<td>2.400</td>
<td>1.031.200</td>
<td>172</td>
</tr>
</tbody>
</table>
network design to balance demand, yield and cost

• Point-Point
  – Minimise unit costs
  – Needs sufficient utilisation for trip revenue to cover trip cost

• String
  – Avoids double handling costs incurred by transhipment
  – Splits ship capacity among multiple segments

• Hub- and Spoke
  – Allows capacity to be better matched to demand in each land
  – Incurs double handling costs
Evidence from Latin America
evolution of vessel sizes on global main routes, 2000 - 2015

Source: Wilmsmeier, based on CompairData, Lloyds List and Marine Traffic various years
cascading - TEU per vessel on SA routes, 2001-2015

Source: Wilmsmeier, based on CompairData, Lloyds List and Marine Traffic various years

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evolution of draught of deployed container vessels, 2001-2015
weekly deployed capacity
2009-2016
LAC evolution of port throughput, 2004-2015
(thousands of TEU)

Fuente: CEPAL.
can the hypothesis of market power in Latin America be ascertained

The minimum scale for efficiency is decisive. The transport capacity of modern ships in frequent regular services can outscale trade volumes, especially those of small economies.
key questions:
what is power is and what does power do?

• three elements (re)produce power relations (Clegg, 1989):

  – agency and the ways in which the articulations of actions, practices and points of resistance define power and its nature.

  – structural dimensions of power in the form of the institutional and societal conditions that inform the behaviors and practices of these actors.

  – organizations, understood as social collectives, that can both benefit from and yet also enable the creation of power.
modalities of power

- Instrumental form of power – power as capacity – thing that is possessed by individuals that may or may not use it (TNCs)
- How actors derive and reproduce positions of power for themselves in the global space economy – power through mobilization a ‘thing’ that can be held and deployed in a hierarchical sense.
- Power emerges through, and is inseparable from, social and economic actions and tactics designed to construct power where it might not already exist.

- The challenge:
  - power not restricted to one spatial scale but cuts across and reproduces both the local and the global depending on the practices associated with power through mobilization.
  - emerging types of power through: authority, coercion, domination, inducement, manipulation and seduction.
  - In which way do organizations enroll other actors into their networks and reproduce positions of power by doing this, since the network determines the ways in which power ‘flows’ geographically
history repeats itself?

“The industry found a solution to the problem of excess capacity in conferences and cartels, which work to control competitive relation between existing lines.” (Marx, 1953)
Average number of companies per country and average container carrying capacity (deployed TEU) per company per country, 2004-2015

Source: UNCTAD RMT 2015, based on Lloyds List Intelligence various years
industry concentration has increased globally.
global fleet capacity June 2016
evolution alliances global main routes, shares 2012-2015

Source: Author based on CompairData various years

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evolution alliances WCSA main routes, shares 2012-2016

Source: CEPAL, Maritime Bulletin 58, 2015 based on CompairData various years
capacity supply WCSA –Europe Trades, 2000-2008

Source: Wilmsmeier based on ComPairData various years
nominal capacity supply WCSA – Europe Trades, 2000-2012

Source: Wilmsmeier based on ComPairData various years
nominal TEU capacity by service WCSA-Asia, 2000-2012

Source: Wilmsmeier based on ComPairData, various years
WCSA – Asia changes in market structure, 2000-2012

Source: Wilmsmeier and Parushev 2013
market share based on weekly deployed capacity by alliance, January 2015 – January 2016

Source: CEPAL, Maritime Bulletin 58, 2015 based on CompairData various years
market share based on weekly deployed capacity, January 2015

Source: CEPAL, Maritime Bulletin 58, 2015 based on CompairData various years
market share based on deployed weekly capacity by service, January 2015

Source: CEPAL, Maritime Bulletin 58, 2015 based on CompairData various years
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emerging challenges

- policies
- regulation
- future research
reflection and discussion

• Does demand growth assure profitability?
  – More diverse markets require rigorous analysis to
    • maximize profits,
    • identify opportunities, and
    • avoid pitfalls.

• Beware the siren song of low unit costs.
• Big ships must be full to operate efficiently – and the cost of mistakes is getting higher.

• Think about products and networks not vessels
emerging questions & conclusions

- Networks and collaboration do not evolve equally across regions and global industry concentration particularly affects more peripheral routes.
- The current situation leads to a policy dilemma as in certain markets it might be difficult to interpret the boundaries between coordinative behaviour and tacit collusion.
- But just looking at concentration is too simple; the evolution of the maritime industry requires a systemic view reaching from the local to the global.

- Shifting power relations in the maritime industry require a spatialized understanding of power considering: resources, capacities, positioning and strategies.
- ‘Powerful actors’ are present in the market with relatively stable power relations across multiple spatial and temporal scales.
- Creating a significant capacity to choose the timing of their strategic plays or to use stalling tactics to further their strategic interests.

- Networks of association and histories of interaction are both central to the spatial workings of power.
- Power is not equivalent to strategy, nor is it another word for the boundary between cause and effect.
- Power is found in relational positioning, expresses resource endowments, shapes intentions, defines strategic horizons and conditions the range of possible outcomes.
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