Corporate Strategies along the LNG Value Added Chain

An Empirical Analysis of the Determinants of Vertical Integration

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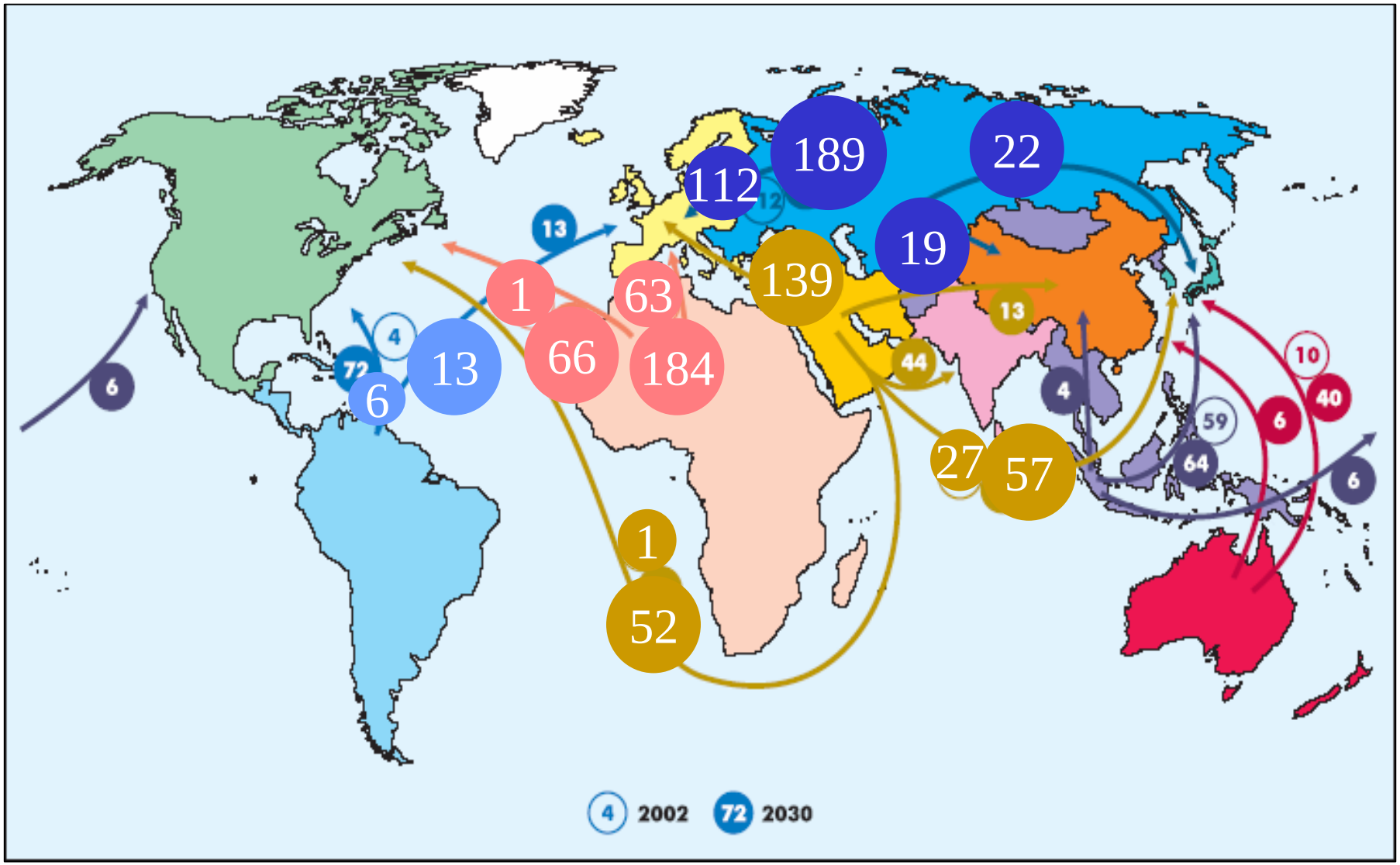
Agenda

1. Introduction
2. Literature
3. Corporate Strategies
4. Data, Methodology and Results
5. Conclusions

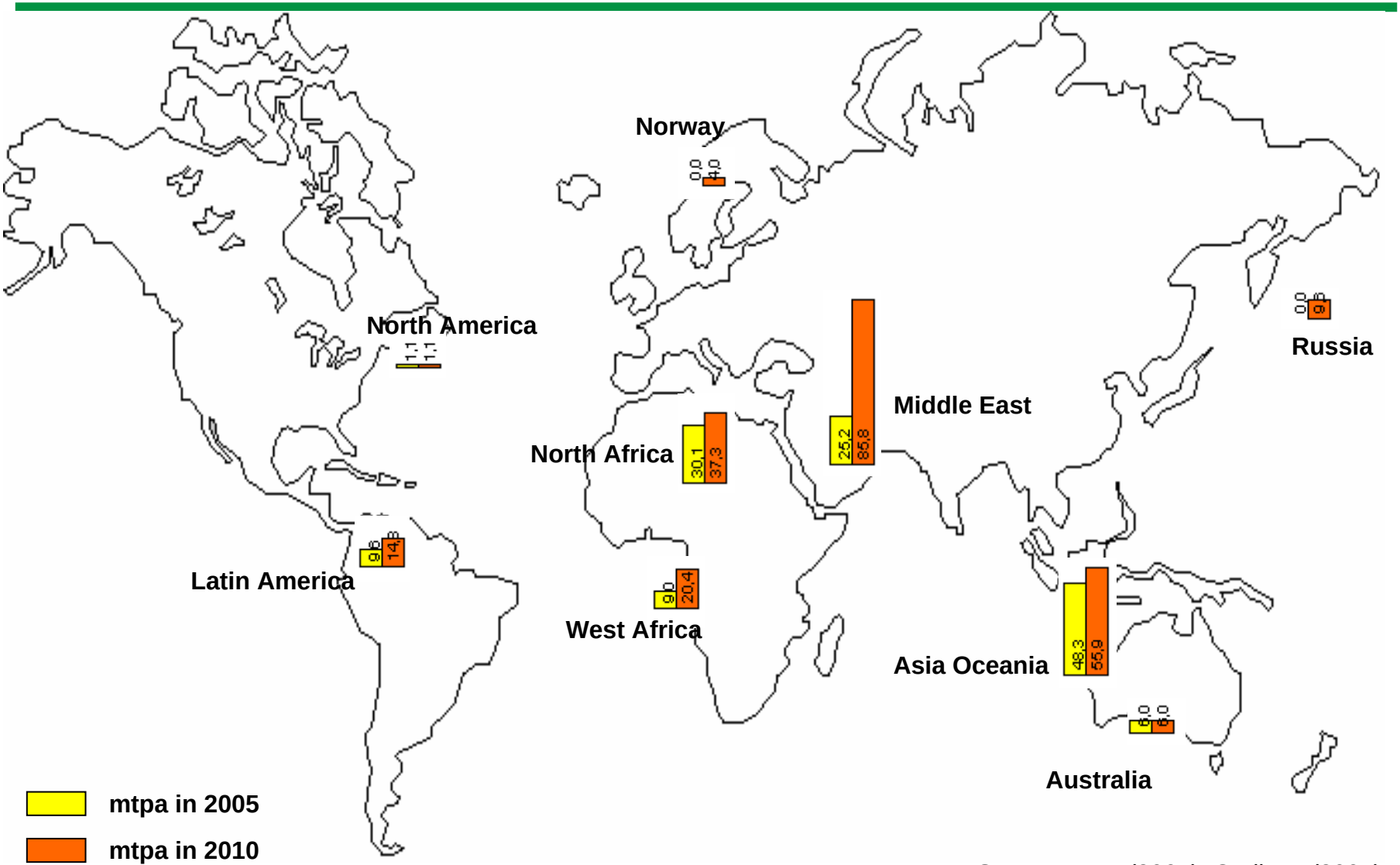
More Competition through „Globalization of Natural Gas Markets“

(trade in 2002 and 2030, bcm)



Source: IEA, 2004

Nominal Liquefaction Capacities Are Increasing

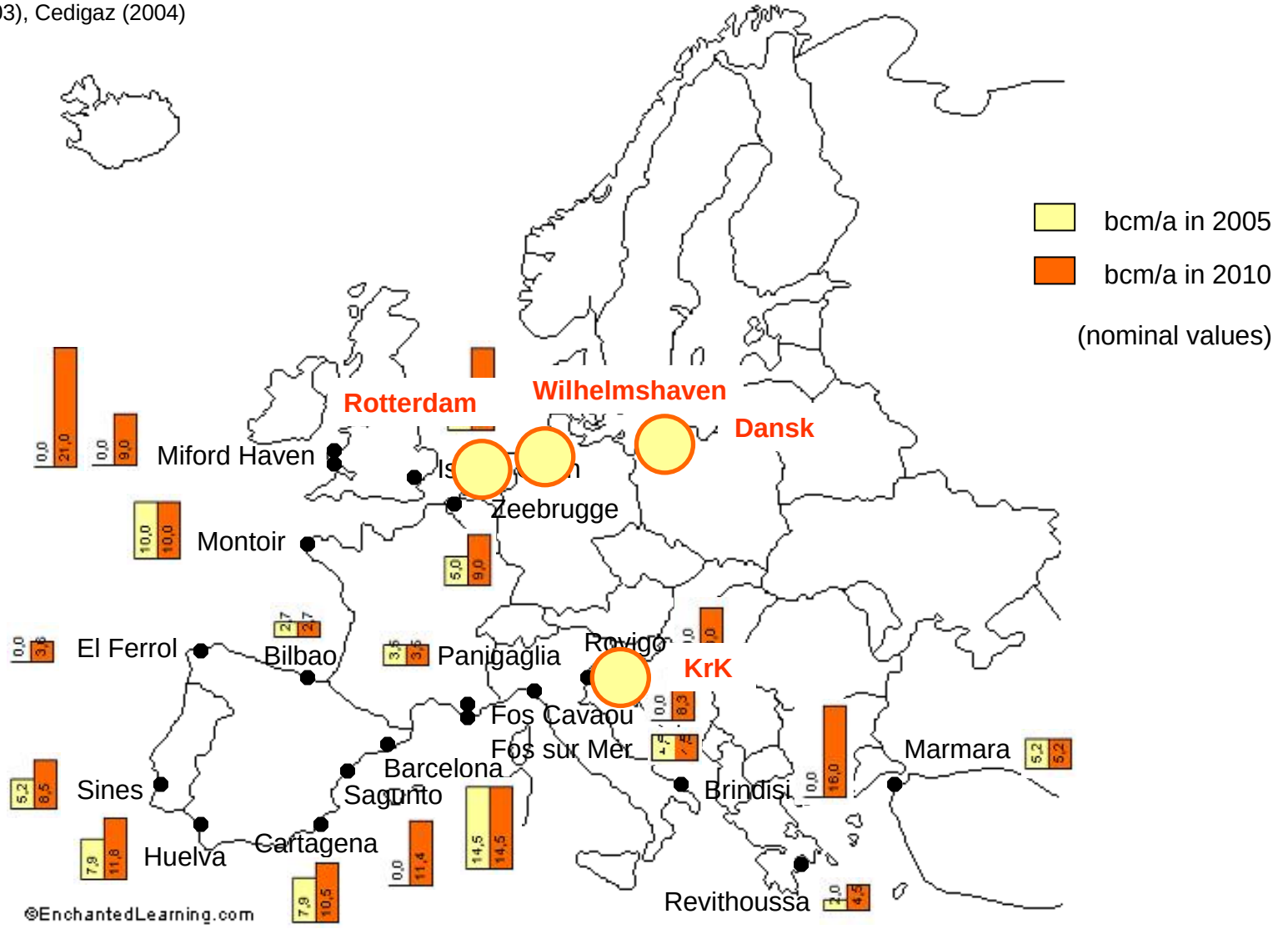


Sources: IEA (2004), Cedigaz (2004)

North America: About 40 Proposed Import Projects

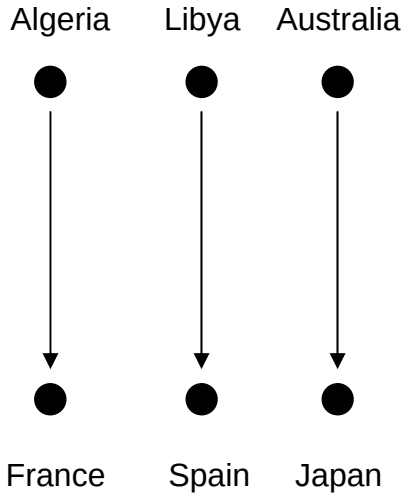
European LNG Import Capacities 2005 vs. 2010

Sources: IEA (2003), Cedigaz (2004)

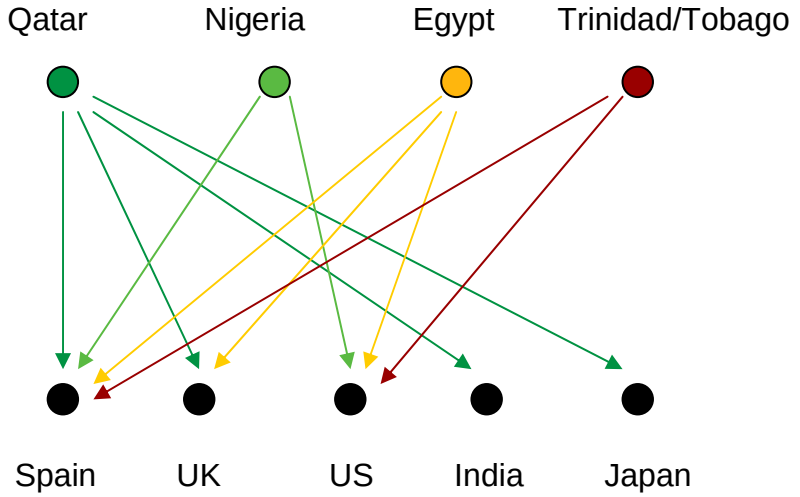


A New World Emerges…

Traditional Industry (examples)



New LNG Industry (examples)



Bilateral long-term contracts between LNG export project and energy companies → inflexible SPAs, ToP-clauses.

Ship ownership embedded in these contracts.

Quantity risk allocated to the buyer, price risk allocated to the seller.

Number of potential trading partners increases.

Contracts become more flexible (duration decreases, increasing LNG trade, decreasing costs, …).

Deregulation and liberalization.

Global players follow a strategy of vertical integration and strategic partnerships.

Research Questions

1. Corporate strategies in the LNG industry?

2. What are determinants of vertical integration of global players in the LNG industry?

Analysis Determinants of Vertical Integration

Project	Prod.	Liquef.	Transp.	Regas	Sales	x1	x2	…
								
RasGas I RasGas II …		Player XY 1	Player XY 2					
Dragon South Hook …			Player XY 4	Player XY 3				

Development of an **econometric** model under a **transaction cost view** to examine the relationship between different exogenous variables (measurements of TAC, industry and project characteristics) and the endogenous variable, the degree of vertical integration.

Main hypothesis: With rising TAC the degree of vertical integration increases.

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Theoretical Background

Joskow (2003): *"there is not and there will never be one uniform theory of VI."*

Transaction Cost Economics

(Coase (1937), Williamson (1975, 1985), Klein et al. (1978))

- TAC attributes: asset specificity, uncertainty, frequency
- uncertain environment, bounded rationality, etc. → incomplete contracts
- incomplete contract + relationship specific investment → "lock-in" situation
- hold up problem (Nash bargaining) → under-investment → inefficiency

→ Choice between (anonymous spot) market and hierarchy

Large number of empirical analysis explain firms' motivation to chose a certain organizational structure (Klein, 2004).

Application to the LNG Industry

- **Investments in specific infrastructure**
  - Especially liquefaction project (physical assets specificity and site specificity to the well)

- **Complex environment**
  - Large number of parties involved
  - Inter-country relationships
  - Complex technologies, …

- **Many uncertainties**
  - Price development
  - Political risk (natural gas reserves mostly in countries with high political risk), …

Costly (or even impossible) to write complete contracts. → Motivation to integrate vertically.

- **North America** (competitive natural gas market) **versus Europe** (liberalization under way)

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Corporate Strategies
Integration, Tolling, and New Entrants

Integrated companies:

- Upstream to downstream (e.g. Shell, BP)

- Downstream to upstream (e.g. BG Group, SUEZ Group)

Non integrated companies – "Tollers":

- Merchant traders, regasification capacity contracted to natural gas importers under "tolling agreements"

- (e.g. Cheniere Energy)

New business models - entry into the capital-intensive LNG business seems to be possible under the current, favorable conditions

- New entrants (Excelerate – a newcomer with deep pockets)

- Shipping companies (Golar LNG – from midstream to upstream & downstream)

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Data

Dataset:

- Detailed information about 85 LNG export and import projects worldwide and LNG world fleet
- 271 observations (162 Atlantic-, 109 Pacific Basin): VI of a player along an actual value chain

Example BG deliveries from Egypt to Italy:

WDDM (Saphire Field): operator with 50% interest.

Egypt/Idku: Train II from 2006, 38% interest, entire output to BG.

8 vessels, 7 ordered, of which 2 planned for this route.

Italy/Brindisi: start up 2007, operator with 50% interest.

40% capacity ownership of Brindisi terminal (2.4 mtpa).

→ Example of total vertical integration along all stages of the LNG value chain.

Definition of the Variables

Dependent variable: degree of vertical integration

$$VI_i = \begin{cases} 1 & n = 1 \\ 2 & n = 2 \\ 3 & n = 3 \\ 4 & n = 4 \\ 5 & n = 5 \end{cases} \quad \text{if}$$

With *n* as the number of successive stages in which a certain player is active in series i.

Independent variables: transaction cost proxies, industry- and firm characteristics

Proxy for	Proxy	Denotation	Expected Sign
Asset Specificity	Dummy export project (high specificity)	DX	+
Uncertainty of a Project	Political country risk (ordinal ranking)	RISK	+
Transaction Frequency	Firm's participation in projects (standardized)	CAPOWN	+
Small Number Bargaining	Market concentration index (HHI)	HHI	+
Industry Characteristics	Dummy start up before 2002 Dummy value chain situated in Atlantic Basin Dummy value chain to European importer	D2002 ATLANTIC EUR	-
Firm Characteristics	Dummy state-owned entity Firm size (assets in million USD, standardized)	ST ASSETS	- +

Econometric Model and Results Ordered Probit Estimation

Analysis world LNG value chains:

$$VI_i = \alpha + \beta_1 DX + \beta_2 RISK + \beta_3 CAPOWN + \beta_4 HHI + \beta_5 D2002 + \beta_6 ST + \beta_7 ASSETS + \beta_8 ATLANTIC + \varepsilon_i$$

Results ordered probit model (total dataset; 271 observations):

	Regression Results				**Descriptive Statistics (Original Data)**			
	Coeff.	Std. Error	z-Stat.	Prob.	Mean	Min	Max	[Unit]
DX	0.525	0.171	3.073	**0.002**	0.517	0.0	1.0	
RISK	- 0.086	0.248	- 0.347	0.729	0.318	0.0	1.0	
CAPOWN	0.395	0.078	5.059	**0.000**	13.57	0.15	54.5	[mtpa]
HHI	0.694	0.273	2.542	**0.011**	0.638	0.1	1.0	
D2002	- 0.535	0.145	- 3.691	**0.000**	0.385	0.0	1.0	
ST	- 0.384	0.171	- 2.252	**0.024**	0.428	0.0	1.0	
ASSETS	0.134	0.086	1.565	0.117	68,770	151	279,177	[mn USD]
ATLANTIC	0.346	0.159	2.172	**0.029**	0.598	0.0	1.0	

Focus on the Atlantic Basin

Analysis LNG value chains in the Atlantic Basin:

$$VI_i = \alpha + \beta_1 DX + \beta_2 RISK + \beta_3 CAPOWN + \beta_4 HHI + \beta_5 D2002 + \beta_6 EUR + \beta_7 ST + \beta_8 ASSETS + \varepsilon_i$$

Results ordered response estimation (Atlantic Basin dataset; 162 observations)**:**

	Regression Results				**Descriptive Statistics (Original Data)**			
	Coeff.	Std. Error	z-Stat.	Prob.	Mean	Min	Max	[Unit]
DX	0.351	0.310	1.133	0.257	0.549	0.0	1.0	
RISK	0.723	0.376	1.924	**0.054**	0.318	0.0	1.0	
CAPOWN	0.525	0.115	4.561	**0.000**	13.38	0.5	25.4	[mtpa]
HHI	0.441	0.351	1.257	0.209	0.638	0.1	1.0	
D2002	- 0.446	0.201	- 2.217	**0.027**	0.552	0.0	1.0	
EUR	0.642	0.302	2.123	**0.033**	0.352	0.0	1.0	
ST	- 0.631	0.239	- 2.642	**0.008**	0.411	0.0	1.0	
ASSETS	0.180	0.120	1.492	0.136	66,216	151	195,256	[mn USD]

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Conclusions

What do we observe?

- Major players following a strategy of vertical integration and strategic partnerships

What have we shown?

- With increasing **TAC** the degree of vertical integration increases.

- The degree of VI for the **Atlantic Basin,** and there especially for value chains connecting **European markets,** exceeds the Pacific Basin ones'.

- The degree of VI increased **since 2002**.

What does it mean?

- Global **"super majors"** (large firms, especially oil and gas majors) dominate the industry

- Difficult situation for new entrants → in contrast to Continental Europe's liberalization efforts!

- There may has to be a higher level of competition to motivate new non-integrated players to enter the European stage

Thank you very much for your attention!

Any Questions or Comments?

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http://www.tu-dresden.de/wwbwleeg/projekte/gg.html?7

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