

附件三：會議簡報內容(大會公布於 OECD 網站之文件)





# OVERVIEW OF THE MARITIME EQUIPMENT INDUSTRY

Workshop on trends and challenges in shipbuilding  
- a special look at the maritime equipment industry -  
Paris, December 12, 2019

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Mr. Hiroki TAKAGI, [Hiroki.TAKAGI@oecd.org](mailto:Hiroki.TAKAGI@oecd.org)



## Aim of this presentation

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- To provide basic information on the current situation and challenges in the marine equipment industry
- To facilitate the discussions on the characteristics and challenges in the marine equipment industry



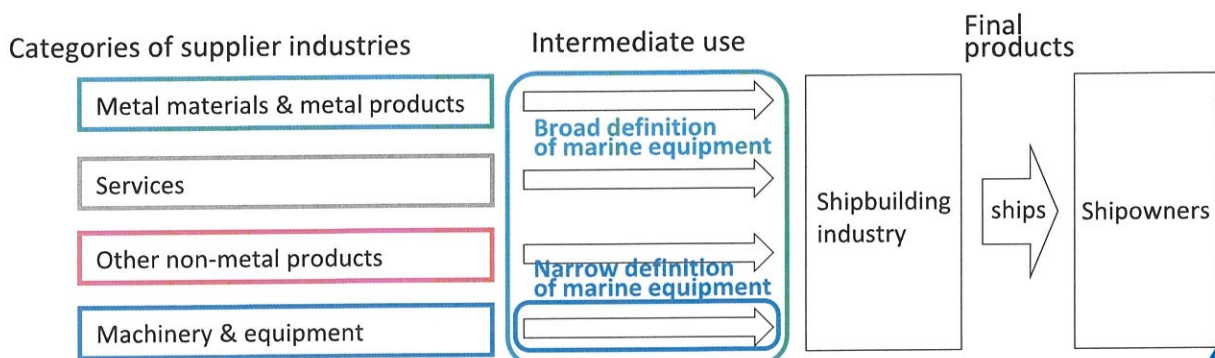
# 1) OVERVIEW OF THE MARINE EQUIPMENT INDUSTRY

2



## Data source and assumption

- Values shown in the following slides were
  - Created from OECD Inter-Country Input-Output (ICIO) Tables
  - Extracted from the intermediate use table, limited to the inputs to the shipbuilding industry
  - Based on the assumption that all or a part of goods and services provided from the supplier industries to the shipbuilding industry could be deemed to be marine equipment

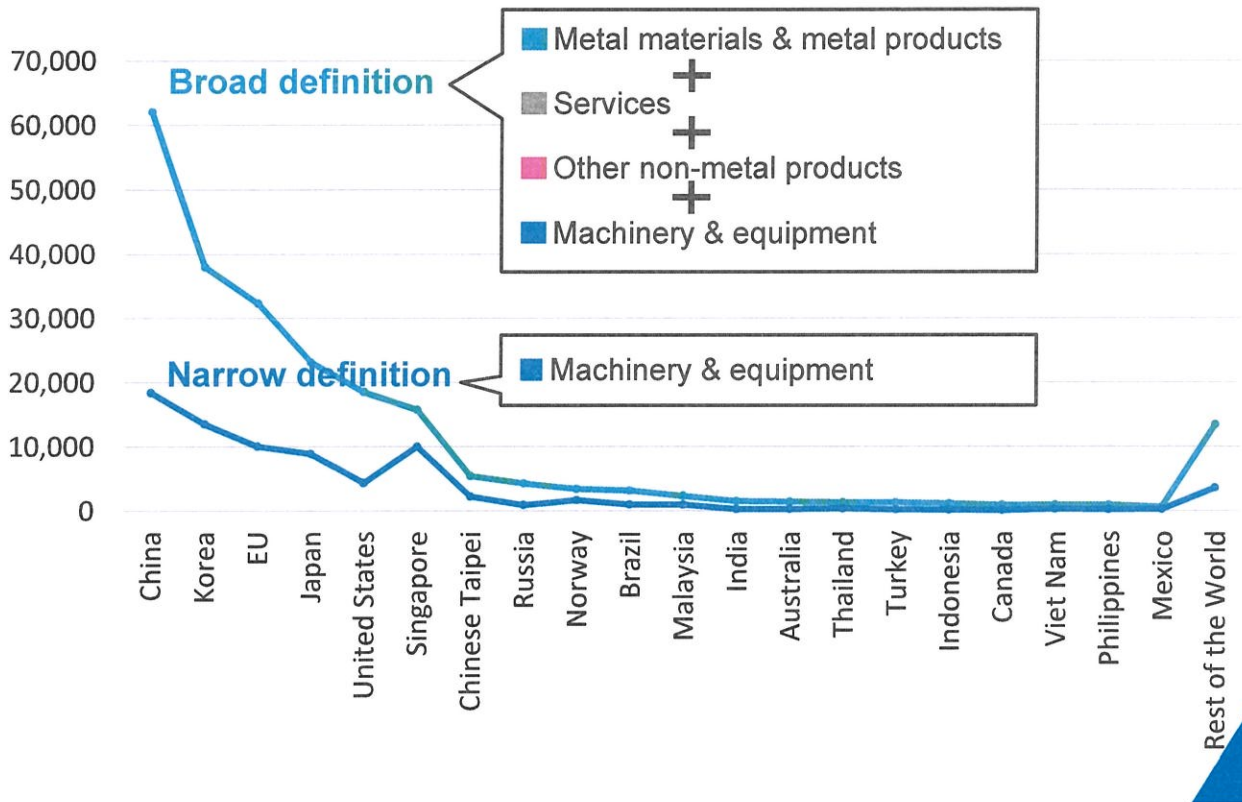


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# Sales of supplier industries to the shipbuilding industry in 2015

(current million USD)

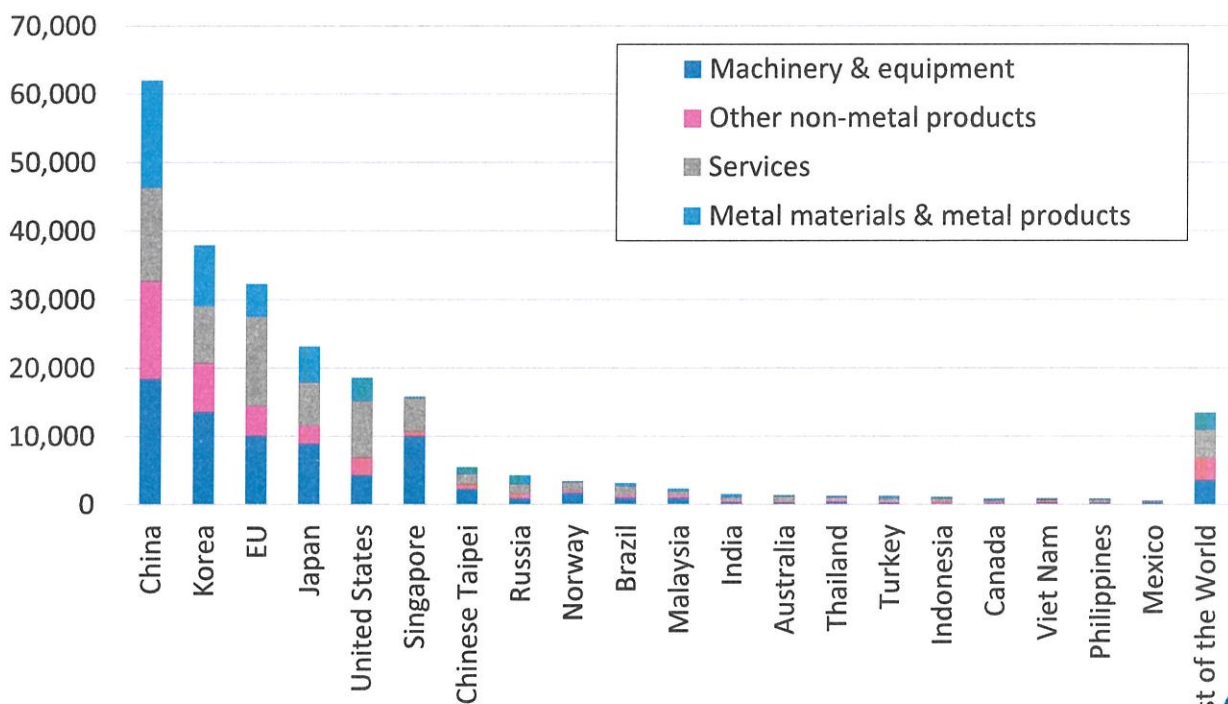


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# Sales of supplier industries to the shipbuilding industry Breakdown in supplier categories

(current million USD)

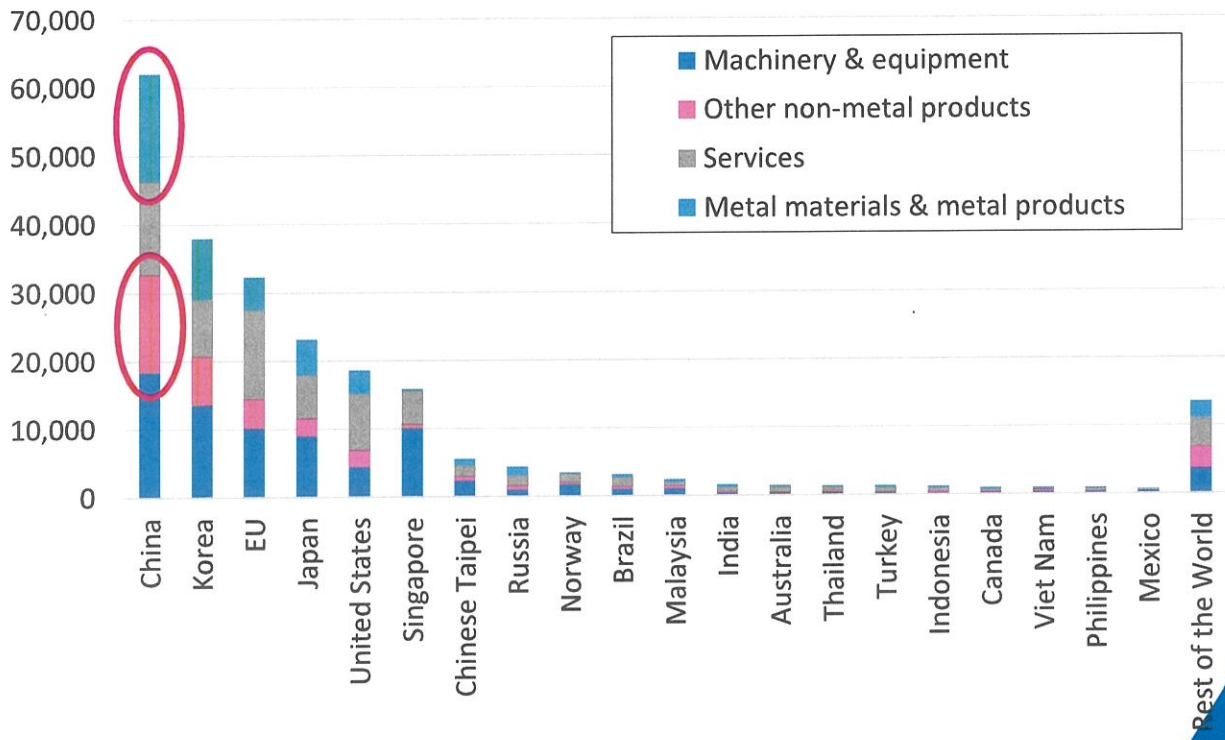


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## Sales of supplier industries to the shipbuilding industry Breakdown in supplier categories

(current million USD)

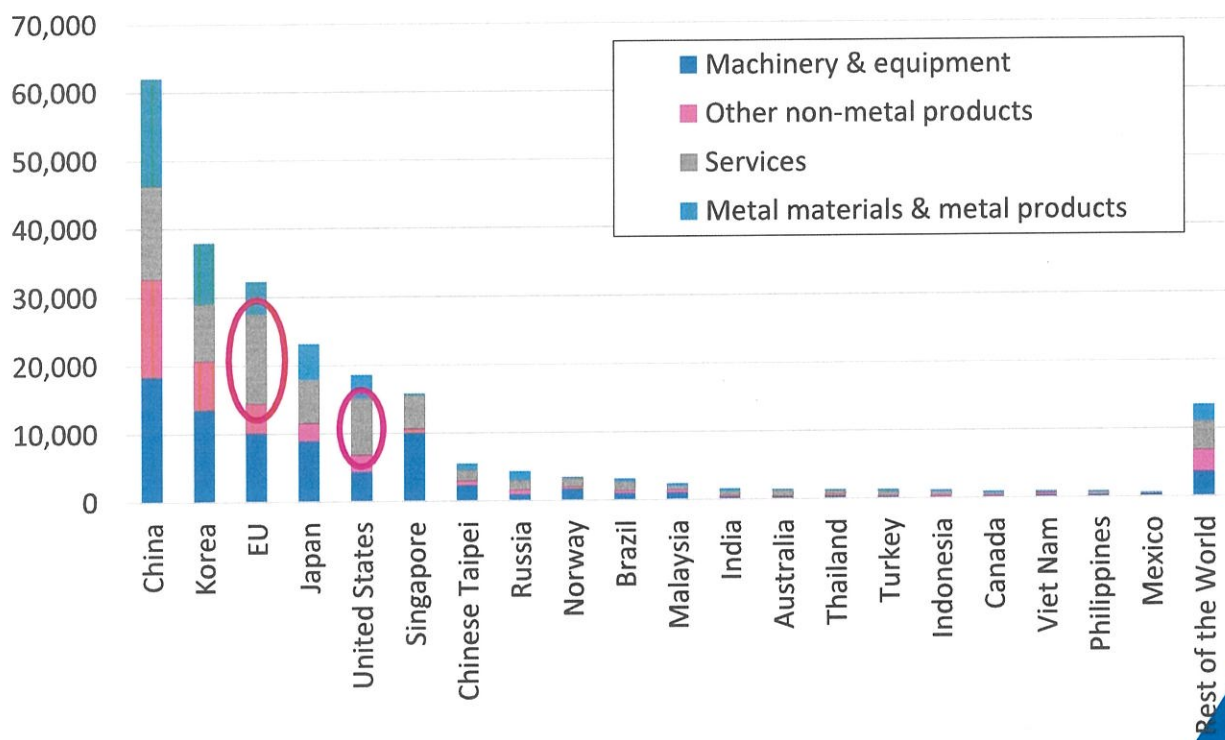


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## Sales of supplier industries to the shipbuilding industry Breakdown in supplier categories

(current million USD)

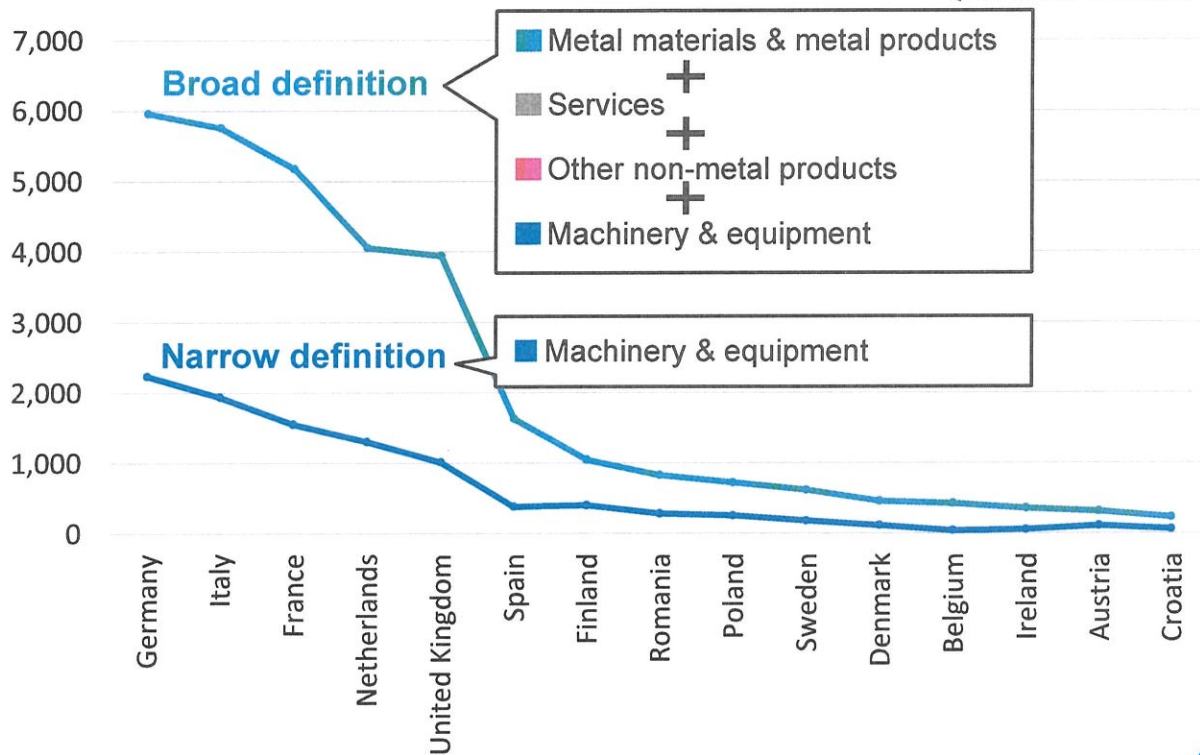


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## Sales of supplier industries to the shipbuilding industry in the EU in 2015

(current million USD)

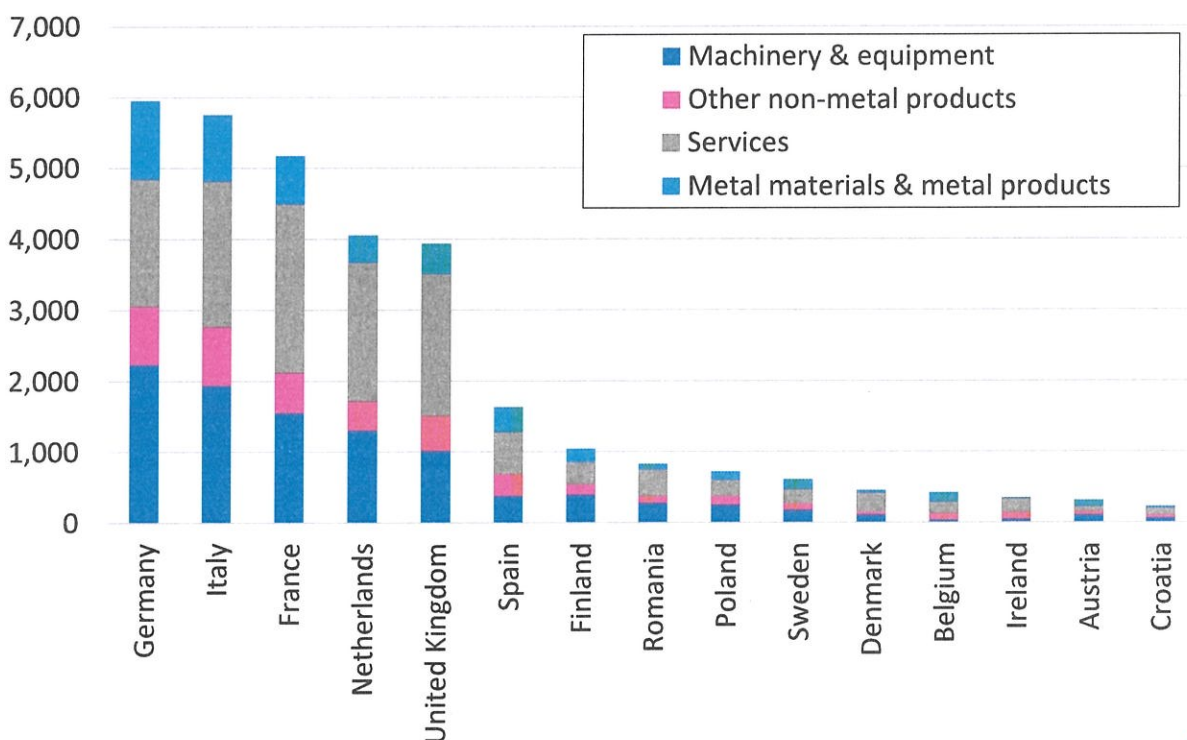


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## Sales of supplier industries to the shipbuilding industry Breakdown in supplier categories

(current million USD)

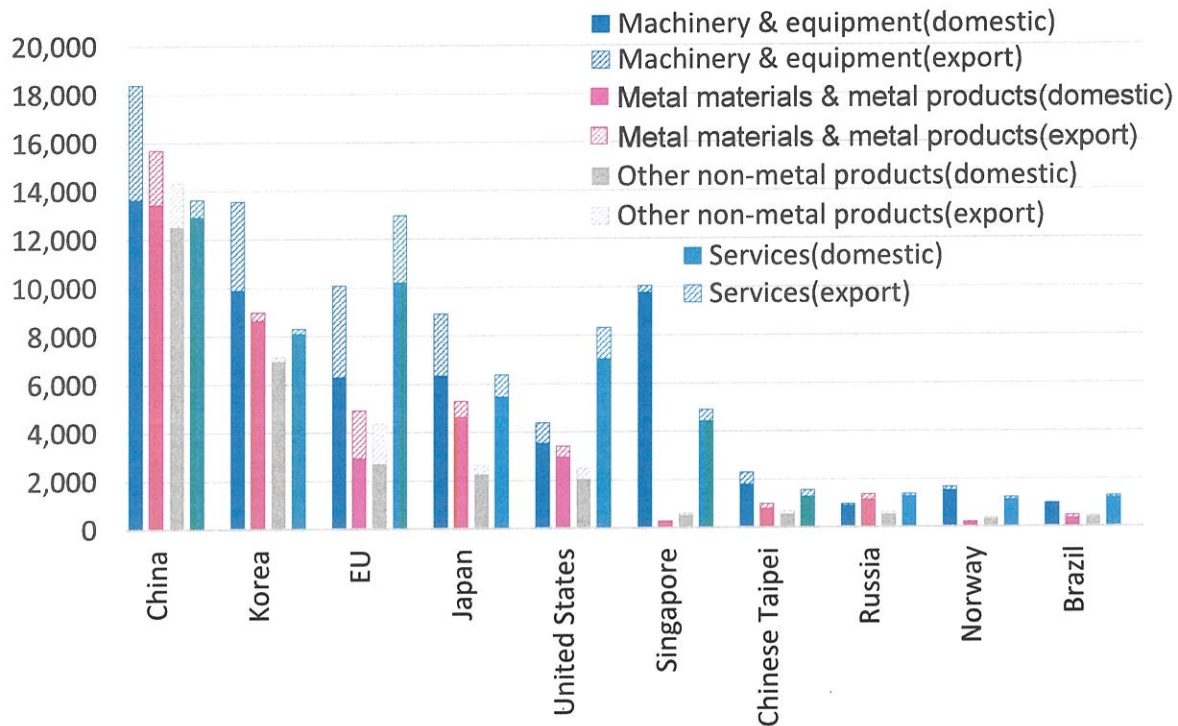


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## Sales of supplier industries to the shipbuilding industry Breakdown between domestic sale and export

(current million USD)

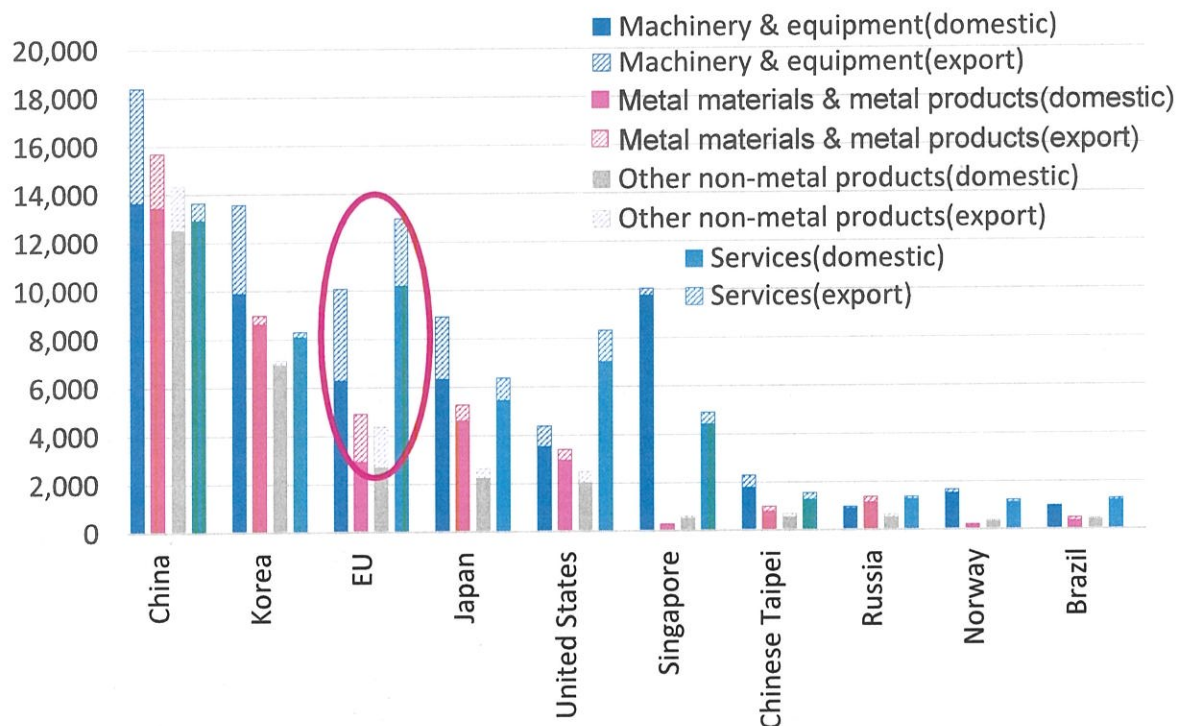


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## Sales of supplier industries to the shipbuilding industry Breakdown between domestic sale and export

(current million USD)



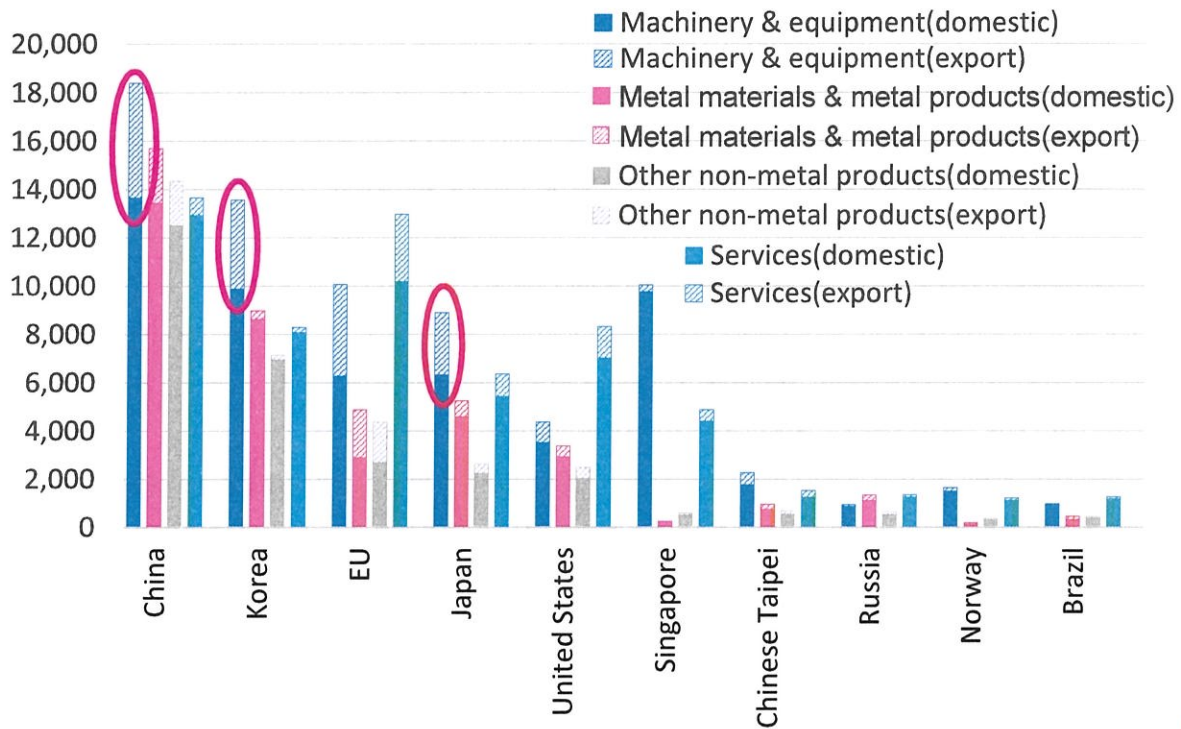
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## Sales of supplier industries to the shipbuilding industry Breakdown between domestic sale and export

(current million USD)



12



## 2) POTENTIAL CHALLENGES FOR THE MARINE EQUIPMENT INDUSTRY

13



## Challenges leading to potential negative impacts for ME companies

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### **a. Infringement of Intellectual Property Rights (IPRs)**

- Are the IPRs of marine equipment companies sufficiently protected by the current international legal instruments?

### **b. Forced technology transfer (FTT)**

- What are the consequences of FTT occurring in the marine equipment industry?

### **c. Impact of excess capacity in the shipbuilding industry**

- How does shipbuilding excess capacity affect the price and production volume of marine equipment?

14



## Challenges affecting normal competitive conditions

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### **d. Government support measures**

- Do some shipyards indirectly benefit from government support measures to marine equipment companies?

### **e. Dumping**

- Is dumping a widespread concern in the marine equipment industry compared to other industries?
- To what extent does dumping of marine equipment products affect ship prices?

### **f. Financing under preferential conditions**

- Is there any special financing practices taking place in the marine equipment industry, which could affect ship prices?

15



## Applying WTO rules to the marine equipment industry

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### **g. Export of marine equipment**

- The export of marine equipment can in some cases follow the same procedure as for other manufacturing industries or can be similar to ship exports when marine equipment has been integrated in a given vessel before its sale.
- How can WTO rules be applied to the marine equipment industry?

16



## Challenges on transparency and monitoring

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### **h. Definition of marine equipment**

- It appears difficult to have a common understanding of what sectors are included in the marine equipment industry.
- Could this uncertain definition of the marine equipment industry be a challenge to ensure transparency in the shipbuilding industry?

17



## Aim of this presentation

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- Participants are invited to give their views on the situation and challenges of the marine equipment industry.

18



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Thank you.

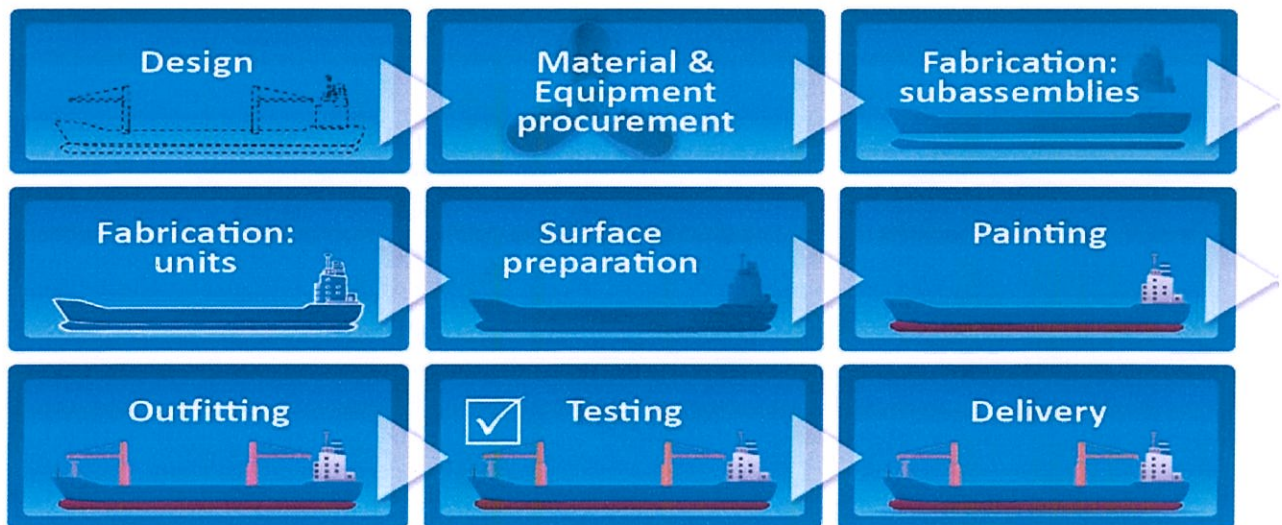
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# The European maritime supply industry

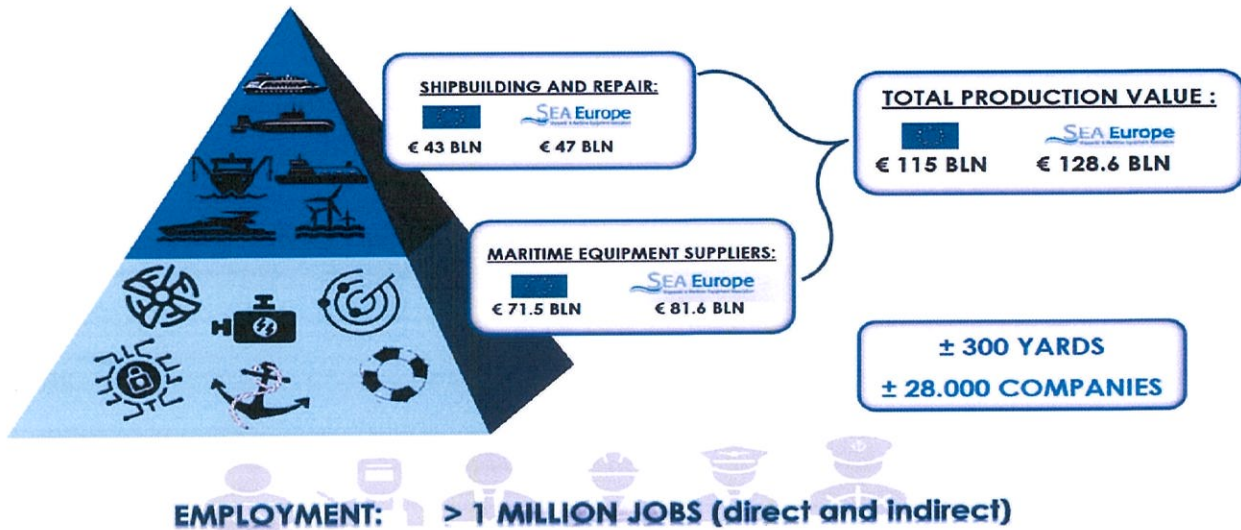
Dario Bazargan, OECD 12 December 2019



## European Maritime technology Industry as a closely integrated cluster



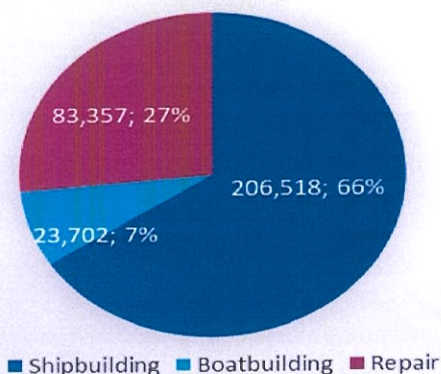
## ECONOMIC VALUE OF EUROPEAN MARTIME TECHNOLOGY SECTOR\*



\* Annual values based on a 2012-2016 average  
 ■ EU-28 Region ■ SEA Europe SEA Europe Region

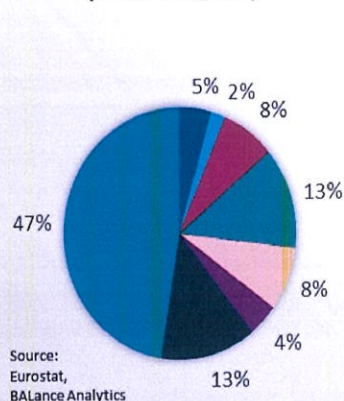
## DIRECT JOBS – SEA Europe region (2012-16)

Employment Shipbuilding  
 (Total 313,577)



1<sup>st</sup> tier Maritime Equipment Suppliers

Number of employees  
 (Total 226,055)



2<sup>nd</sup> tier Maritime Equipment Suppliers

Number of employees: 120,000

- Steel and NF metals
- Paints and coatings
- Other materials
- Steel products
- Mechanical engineering incl. Engines
- Electrical Engineering, Electronics
- Engineering and Design services, etc.
- Other

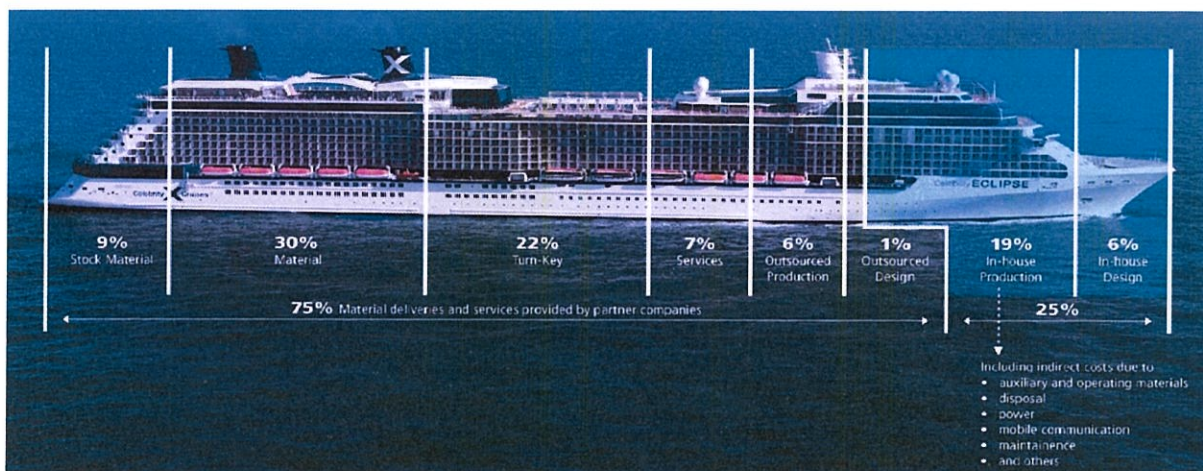
European Shipbuilding Supply Chain Statistics - A REPORT FOR SEA EUROPE

# Role of European Maritime Equipment Suppliers

- *Maritime equipment suppliers deliver materials, systems, and component;*
- *act as service providers in engineering and consulting;*
- *or are integrated as subcontractors in pre-product manufacturing and assembly.*

This industry provides a very wide range of supplies, from 5mm titanium bolts to 50 MW diesel generators with everything in between, for an equally diverse range of vessel types and sizes

**75% of the value of a complex ship is equipment, systems and technologies.**  
**25% of the value relies on the work of shipyards for design, production and assembly**



# Blue Growth & Maritime Technology

Oil & Gas  
Industry



Offshore  
Renewables



Aquaculture



Deepsea  
Mining



Shipping



Maritime tech and tools are provided to bring these activities to sea

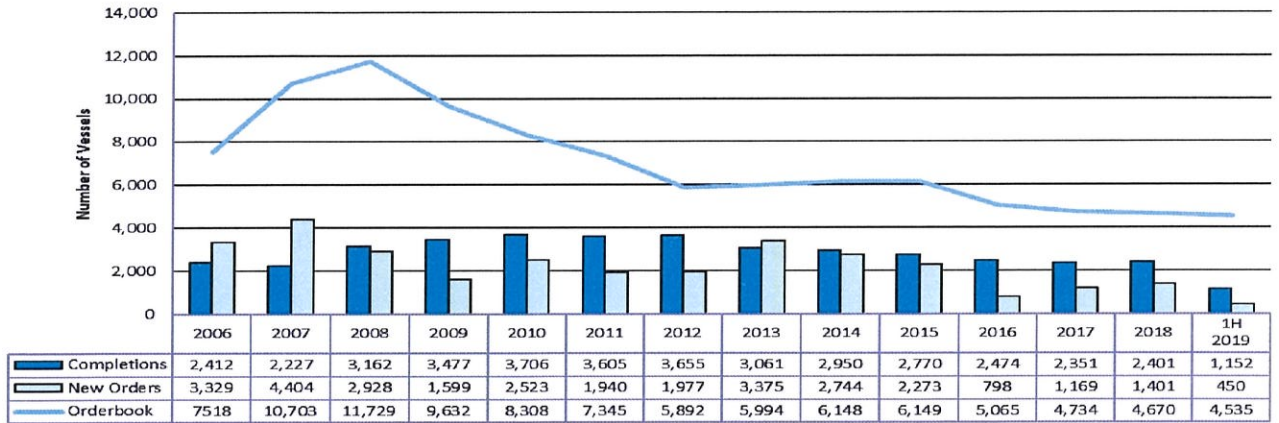
Key Enabling Technologies

## Trends, opportunities and challenges



# Global Shipbuilding Activity: Contracting historically low (esp. in number of vessels)

Global Commercial Shipbuilding Activity in Number of Vessels

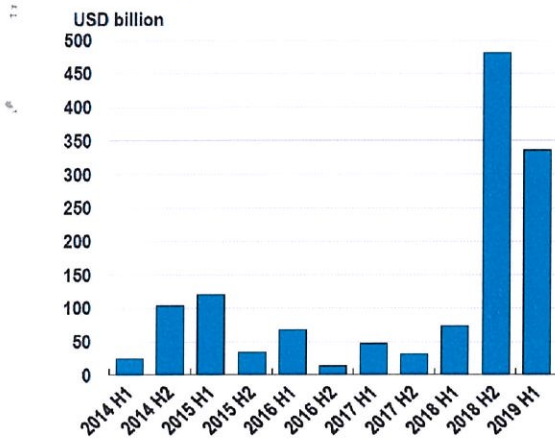


Data Source: IHS Fairplay

## Trade growth is stalling as restrictions bite and protectionism rises

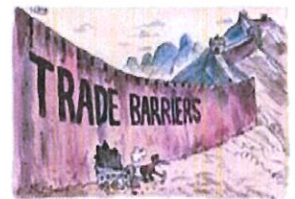
### New trade restrictions in the G20

Trade coverage of measures introduced in each period



### World trade growth

Goods and services, volumes



Source: OECD Outlook

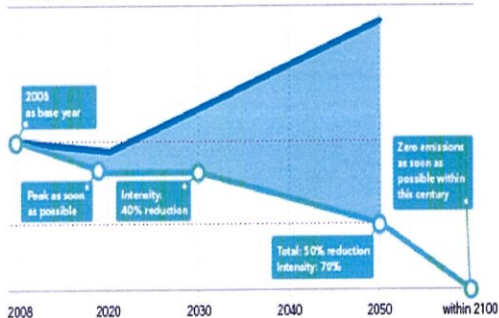
## Industry's Trade Policy Priorities in FTA negotiations

- Phasing out of industrial tariffs for machinery, equipment and electronic
- Government procurement provisions that eliminate possibility of maintaining preferential obligations to select local marine products to detriment of foreign suppliers.
- Ensuring standardisation, certification and approval of maritime products by foreign manufacturers do not constitute Technical Barriers to Trade
- Mutual recognition of maritime equipment (as per Art. 10 of EU Reg. 391/2009)
- Service trade liberalisation in areas relevant for maritime technology companies
- Protection of intellectual property rights.



## THE "GREENING" MARITIME TECHNOLOGY OPPORTUNITY

Units: GHG emissions



- Emission pathway in line with IMO's GHG strategy
- Business-as-usual emissions\*
- Emission gap



## Growing political pressure has made sustainability now key topic at IMO



Faster evolution of technology is a positive factor in terms of faster fleet renewal and therefore stimulating demand for innovative maritime equipment.

But:

- Legal Certainty & rigorous/timely enforcement of internationally agreed rules is key
- Investment in clean ships and advanced equipment and technology solutions require better framework conditions that allow producers and users to earn money.

## Connectivity & Digitalization: the role of Maritime equipment suppliers

**Smart Ship today**

Fleet operation centre (Hamburg)

- ...optimize shipboard energy performance
- have an accurate ETA (weather, queues, ...)
- on board situation awareness and assist when decisions are necessary
- ...monitor equipment and predict its maintenance needs
- ...identify trends and implement operational best practice



### Smart Ship today

### Equipment monitoring



Remote Monitoring and Assistance System (RMS) enables service personnel and experts to connect to Wärtsilä Integrated Automation System (WIAS) remotely.

Control & Communication Centre (3C) all data into a single platform to support decision making, aiming at reductions of fuel consumption & harmful emissions.

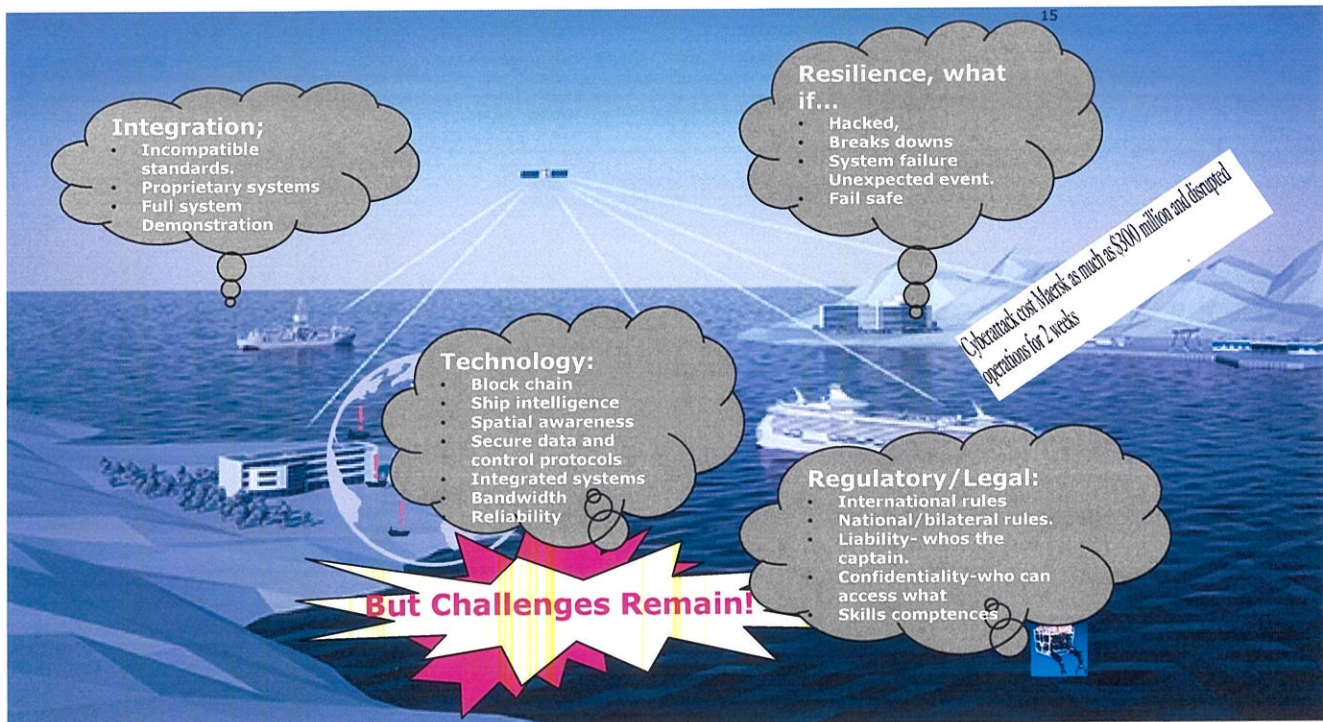
has remotely accessed systems for 15 years and uses remote maintenance in around 300 installations with several hundreds of engines and system parts.



If a symptom of damage is detected provide help directly online or make sure the right specialist with suitable replacement parts is on the way

- ...monitor and optimize shipboard energy performance
- ...monitor equipment and predict its maintenance needs

≡ Remote monitoring link to fuel efficiency



## CONCLUSIONS

- ❖ Availability of a competent supply chain is a major competitive advantage in the shipbuilding market;
- ❖ Maritime technology key for providing solutions for addressing societal challenges;
- ❖ Current state and outlook of world shipbuilding market and rising protectionism negatively affects business prospects of globally operating equipment manufacturers.
- ❖ Greening and Digitalisation offer potential opportunities. But bottlenecks remain to unlock greater uptake of technologies. Huge investments needed!
- ❖ Gov-led overcapacity and aggressive pricing in world shipbuilding have detrimental impact: lack of profitability hinders technological progress and investment in clean technology.

Thank You!

More info:  
[www.seaurope.eu](http://www.seaurope.eu)  
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# Trends in Marine Supplies Industries

Industry Dimension

Industry Structure

Demand Patterns

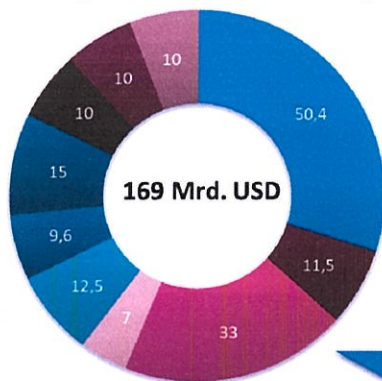
Joachim Brodda,  
BALANCE Technology Consulting

## Global Maritime Technology Market Dimension



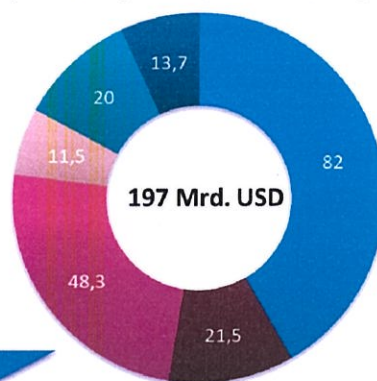
### Ausrüstung, Material, Dienstleistungen

- Schiffsneubau
- Reparatur, Retrofitting
- Marine (Neu und Rep)
- Fixed Offshore Structures
- Bootsbau
- Offshore Wind
- Offshore Subsea
- Port Equipment
- Maritime Überwachungs- und Sicherheitstechnik
- Other



### Systemintegration, Werften, Projektentwickler

- Schiffsneubau (incl. Floating Offshore)
- Reparatur, Retrofitting
- Marine (Neu, Instandhaltung)
- Fixed Offshore Structures
- Bootsbau <500GT
- Offshore Wind



### Customers:

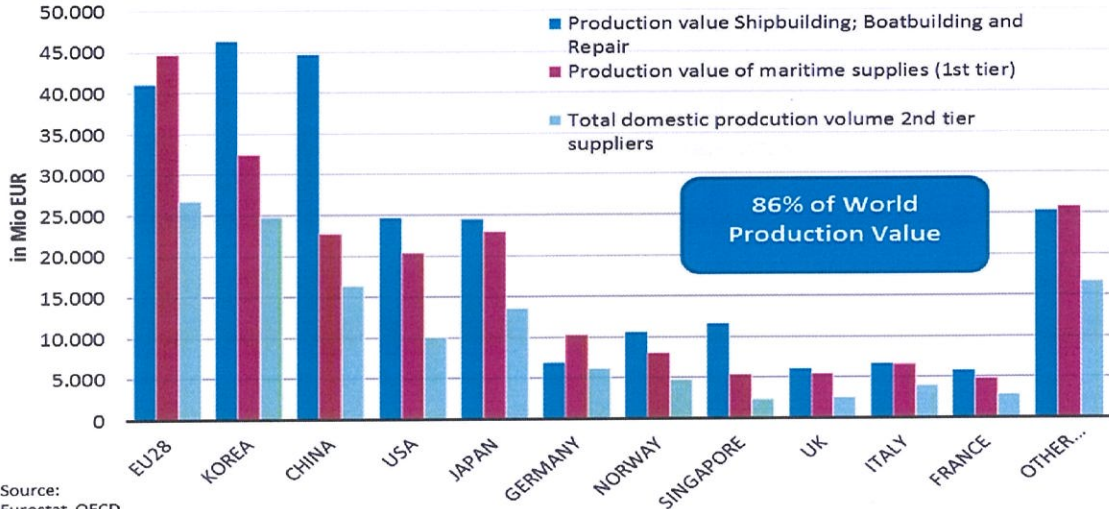
Shipping Companies, Offshore-Operators,  
Navies, Private Customers, Energy Firms, Authorities

© BALANCE Analytics 2017

# World Shipbuilding Model by Value (Shipyards + Suppliers)

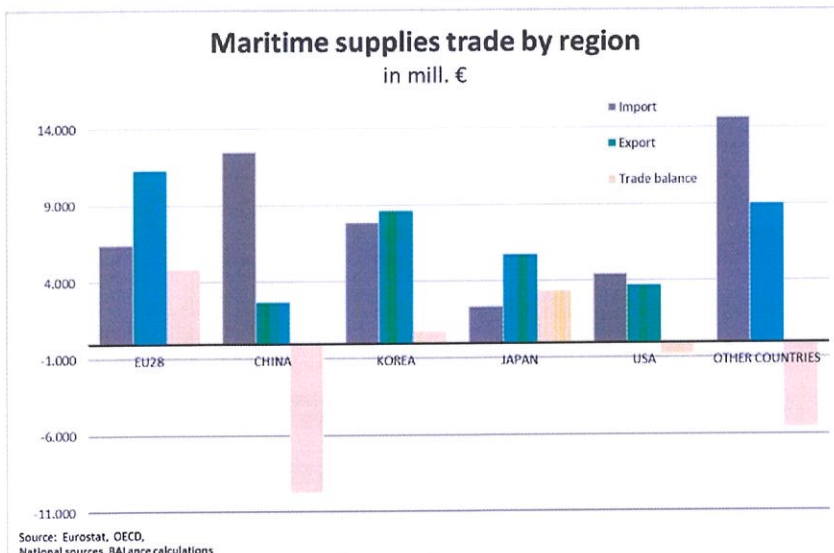
Value Chain Comparison (2010 – 2014)

Annual average production values (2010-2014) of the shipbuilding value chain  
Top 10 countries - Total World "Production Value" 482,5 Mrd Euro



Source: Eurostat, OECD  
BALance calculations

# Global Trade Balance marine supplies (2010 – 2014)

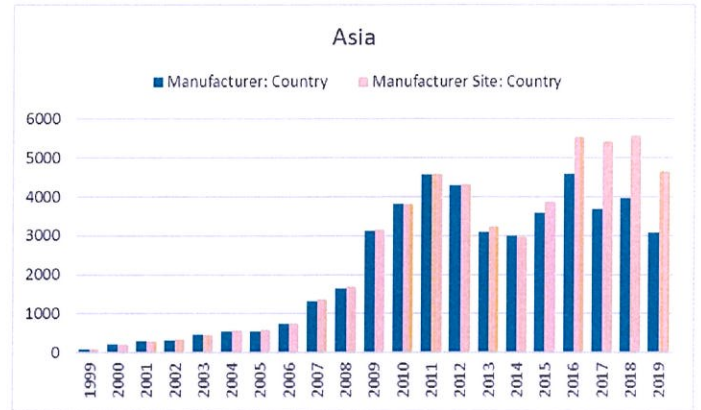
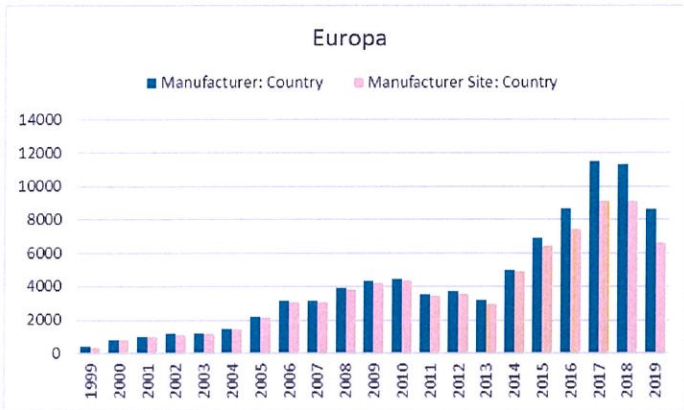


Source: Eurostat, OECD,  
National sources, BALance calculations

Note: trade balance of 1st and 2nd tier suppliers without intra EU import/export



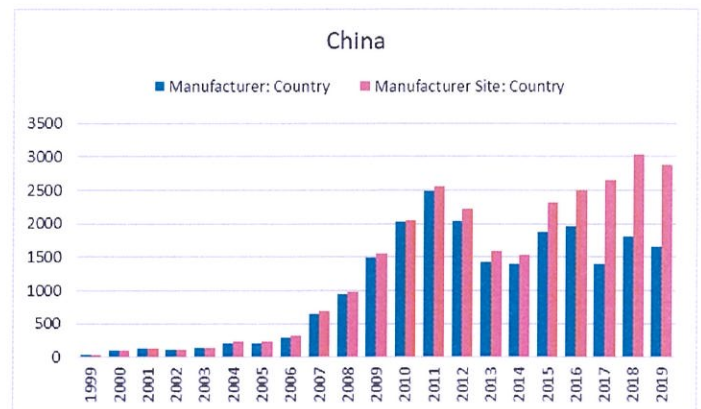
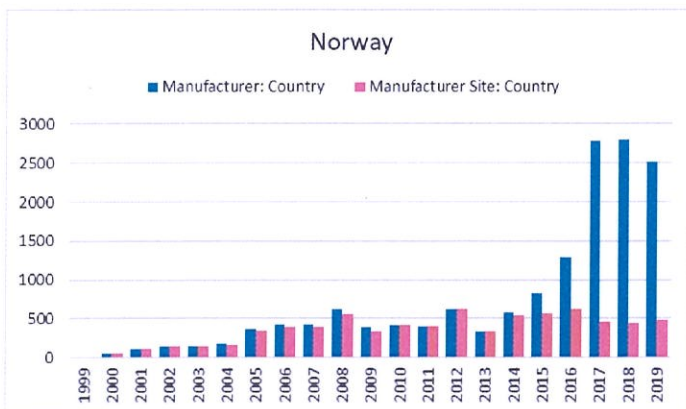
## Swap of manufacturing from Europe to Asia is obvious



EU Marine Equipment Directive

Source: BALance Analytics, MarED 11/2019

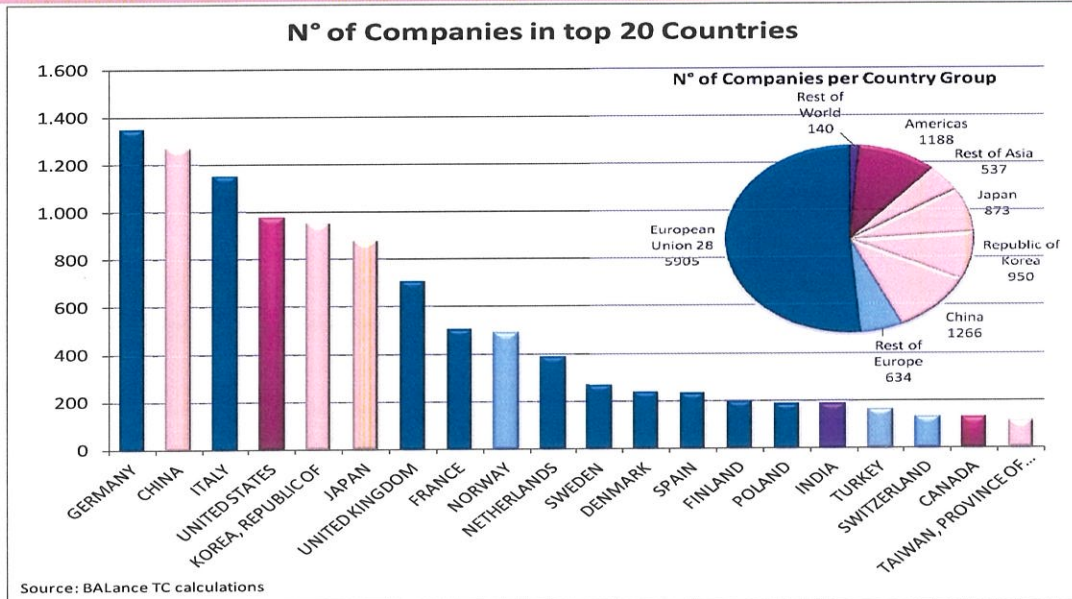
## Swap of manufacturing from Europe to Asia is obvious – Driving Countries



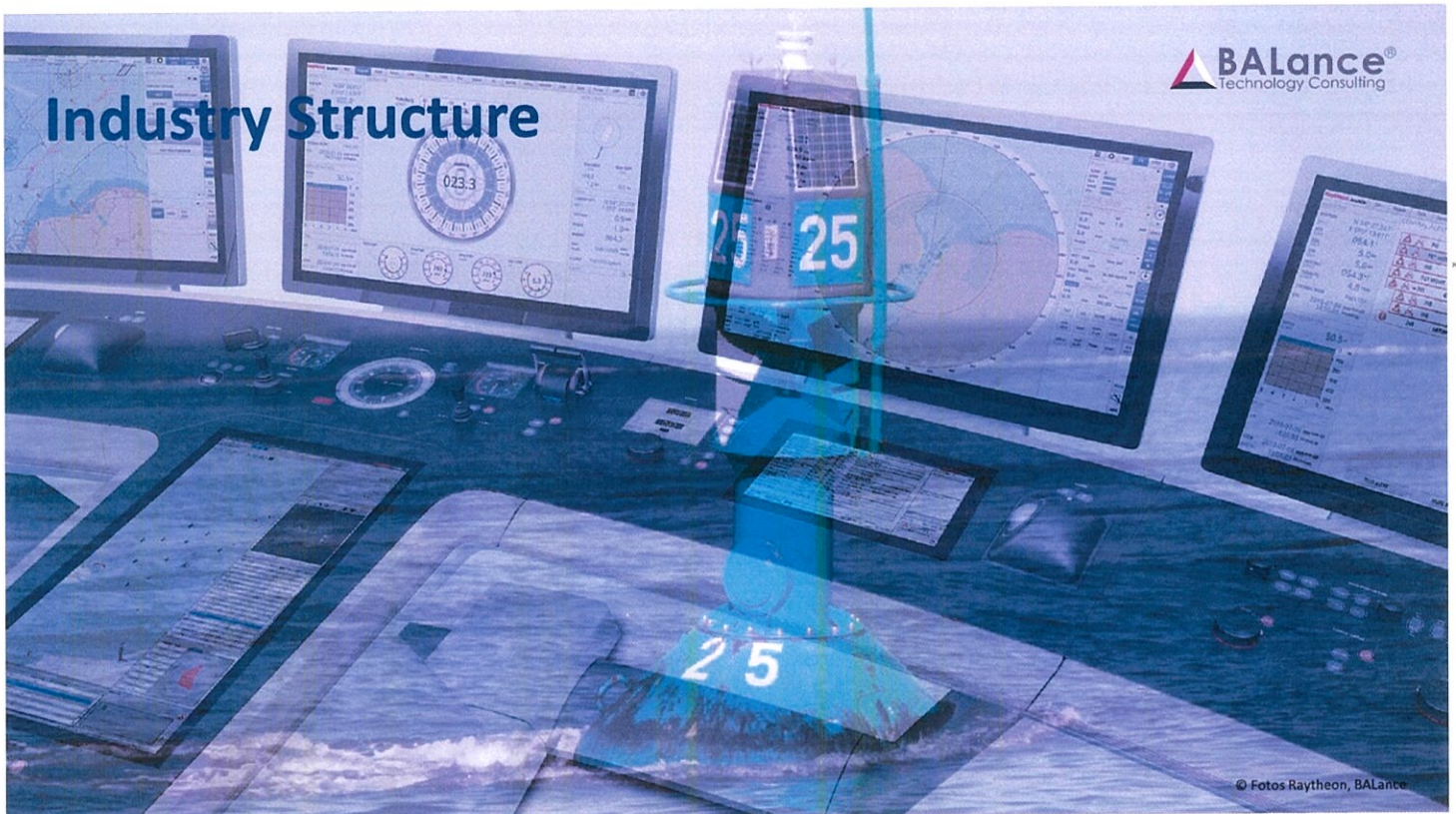
EU Marine Equipment Directive

Source: BALance Analytics, MarED 11/2019

Globally >11.500 marine supplies companies exist based on analysis of certificates

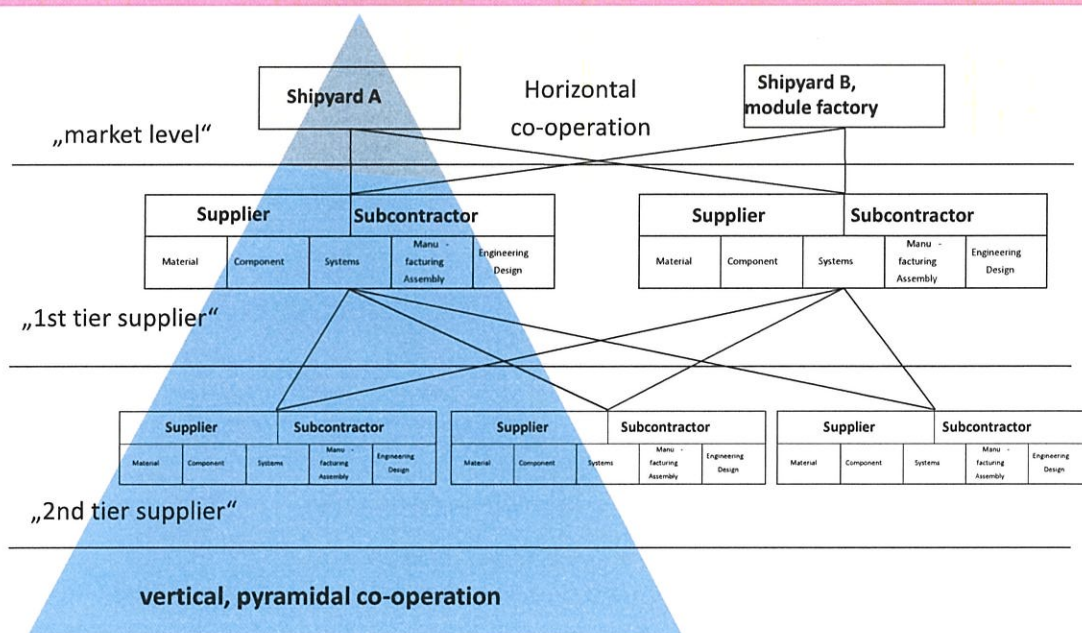


Source: BALance Analytics, MarED 2014

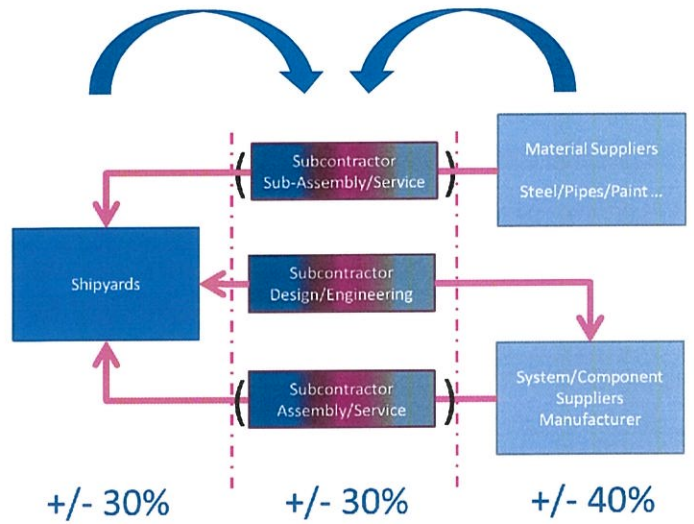
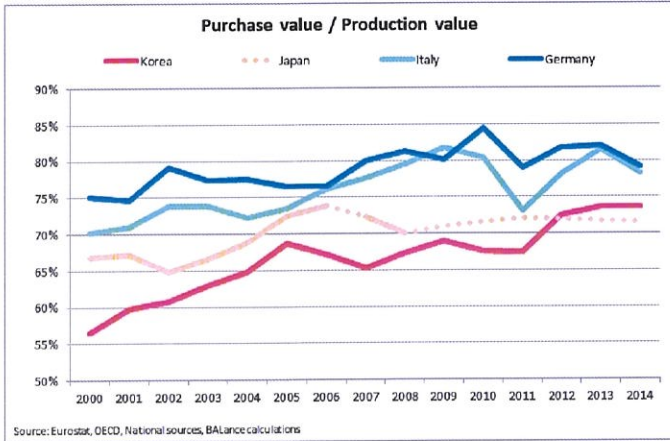


1. External services and subcontracts - engineering, design and consulting services
2. Materials – Steel (half raw materials, subassemblies)
3. Materials – Pipes and Ducts (half raw materials, subassemblies)
4. Materials – Paint, Coating (paints, painting services)
5. Systems/Equipment – Ship Operation (steering gear, anchor, deck machinery, life saving equipment, MARPOL equipment, general outfitting components)
6. Systems/Equipment - Cargo Handling Equipment and Special Cargo Plants
7. Systems/Equipment – Accommodation (cabins, public rooms, functional rooms)
8. Systems/Equipment – Propulsion Plants and Chains, Power Generation
9. Systems/Equipment - Auxiliary Systems
10. Systems/Equipment - Electrical Plants and Electronic Systems, Navigation, Entertainment

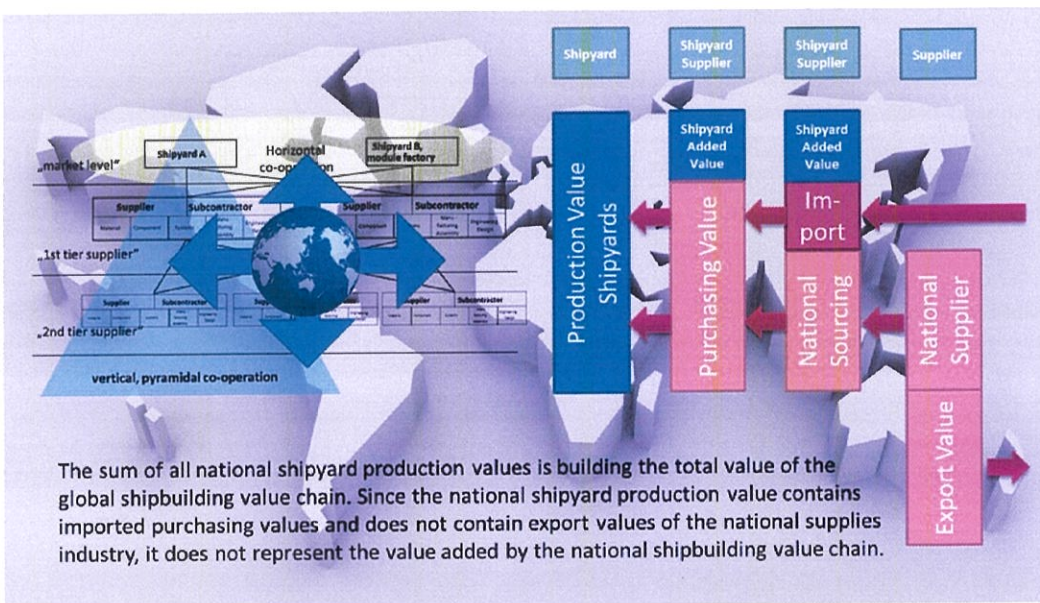
## Horizontal and vertical co-operation of shipyards and suppliers



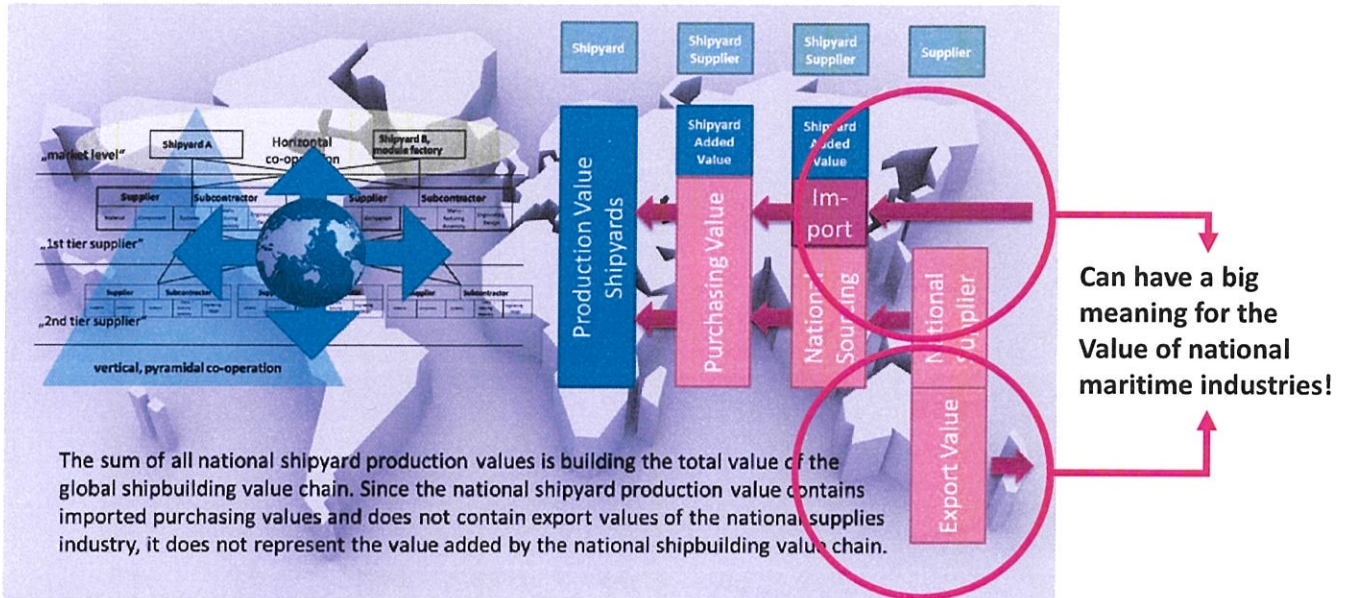
# Pattern of Supply Chains changing



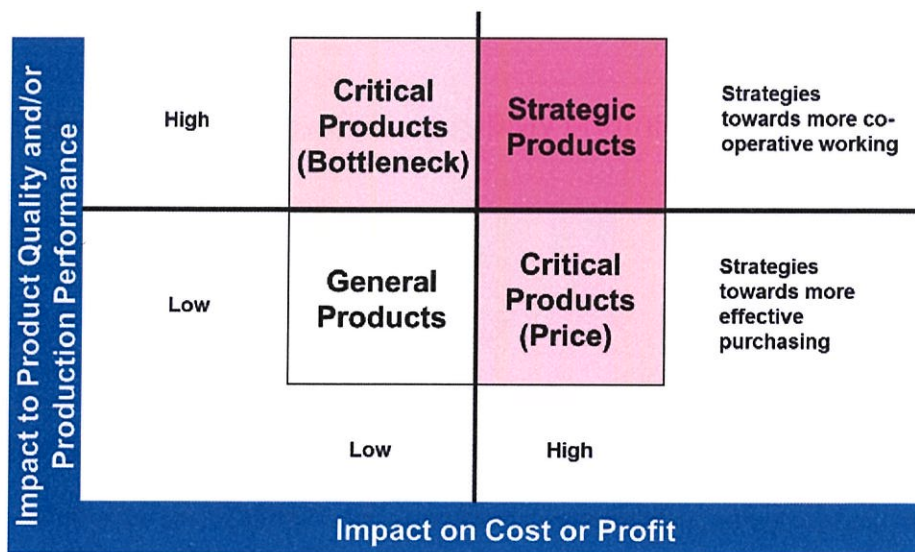
# Increasing Globalisation of Supply Chains



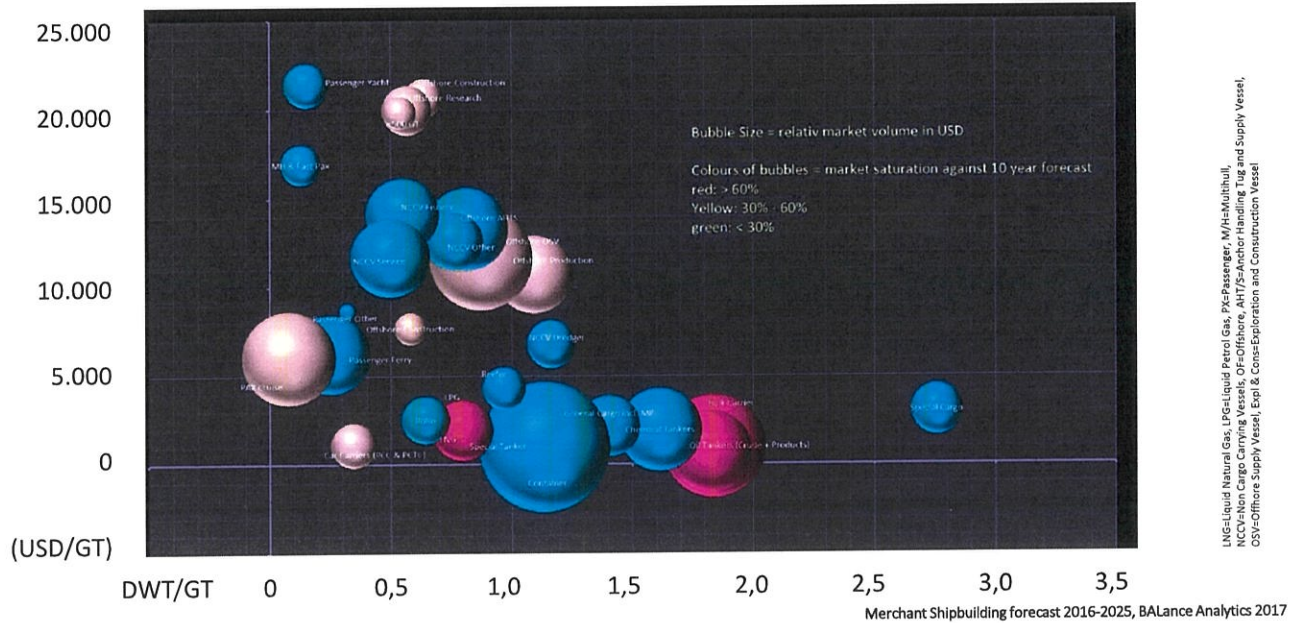
## Increasing Globalisation of Supply Chains



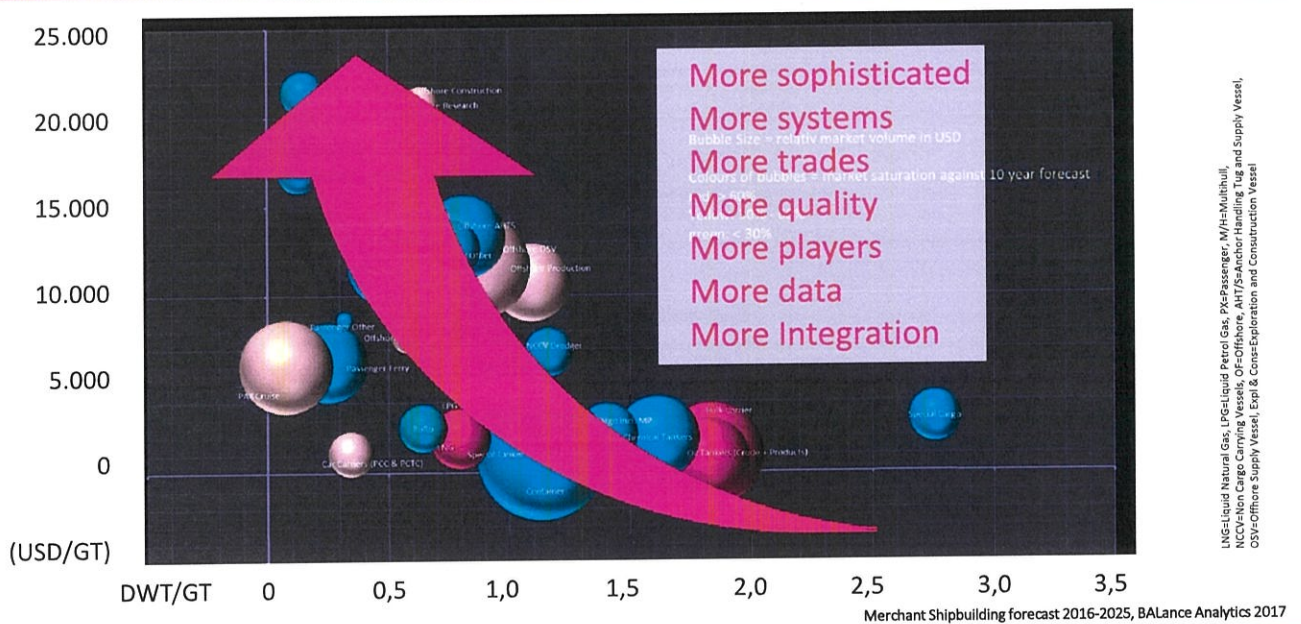
## Supplies have different impact on supply chains and products



## Meaning of supplies varies, Shiptype values show significant differences



## Meaning of supplies varies, Shiptype values show significant differences



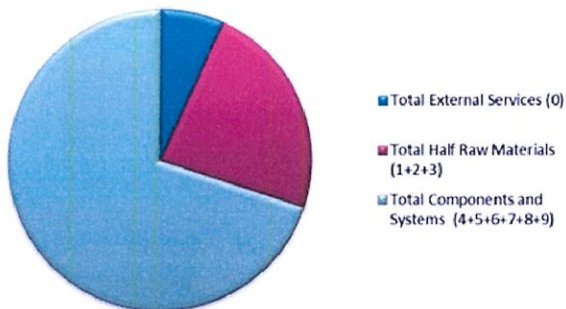
# Demand Patterns



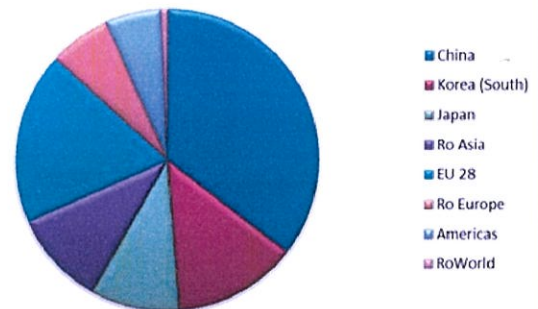
© BALance 2019

## World market for marine supplies – merchant shipbuilding only

**Marine Supplies Market 2016-2025**  
567 bn USD - Distribution to Trades

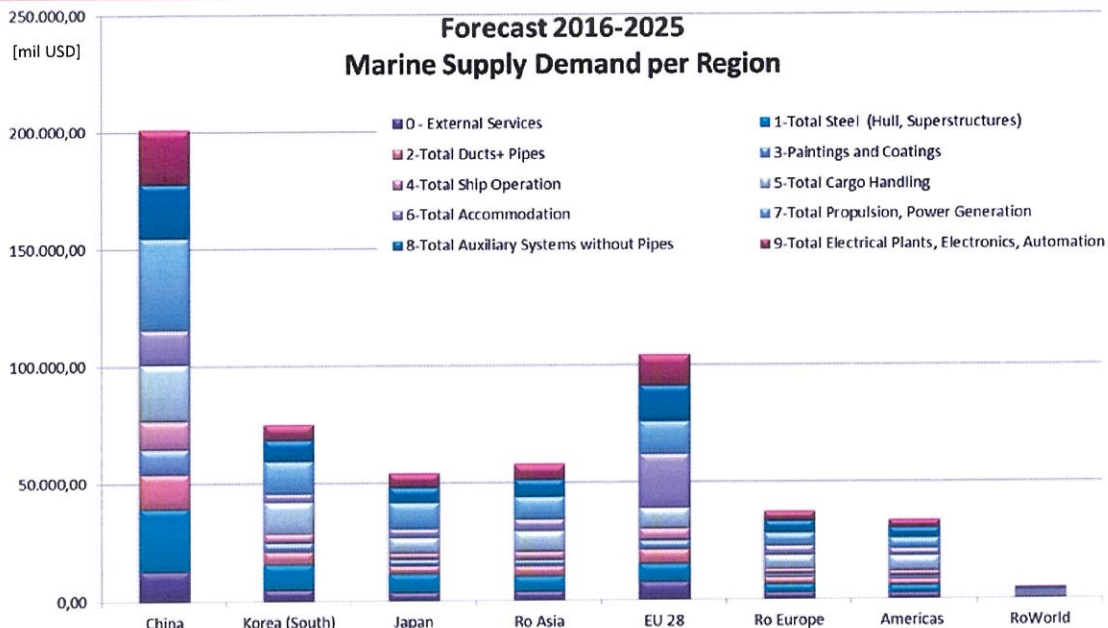


**Marine Supplies Market 2016-2025**  
567 bn USD - Demand from Regions



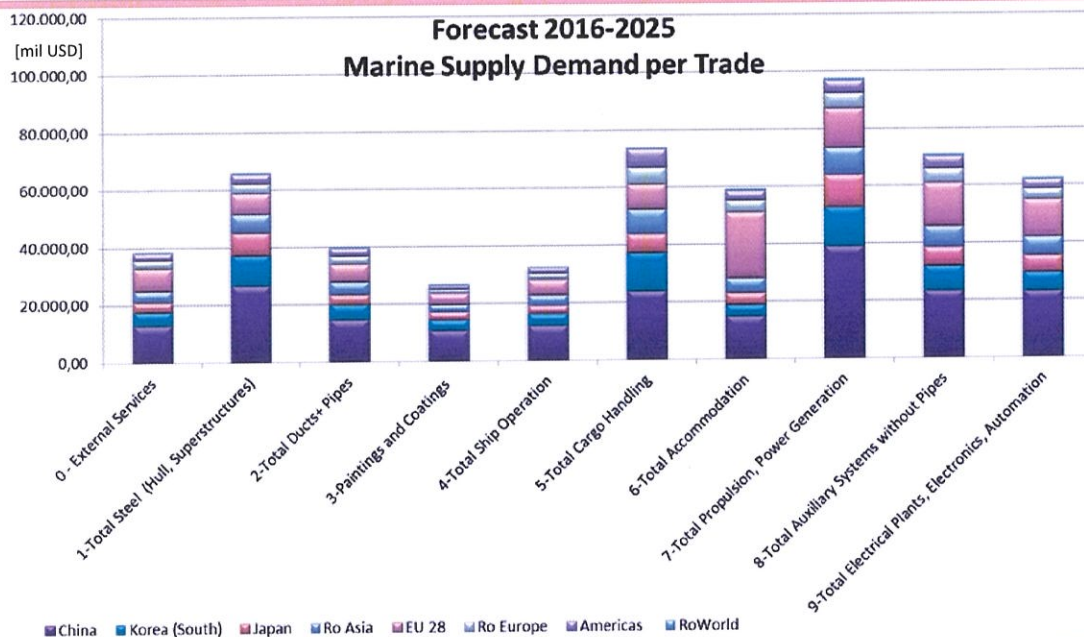
Merchant Shipbuilding forecast 2016-2025, BALance Analytics 2015

# World Market Marine Supplies (Forecast 2016-2025)



Merchant Shipbuilding forecast 2016-2025, BALANCE Analytics 2015

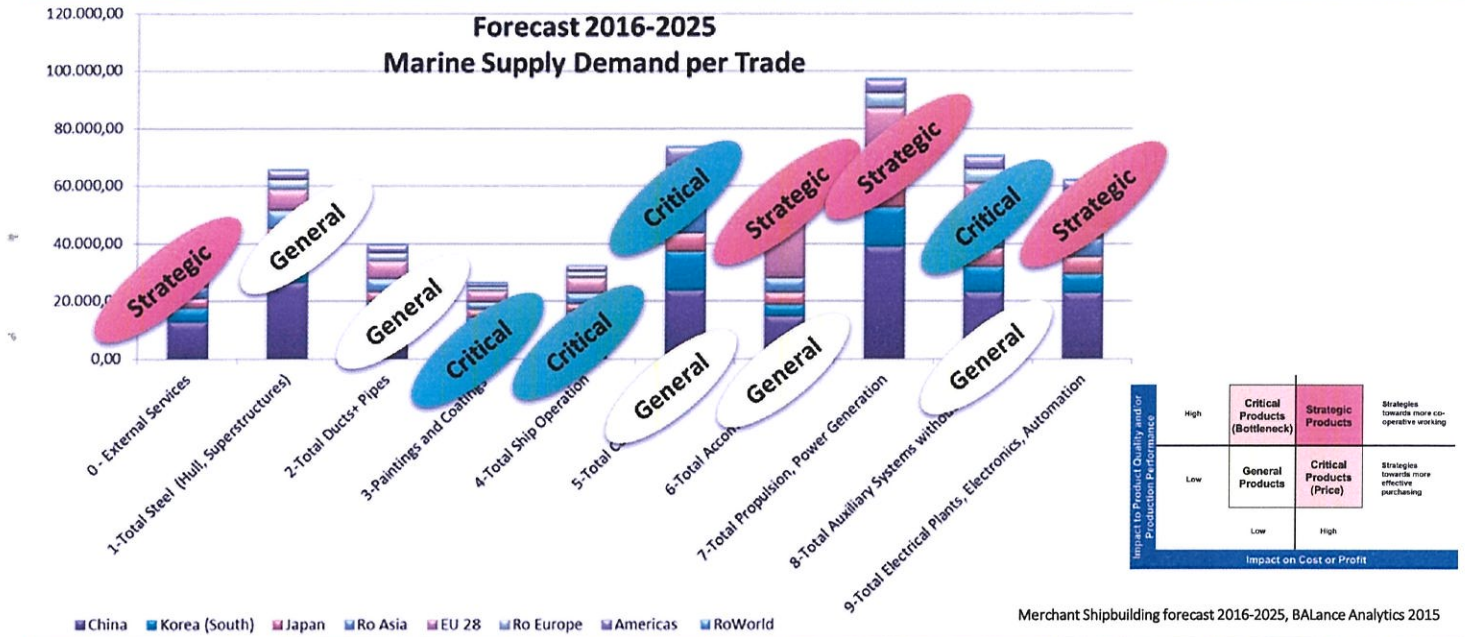
# World Market Marine Supplies (Forecast 2016-2025)



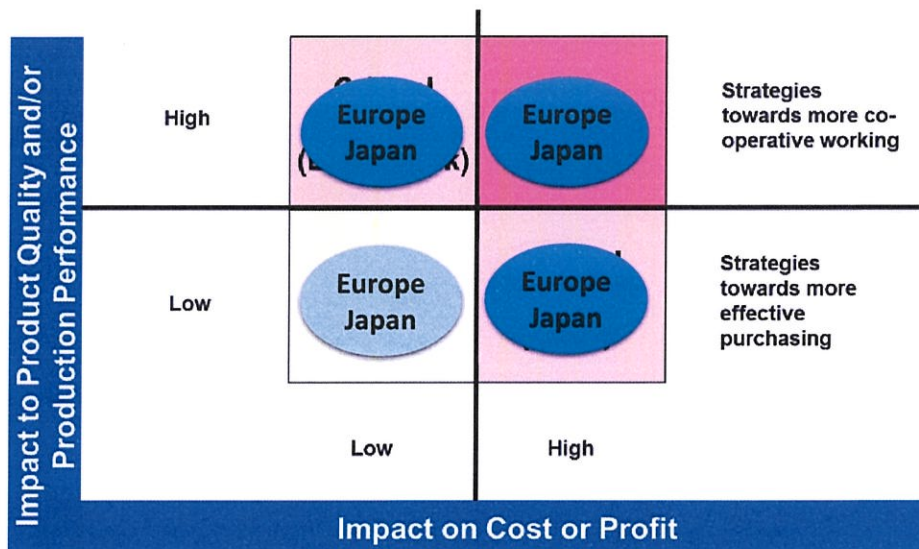
Merchant Shipbuilding forecast 2016-2025, BALANCE Analytics 2015



# Marine supplies are differently critical – depending on shiptypes

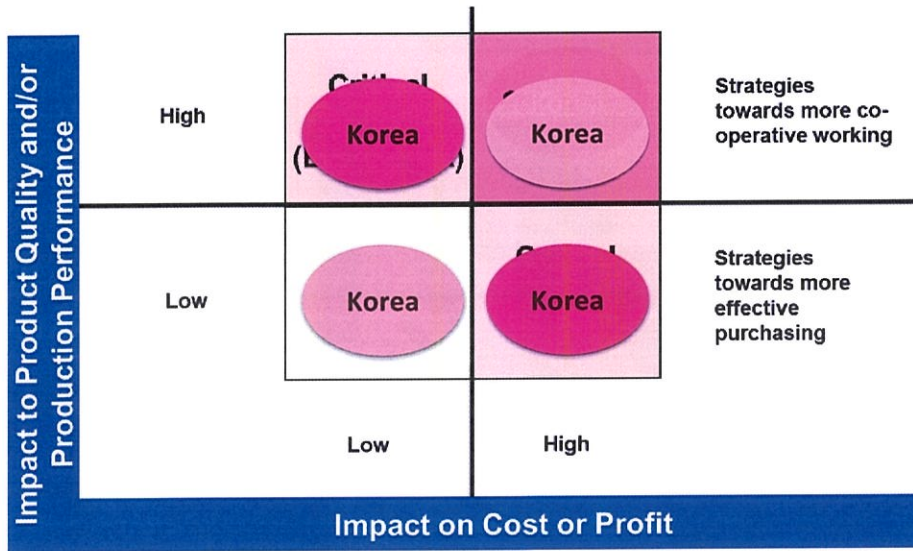


## Europe and Japan are strong in critical and strategic supplies, but have to follow markets



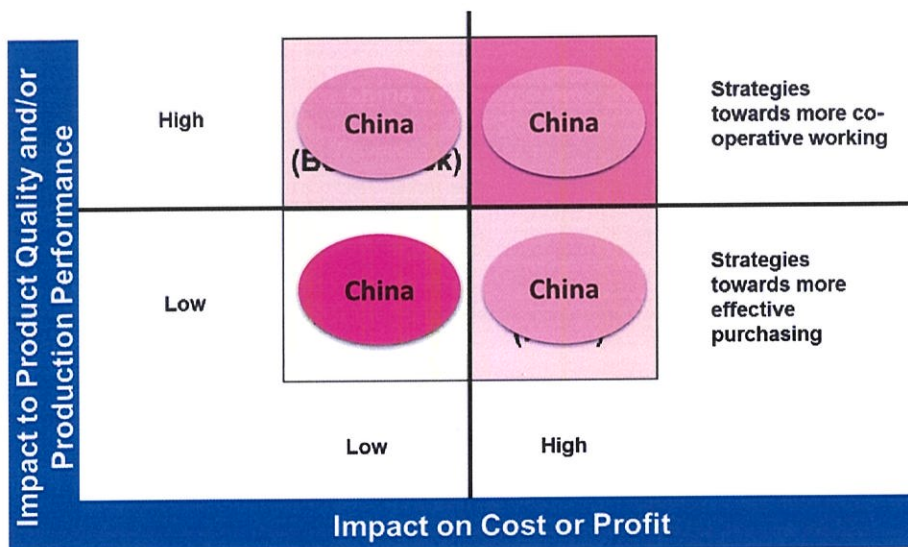
Note: dark blue = strong position of suppliers in these supplies classes

Korea is good at critical supplies but has shortcomings in some strategic supplies



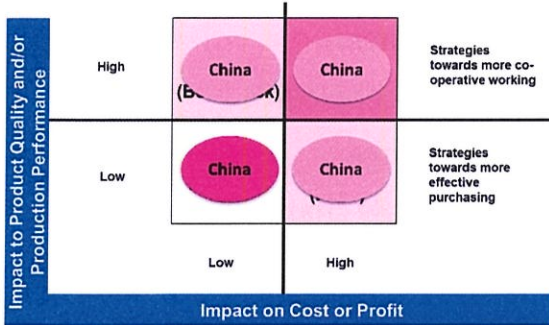
Note: dark red = strong position of suppliers in these supplies classes

China has shortcomings in strategic and critical supplies and has to create attractive market conditions



Note: dark red = strong position of suppliers in these supplies classes

## China has shortcomings in strategic and critical supplies and has to create attractive market conditions



MIIT - Action Plan 2016-2020 – “Boosting Capabilities of Marine Equipment Industry” (status 10/2016)

### Quotes

Targets for the next decade

*By 2020 a world class level of marine component industry shall be achieved in respect of power system, deck machinery, navigation/communication system, IT technology for marine application. The ratio of localisation of marine components shall be more than 80% for conventional vessels such as tanker, bulker and container vessel.*

Note: dark red = strong position of suppliers in these supplies classes

## Technological challenges will bring new kids on the block



## Future Trends influencing supplies and supply chains

- Consolidation of suppliers – from components to systems and multi systems suppliers
- Digitalisation – all ship systems have an IT dimensions – sensors and networks – new regulatory regime required including certification and classification
- Sustainability – zero emission vessels - new ships with new technologies
- Autonomous sustainable ships as ultimate (long term?) challenge
- Digitalisation – ships to become integral parts of logistical supply chain
- World fleet decarbonisation - increasing demand of retrofiting
- Faster retrofiting cycles in order to cope with regulatory updating – advanced life cycle management with suppliers and new services involved
- 3D-Printing – Central design and marketing - local manufacturing and certification



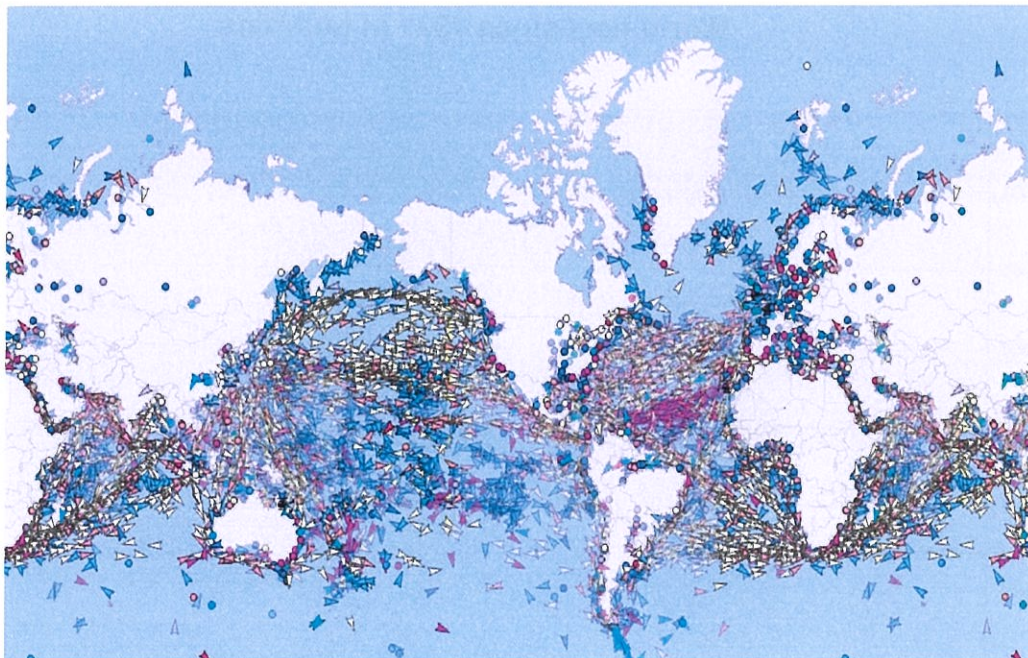
Advanced Marine Supplies  
are a vital element  
for innovative global  
shipbuilding



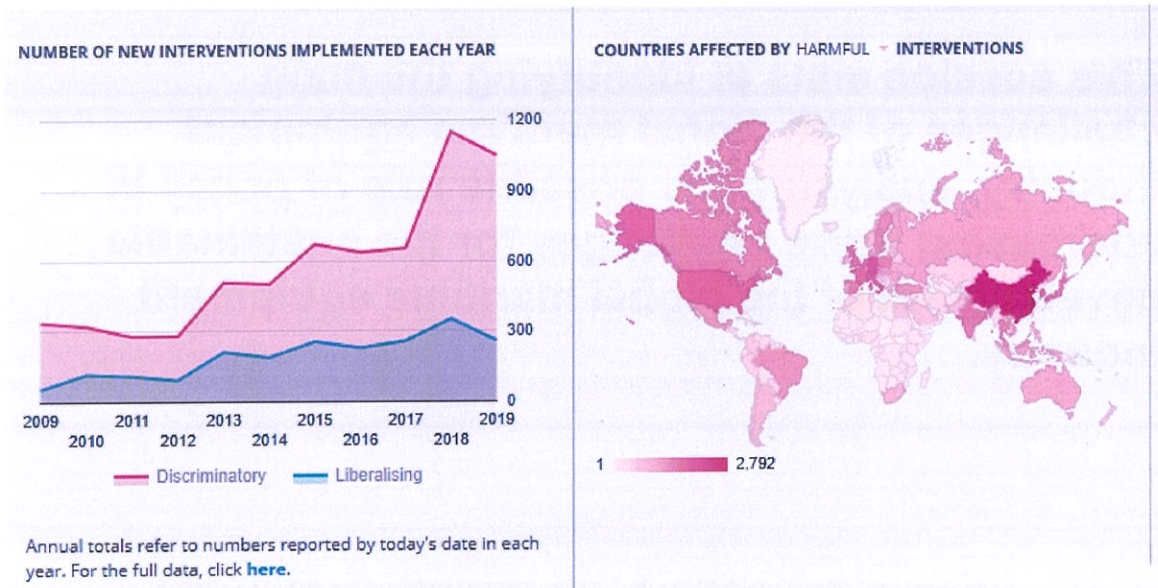
Contact  
Joachim Brodda  
BALance Technology Consulting GmbH  
Joachim.Brodde@bal.eu

**This session aims at identifying the main challenges of the global maritime equipment industry, analysing the possible role of policy in addressing these challenges for the sustainable development of the global maritime equipment industry.**

Jenny N. Braat, CEO, Danish Maritime and Chair, SEA Europe Market Forecast Working Group



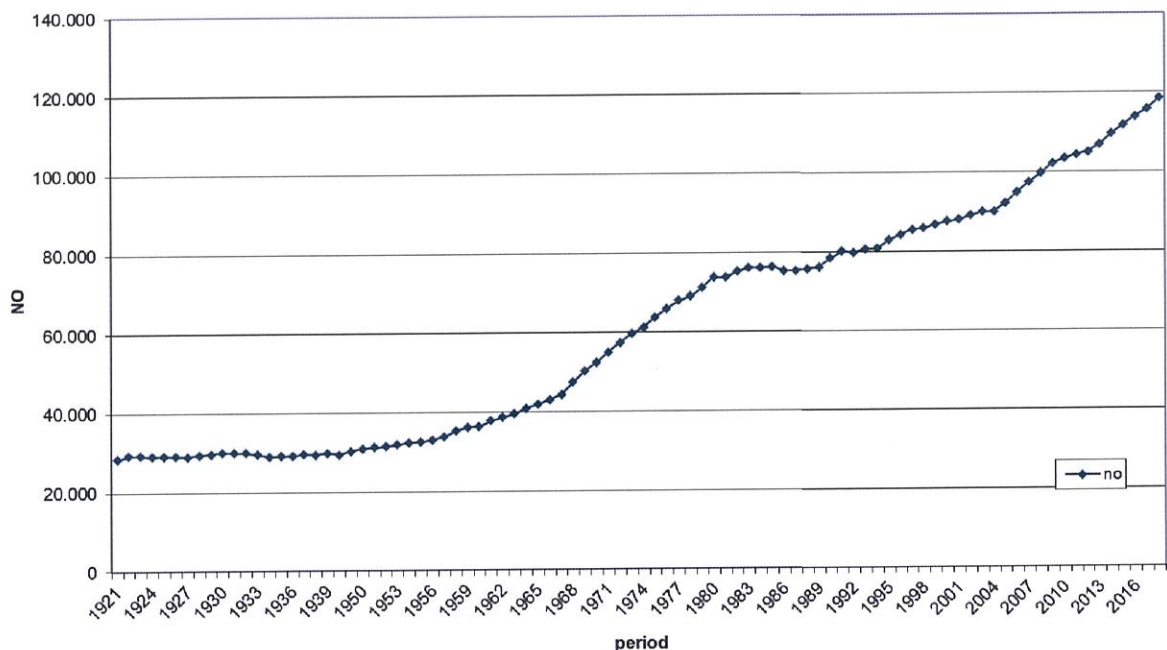
**A TRUE GLOBAL INDUSTRY**



WTO lowers trade forecast as tensions unsettle global economy  
 World merchandise trade volumes are now expected to rise by only 1.2% in 2019, substantially slower than the 2.6% growth forecast in April. The projected increase in 2020 is now 2.7%, down from 3.0% previously.

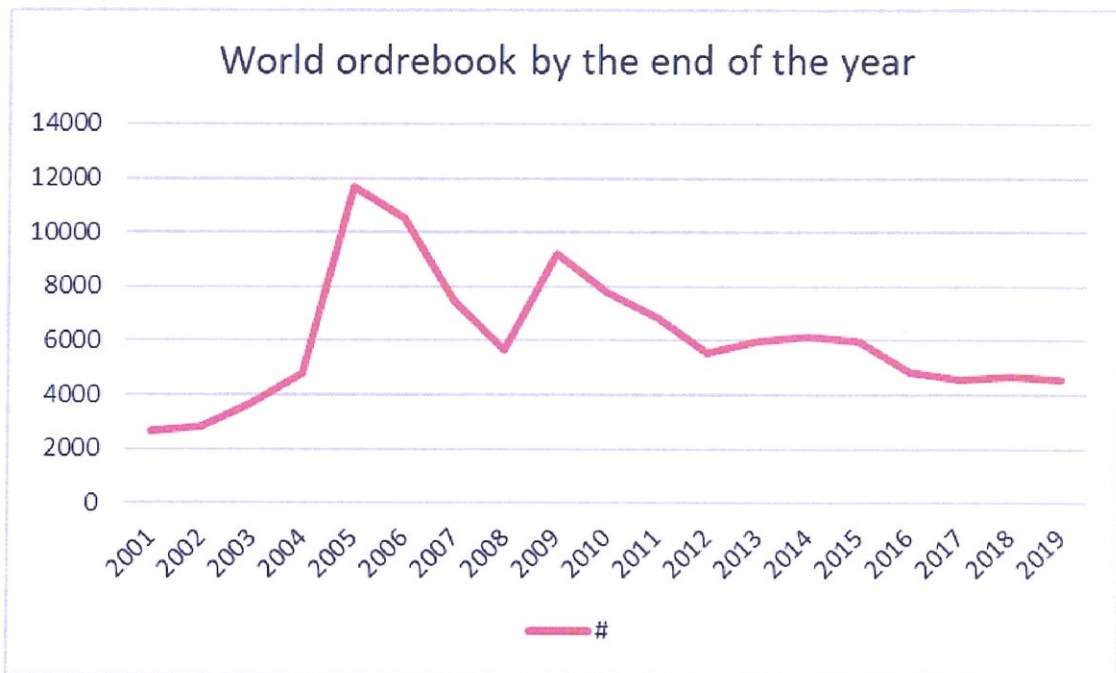
OECD 12. December 2019

**World fleet since 1921 in numbers**

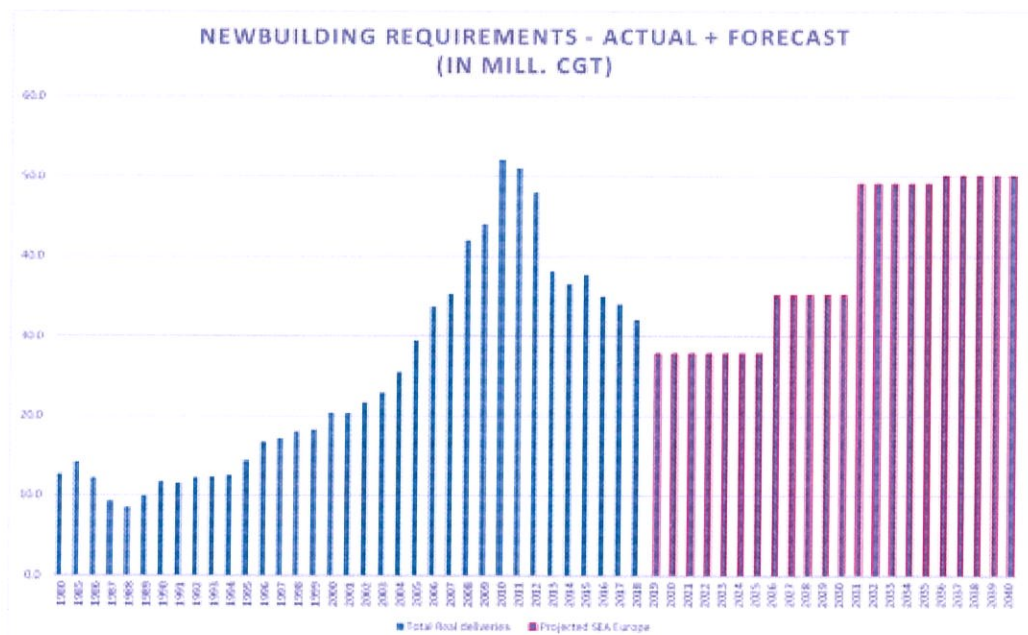


Source: IHS Lloyds

OECD 12. December 2019

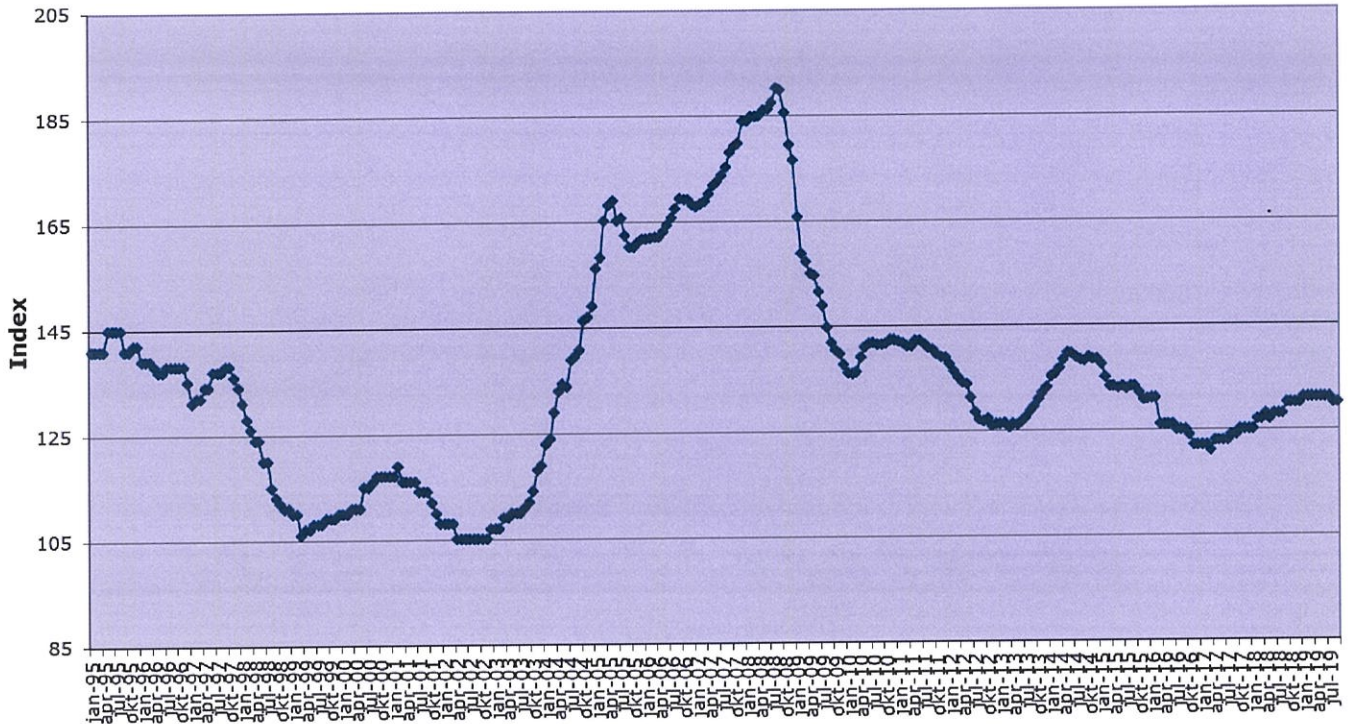


OECD 12. December 2019



Overall Summary of Long-term Newbuilding Forecast

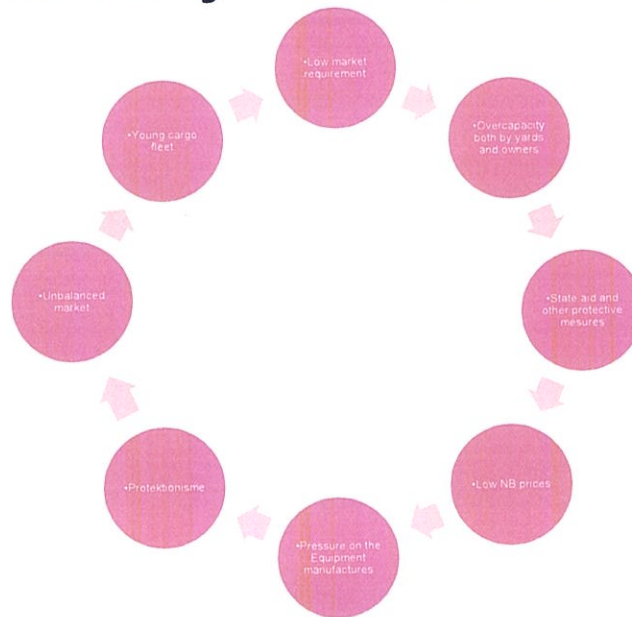
OECD 12. December 2019



Source: Clarkson

OECD 12. December 2019

## A global industry - our market reality



OECD 12. December 2019



## Need for adequate framework conditions and a global level playing

- Increased trade protectionism harmful
- Concrete examples of sector-specific measures boosting the shipbuilding sector
  - China (Made in China 2025)
  - South Korea – state aid and technical barriers
  - India – local content
  - Russia – local content
- Act against trade protectionism, whilst exploring new trade opportunities

## Actions internationally - WTO and OECD

- Amend the WTO anti-subsidy rules
- Tackle injurious pricing practices in shipbuilding
- Address forced technology transfers and respect IPR
- Make progress on services liberalization and reduce investment barriers
- Avoid discriminatory government procurement practise and local content requirements



# International Technology Transfer Policies

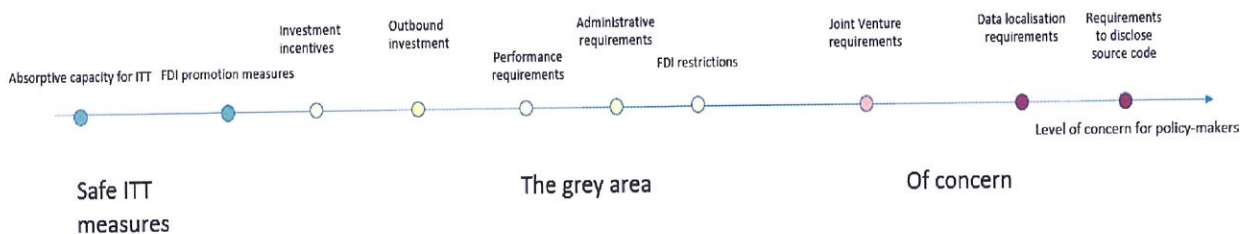
**Workshop on Trends and Challenges in Shipbuilding**  
**12 December 2019**  
**Paris, France**

## Policies related to international technology transfer

- ❑ International technology transfer (ITT) is an important source of knowledge and economic growth worldwide
- ❑ Increasing share of policies aimed at promoting ITT, including
  - Policies addressing market imperfections and externalities and creating the appropriate supporting environment for ITT
    - ✓ improving intellectual property rights protection,
    - ✓ promoting technology-related foreign direct investment (FDI)
    - ✓ enhancing absorptive capacity
- ❑ But some approaches have the effect of imposing ITT to varying degrees
  - ✓ FDI restrictions,
  - ✓ performance requirements,
  - ✓ mandatory joint venture requirements
- ❑ How can we distinguish between mutually agreed upon technology transfer and transfer that is in fact compelled ?

# A continuum of measures related to ITT

- ❑ The continuum provides a framework for considering ITT measures' potential to force the disclosure of sensitive technology
- ❑ Two main criteria:
  - the degree of compulsion the policies impose on foreign firms when they interact with local counterparts
  - the effect they have on the extent of foreign firms' control of their proprietary technology



# Factors influencing the level of concern

- ❑ The nature of the measures and the broader policy environment
  - *Quid pro quo* for accessing the market
  - Discrimination in terms of the measure or the broader environment
  - Lack of transparency in formulation and application
  - Role of State in the economy
- ❑ The design and enforcement in the IPR regime
  - The patent system
  - Licensing agreements
  - Trade secrets
  - Enforcement of IPRs

# WTO and International Investment Agreements rules

Relevant disciplines related to IPR protection, and ITT more broadly, can be found

## ❑ In the WTO

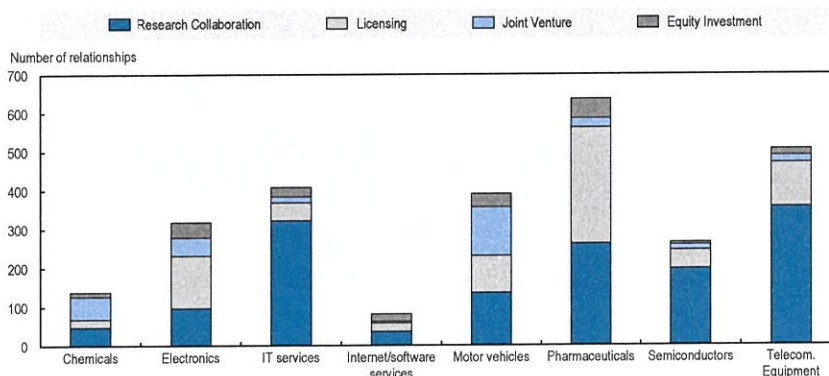
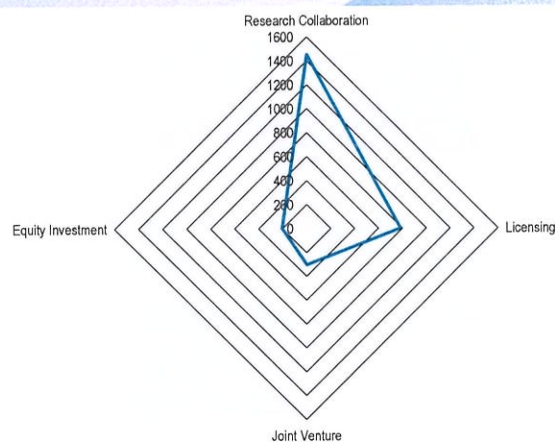
- In particular disciplines such as TRIPS provisions on national treatment, patents and protection of undisclosed information,
- Beyond IP related disciplines, provisions governing the wider investment policy environment can be found in TRIMS

## ❑ In International Investment Agreements

- Disciplines on the conditions imposed in order to approve the establishment in the recipient country;
- Limitations to performance requirements, including in the form of technology transfer

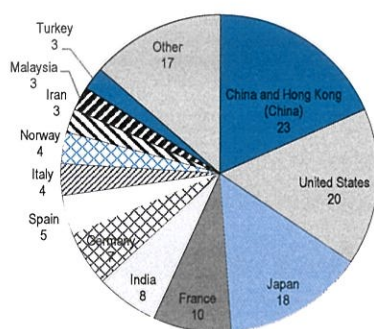


# Firm-level analysis

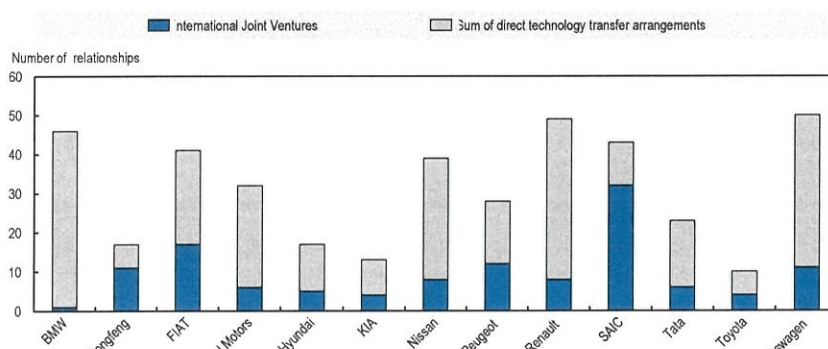


# Joint Ventures: the example of motor vehicles

International Joint Ventures in Motor vehicles, by country



International Joint Ventures as a share of direct technology transfer arrangements, by company



Source: OECD, based on the Factset Supply Chain Relationships database

OECD Trade and Agriculture Directorate

7

## Insights from company interviews

Broadly...

- There are barriers to reporting publicly: fear of retaliation in valuable markets
- Concerns go beyond trade-related policies (e.g. criminal, cybersecurity)
- Companies sometimes balance economic opportunities with risks to IP
- Non-transferability of certain business processes is a limit to FTT policies' effectiveness

And specifically...

- Administrative requirements are of concern (especially in product certification processes and processes to obtain investment licenses)
- Aggravating conditions: transparency and the role of the state



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8

# Thank you!

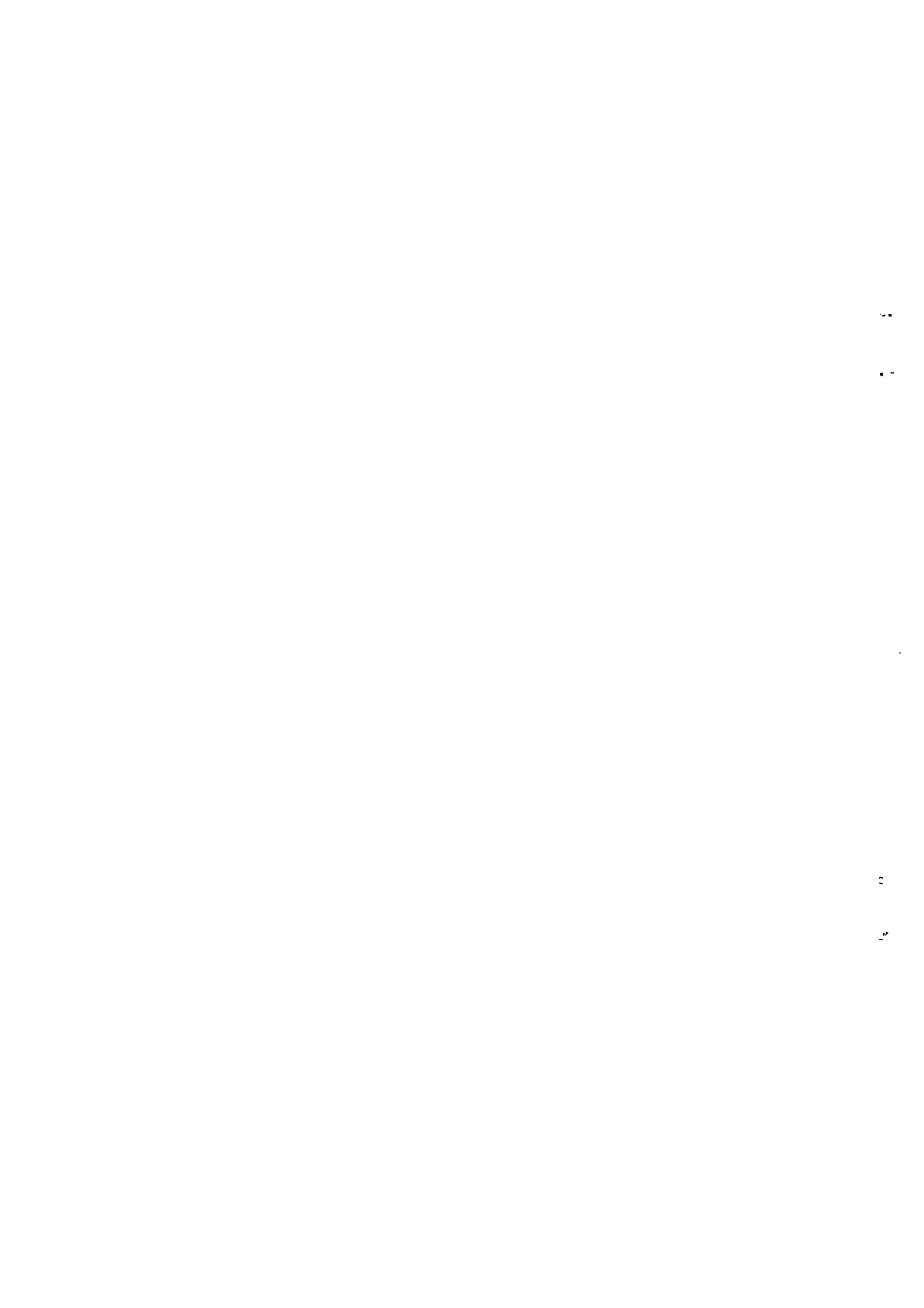
Andrenelli, A., J. Gourdon and E. Moïsé (2019), "International Technology Transfer Policies", *OECD Trade Policy Papers*, No. 222, OECD Publishing, Paris, <https://doi.org/10.1787/7103eabf-en>.



## Annex

**Table A.2. Types of supply chain relationships covered by FactSet**

<b>Investment</b>	
Subsidiaries	An investment enterprise that is fully (100%) or majority owned (>50%) by its parent company.
Equity investment	An investment of up to 50% of an enterprise's voting power.
Investors	Entities which own equity stake in the parent company
<b>Strategic partnerships:</b>	
Joint Venture	The parent company jointly owns a separate company with one or more companies.
Out-licensing	An owner (licensor) of intellectual property (patents, trademarks, copyrights, trade secrets) (IP) authorizes a licensee to make, use, or sell, the specified IP of the licensor, under voluntary and mutually agreeable terms.
In-licensing	A licensee receives authorization from an owner (licensor) of intellectual property (patents, trademarks, copyrights, trade secrets) (IP) for the licensee to make, use, or sell, the specified IP of the licensor under voluntary and mutually agreeable terms.
Research collaboration	Companies collaborating with the parent company for research and development, generally for new product development, common between science companies and between technology companies. This designation is applicable for products in development, not marketed.
Integrated product offering	Companies with whom the parent company agrees to bundle standalone products/services of each company, which are marketed together as one offering. No money is exchanged upfront, and costs, risks, and profits are shared.
<b>Arm's length trade</b>	
Suppliers	Companies from which the parent company purchases goods or services.
Manufacturing	Entities which provide paid manufacturing services to the parent company.
Distribution	Entities which the parent company pays to distribute this company's products/services.
Marketing	Entities which provide paid marketing and/or branding/advertising services to the parent company.
Customers	Entities to which the parent company sells products/services; the "opposite" of Supplier relationship.







MANAGEMENT  
SCHOOL  
PARIS-LA DÉFENSE

# Understanding and managing “forced” technology transfer

OECD, Paris  
December 12<sup>th</sup> 2019

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Non-resident Research Associate, Duke University's Kunshan, China campus

## Contents

- 1. Introduction**
2. Understanding how FTT policies work
3. Managing risks from FTT policies
4. Implications

## 1. Motivation and research questions

- **“Forced” technology transfer (FTT) policies faced by MNCs are increasingly controversial...a basis for WTO disputes and recent US-China trade war**
- **Questions:**
  1. **How do these policies function to spur technology transfer from foreign MNCs to local firms?**
  2. **How do foreign MNCs manage the risks from FTT policies and why?**
- **Some research on aspects of these questions, but still major gaps!**

3

## 1. Method and materials

- **Empirical context:** Workings and effects of FTT policies in China, in multiple industries, over last 15 years or so and how MNCs respond
  - Findings should be generalizable to some extent
- **Draws on two recent papers: [Prud'homme et al. \(2018, TFSC\)](#) and [Prud'homme and von Zedtwitz \(2019, JIM\)](#)**
  - Survey of >100 European firms operating in China
  - Interviews with IP and R&D managers in > 40 European and US firms operating in China
  - Case studies of Chinese firms benefitting from FTT policies
  - Review of laws and regulations (in Chinese and English)
  - Review of government reports and other documents

4

# Contents

1. Introduction
- 2. Understanding how FTT policies work**
3. Managing risks from FTT policies
4. Implications

5

## 2.1 What are FTT policies?

- **No universal definition of “FTT”!**
- **But some international governance of what MNCs consider “FTT” policies**
  - Multilateral WTO agreements (TRIPs, TRIMs, indirectly other agreements)
  - Plurilateral WTO agreements (e.g., GPA)
  - Country-specific WTO-plus provisions (e.g., Protocol of Accession, Working Party Reports)
  - Plurilateral or bilateral agreements (e.g., investment and trade agreements)
- **My definition of FTT: systematic state measures (de jure or de facto) involving intellectual property (IP) meant to increase foreign-domestic technology transfer that simultaneously weaken appropriability of foreign innovations**

6

## 2.1 Types of FTT policies and caveats

- **Three main types (categorized by consequences for non-compliance):**
  1. No choice
  2. Lose the market
  3. Violate the law
- ***With exception of “no choice” policies, MNCs in fact do have a choice (of sorts, although it’s always met with consequences) to comply***
- **Still use term “FTT” for policies hereafter because that’s how MNCs refer to them**
- **FTT policies are important, but concerns about them in China shouldn’t be overblown – [Prud’homme \(2019, HBR\)](#)**

7

## 2.1 FTT policies of concern in China in the lead up to the trade war

- **Some of most concerning:**
  - Lose the market: Tech transfer for market access requirements (e.g., NEVs)
  - Violate the law: Several provisions of Technology Import-Export Regulations
  - Violate the law: Burdensome SEP disclosure terms and dubious SEP licensing terms
  - No choice/lose the market: Excessive divulgence of trade secrets in regulatory approval processes and passing that information to competitors
  - No choice: Unfair IP court rulings
- **Other examples (non-exhaustive):**
  - Data localization requirements
  - Requirements in Foreign-Sino equity JV regulations
  - Establish R&D center in JV as precondition to enter market
  - Local content requirements
  - Other investment-related requirements

8

## 2.1 FTT policies aren't just in China – US Chamber, UN, Andrenelli et al. (2019)

- **Indonesia** (e.g., 2016 patent law requirement for transfer of patented technologies and processes in Indonesia)
- **South Africa** (e.g., overly broad basis for compulsory licensing)
- **Brazil** (e.g., longstanding restrictions on licensing fees and terms just reformed...yet new areas of concern?)
- **Other markets**

9

## 2.2 Determining risks from FTT policies: understanding FTT policy “leverage”

- **Main business risk from FTT policies = appropriability loss (ability to control and profit from tech)**
- **“Leverage” is the overall mechanism determining such loss = ability to shift bargaining power in foreign-domestic tech transfer arrangements to favor domestic firms**
- **Not all FTT policies exert the same leverage!**
- **7 factors determine FTT policy leverage:**
  1. state support for industrial growth,
  2. oligopoly competition,
  3. other policies closely complementing FTT policies,
  4. high technological uncertainty,
  5. policy mode of operation offering basic appropriability and tailored to industrial structure,
  6. reform avoidance by the state, and
  7. stringent policy compliance mechanisms

10

## 2.2 Example of leverage from China's NEV FTT policy -- according to the FTT Leverage Forecasting Matrix from Prud'homme et al. (2018)

<b>1. Strong state support for industrial growth</b>	√ (Government subsidies for NEV production, government procurement of NEVs, and consumer subsidies for purchasing NEVs, infrastructure investment [although some decentralization issues] – first two sources of funding and NEV production permit denied if don't comply w/FTT policy)
<b>2. Oligopoly competition</b>	√ (Limited number of firms making NEV engines and other core technology for NEV vehicles)
<b>3. Other policies closely complementing FTT policies</b>	√ (CO2 emissions standards and fuel efficiency standards must be met)
<b>4. (High) degree of tech uncertainty in targeted industries</b>	√ (Still lack fully dominant design in EV engines and some other core tech in the NEVs industry)
<b>5. Policy mode of operation offering basic appropriability and tailored to industrial structure</b>	Y (Some appropriability, at least vis-à-vis unfair court rulings; JV mode of operation suited to leaders in auto industry given relatively concentrated)
<b>6. Reform avoidance by the state</b>	√ (Avoidance despite issue being brought up repeatedly by USG and industry associations)
<b>7. Stringent policy compliance mechanism</b>	√ (MIIT oversight of type of tech transferred, even more extreme requirements as of 2017)
<b>TOTAL SCORE</b>	<b>6√s + Y = HIGH LEVERAGE</b>

11

## Contents

1. Introduction
2. Understanding how FTT policies work
- 3. Managing risks from FTT policies**
4. Implications

12

### 3.1 Survey results: Top 10 strategies for managing risks from FTT policies in China (i.e., best at mitigating detrimental effects)

Strategy category	Orientation of strategy	Perceived effectiveness
Policy and law monitoring	Internal	58%
Resources devoted to in-house IP dept. and external IP services	Internal and external	50%
Lobbying via external business groups	External	38%
Efforts to get home government to pressure China	External	31%
Keeping trade secrets	Internal	31%
Lobbying via own government affairs department	External	27%
IP risk assessments	Internal	27%
Avoiding entry into JVs with Chinese partners	Internal	21%
Invention patent filings	External	19%
Establishment of a JV only after careful due diligence	External	19%

Percentages exceed 100% because respondents chose top five strategies, not just one top strategy

13

### 3.1 Survey results (continued)

- R&D to take advantage of state policies (17%)
- applying for government contracts (13%)
- adjudicating IP in a civil proceeding (13%)
- changes to product lines in China (10%)
- utility model filings (10%)
- managing sophistication of technology transfer (and R&D/technological dependencies/complementarities) (10%)
- level of technological linkages with Chinese JV partner (8%)
- relocation of manufacturing away from China (8%)
- usage of strategic price discrimination (8%)
- enforcing IP through administrative authorities (8%)
- resources spent on licensing IP (8%)
- changes to Chinese JV partner(s) (6%)
- applying for government subsidies, tax, and/or financing (6%)
- participation in state-funded research collaboration (6%)
- leverage brand familiarity to gain customers (6%)
- filings of other forms of IP outside invention patents and utility models (6%)
- seeking criminal prosecution for IP infringement (6%)
- standards development (6%)
- shifting of sales focus away from China (4%)
- Black-boxing (4%)
- reductions of product price (2%)
- bringing IP invalidation cases (2%)
- R&D spending/strategy for other reasons (2%)

14

## 3.2 Main internally-oriented strategies: important but not always sufficient

- Ramp up use of trade secrets to create info. asymmetries (although sometimes pressured transfer of these and/or issues enforcing them)
  - Increase in-house R&D in promising areas not subject to FTT policies
  - Double-down on promising R&D co-specialized w/tech transferred to maximize complementarities to complicate outside imitation
  - Avoid JV if possible
- But not sufficient to manage appropriability risks *from highest leverage* FTT policies

15

## 3.2 Main externally-oriented strategies

- Heavily invest in IP management
- Expand patent portfolios 2-3X faster than in developed markets
  - Enforce patents in courts and other venues (minding protectionism)
- If must enter JVs w/local firms to get biz license, conduct careful due diligence
- Only transfer tech behind the frontier if can get away with it
- Lobby Chinese government directly
- Lobby via industry associations
- Lobby via home government (reluctance in past, rising willingness as leverage from FTT policies increased)

16



## 3.2 (continued) Results of lobbying in particular

- Most major FTT policies in China essentially abolished in 2018 and 2019!!
- **Effect on shipping sector in China too:**
  - Longstanding 49% ownership restriction in ship construction and low-speed marine diesel engine production
    - Seen as “key/strategic” industry, policy goals to acquire foreign expertise and tech in marine subcomponents (Grubb, 2008)
  - In 2018, foreign ownership restrictions to be lifted in design and manufacturing in shipping industry, as well as in international shipping and maritime transport services (CMS, 2018)

17

### Side note: Changes of course don't mean Chinese state is no longer involved in guiding development of shipbuilding and maritime equipment industries

- **Strategic Emerging Industries initiative, some provinces choose to specialize in marine equipment** (Prud'homme, 2016, RP)
- **Made in China 2025 promotes specialization in high-end shipbuilding and offshore engineering equipment manufacturing**
- **National Medium-and Long-Term Plan of the Shipbuilding Industry (2006-2016)**
  - Annual output targets set; annual production targets for medium- and low-speed ship diesel engines set; more than 60% of ship equipment to be produced locally
- **Sources indicate recent subsidies in shipbuilding and supporting industries** (e.g., Haley and Haley, 2013; Thompson, 2014; ShippingWatch, 2018; Kalouptsidi, 2018)
- **Shipbuilding Industry Deeping Structural Adjustment, Accelerating Transformation and Upgrading Action Plan (2016-2020) from MIIT**
  - Eliminate low-end production capacity; increase R&D; further concentrate industry (significant consolidations by CSSC and CSIC); produce more luxury cruise vessels
- **Several implementing plans for overarching plans**
- **Maritime Silk Road investments**

18

# Contents

1. Introduction
2. Understanding how FTT policies work
3. Managing risks from FTT policies
- 4. Implications**

19

## 4. Implications

### **Policymakers:**

- The design of FTT policies *per se* – *in any industry* – doesn't fully determine their risks to foreign MNCs, one must also consider how policies interact with seven conditions determining leverage
- Sometimes the policies achieve their goals, but often they don't or even discourage tech transfer (especially of frontier tech)

### **Managerial:**

- Foreign MNCs may use internally-oriented strategies to manage risks from lower/middle-leverage policies
- But as leverage increases, a combination of internal- and external-oriented strategies may be needed to best manage risks

20

Thank you



