TECHNISCHE UNIVERSITÄT DRESDEN

Trust as a Shift Parameter in the Extended Transaction Cost Framework

A first Application to the Liquefied Natural Gas Industry

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Sophia Ruester EE²
Chair of Energy Economics and Public Sector Management

Agenda

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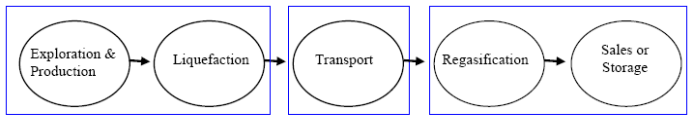
Introduction

- **TCE in its basic form is a static concept → Williamson answers to this critique in 1991 → *Shift Parameter Framework***
- **Recent theoretical papers call for a combination of alternative approaches explaining firm behavior; furthermore, specificity itself is a decision variable → *Positioning-Economizing Perspective***

Industry context:

- **LNG industry has reached maturity during the last decade, very dynamic market with global mergers, strategic partnerships, VI, but also non-integrated "tolling facilities" being common practices**
- **Asset specificity lies downstream**
- **Unit of analysis: integration into midstream shipping along the LNG value added chain**



Linking Porter and Williamson
Asset Specificity Being an Endogenous Variable

- **Empirical work provides strong support for TCE, but generally does "not explore how the make or buy decision for a single transaction fits into a firm's overall strategy" (Nickerson, 1997)**
- ***Positioning-economizing perspective:* decisions regarding market position, resources, and governance mode are interdependent**

Proposition 1: NOCs should rely on less idiosyncratic assets than companies following a flexibility strategy; which in turn should rely on less idiosyncratic assets than chain optimizers.

- **According to Williamson's discriminating alignment hypothesis, we derive:**

Proposition 2: The higher the share of idiosyncratic (downstream) assets in the portfolio of an LNG firm, the higher should be the probability of vertical integration along the LNG value chain.

Shift Parameter Framework
An Application to the LNG Industry Discussing TRUST as a Shift Parameter

- **Inter-organizational trust should attenuate the incentives to behave opportunistically**
- **Presence of trust should enhance information exchange, support conflict resolution and decrease TAC**

Proposition 3: An increase in the level of trust between upstream and downstream players in the LNG industry should support the substitution of vertical integration in favor of less hierarchical governance modes.

Figure:

- Governance costs change disproportionally
- Basic model:

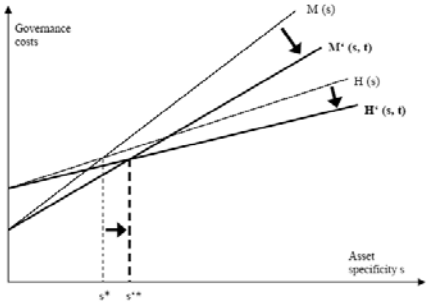
$$M(0) < H(0)$$

$$\delta M(s)/\delta s > \delta H(s)/\delta s > 0$$

- Model including trust:

$$M(0,t) = M(0) \text{ and } H(0,t) = H(0)$$

$$\delta M(s,t)/\delta t < \delta H(s,t)/\delta t < 0 \text{ for all } s > 0 \text{ if } t > 0$$



Data

Characteristic	Denotation	Unit/Type	Mean	Min	Max
Main dependent variable:					
Vertical integration into midstream transportation	VI	Dummy	0.570	0	1
Transaction cost variables:					
Level of idiosyncratic assets	SPEC	Continuous [0,1]	0.479	0	1
Upstream project uncertainty: POLCON index (adjusted to [1-POLCON])	UNC	Continuous [0,1]	0.616	0.13	1
Strategic positioning variables:					
Firm follows chain optimization strategy	CHAIN	Dummy	0.409	0	1
Firm follows flexibility strategy	FLEX	Dummy	0.342	0	1
Firm is a national oil company	NOC	Dummy	0.219	0	1
Control variables:					
Exporter situated in Atlantic Basin	EXPAB	Dummy	0.439	0	1
Exporter situated in Pacific Basin	EXPPB	Dummy	0.401	0	1
Exporter situated in Middle East	EXPME	Dummy	0.160	0	1
Dummy for value chain start up > 1999	D2000	Dummy	0.527	0	1
Firm's participation in the industry (capacity controlled in % of total capacity)	CAPOWN	%	0.040	0.001	0.303
Firm type: state-owned entity	STATE	Dummy	0.380	0	1
Financial resources: firm size measured via assets value	ASSETS	mn USD	63,476	358	195,265
Shift parameters:					
Trust1: years of previous inter-country LNG trade + 1	TRUST1	Count index	6.283	1	38
Trust2: expansion project covering again an existing value chain	TRUST2	Dummy	0.367	0	1

- **Unique global dataset**

  (including amongst others information on ownership structures and trade relationships along actual LNG value chains)
- **237 corporate specific value chains**

  (131 Atlantic Basin and 106 Pacific Basin trade)

Methodology

- **1st step: Simple Probit model explaining VI**

$$VI_i = \alpha_0 + \alpha_1 SPEC_i + \alpha_2 UNC_i + \alpha_3 (SPEC_i \cdot UNC_i) + \alpha_4 EXPAB_i + \alpha_5 EXPME_i + \alpha_6 D2000_i + \alpha_7 CAPOWN_i + \alpha_8 STATE_i + \alpha_9 \log(ASSETS_i) + \alpha_{10} TRUST_i + \varepsilon_i$$

- **2nd step: Simultaneous equation model linking Porter and Williamson and accounting for the endogeneity of SPEC**

$$SPEC_i = \gamma_0 + \gamma_1 CHAIN_i + \gamma_2 NOC_i + \gamma_3 UNC_i + \gamma_4 EXPAB_i + \gamma_5 EXPME_i + \gamma_6 D2000_i + \gamma_7 CAPOWN_i + \gamma_8 STATE_i + \gamma_9 \log(ASSETS_i) + \gamma_{10} TRUST_i + \omega_i$$

$$VI_i = \beta_0 + \beta_1 SPEC_i + \beta_2 UNC_i + \beta_3 EXPAB_i + \beta_4 EXPME_i + \beta_5 D2000_i + \beta_6 CAPOWN_i + \beta_7 STATE_i + \beta_8 \log(ASSETS_i) + \beta_9 TRUST_i + \nu_i$$

- **Both models are estimated i) without and ii) with the shift parameter**

First Results and Conclusions
Simple Model Explaining VI

Independent variables	Probit 1	Probit 2	Probit 3	Probit 4	Probit 5a	Probit 5b
CONSTANT	0.979 *** (0.269)	0.949 *** (0.295)	0.783 *** (0.302)	-3.446 *** (0.968)	-2.971 *** (1.000)	-3.308 *** (0.984)
SPEC	-0.722 ** (0.369)	-0.708 * (0.375)	-0.761 ** (0.375)	-0.521 (0.437)	-0.610) (0.445	-0.537 (0.438)
UNC	-1.486 *** (0.341)	-1.487 *** (0.354)	-1.468 *** (0.359)	-1.640 *** (0.389)	-1.626 *** (0.397)	-1.638 *** (0.390)
(SPEC*UNC)	1.794 *** (0.522)	1.789 *** (0.523)	1.856 *** (0.525)	2.160 *** (0.580)	2.250 *** (0.590)	2.179 *** (0.582)
EXPAB		0.034 (0.195)	-0.111 (0.205)	-0.160 (0.223)	-0.342 (0.240)	-0.177 (0.225)
EXPME		0.058 (0.257)	-0.090 (0.265)	-0.150 (0.287)	-0.370 (0.304)	-0.178 (0.289)
D2000			0.469 *** (0.180)	0.668 *** (0.203)	0.717 *** (0.206)	0.677 *** (0.203)
CAPOWN				5.257 ** (2.293)	5.784 ** (2.517)	5.535 ** (2.381)
STATE				0.549 ** (0.231)	0.515 ** (0.237)	0.540 ** (0.232)
log (ASSETS)				0.356 *** (0.080)	0.339 *** (0.082)	0.349 *** (0.081)
log (TRUST1)					-0.210 *** (0.080)	
TRUST2						-0.181 (0.195)
Pseudo R^2	0.0819	0.0821	0.1032	0.2107	0.2321	0.2134
p-value Chi^2	0.000	0.000	0.000	0.000	0.000	0.000
Log likelihood	-148.71	-148.68	-145.25	-127.84	-124.37	-127.41
N	237	237	237	237	237	237

- Specificity seems to decrease the likelihood of VI, so does uncertainty
- **Specific investments <u>in the presence</u> of uncertainty** result in a strong motivation to integrate
- There seem to be no regional differences
- Vertical integration has become more common
- Larger companies are more integrated (financial strength?)
- The higher the level of **trust**, the more likely are less hierarchical governance modes

First Results and Conclusions

Simultaneous Equation Model (SPEC as endogenous variable)

Independent variables	System 2	System 3a	System 3b
Dep. var.: SPEC			
CONSTANT	1.489 *** (0.149)	1.488 *** (0.154)	1.500 *** (0.154)
CHAIN	0.215 *** (0.045)	0.214 *** (0.045)	0.213 *** (0.045)
NOC	-0.681 *** (0.061)	-0.683 *** (0.061)	-0.683 *** (0.061)
UNC	-0.111 ** (0.046)	-0.112 ** (0.047)	-0.110 ** (0.046)
EXPAB	0.120 *** (0.039)	0.121 *** (0.041)	0.119 *** (0.040)
EXPME	-0.101 ** (0.052)	-0.100 * (0.054)	-0.103 ** (0.052)
D2000	0.055 (0.035)	0.055 (0.035)	0.056 (0.035)
CAPOWN	1.887 *** (0.342)	1.891 *** (0.343)	1.892 *** (0.343)
STATE	0.136 *** (0.047)	0.138 *** (0.047)	0.137 *** (0.047)
log (ASSETS)	-0.104 *** (0.013)	-0.104 *** (0.013)	-0.104 *** (0.013)
log (TRUST1)		0.002 (0.014)	
TRUST2			-0.007 (0.034)

Independent variables	System 2	System 3a	System 3b
Dep. var.: V7			
CONSTANT	-6.015 *** (0.943)	-5.688 *** (0.973)	-5.932 *** (0.959)
SPEC	1.805 *** (0.285)	1.775 *** (0.289)	1.801 *** (0.285)
UNC	-0.340 (0.261)	-0.292 (0.265)	-0.337 (0.262)
EXPAB	-0.188 (0.210)	-0.343 (0.226)	-0.205 (0.212)
EXPME	0.020 (0.273)	-0.173 (0.291)	-0.008 (0.277)
D2000	0.429 ** (0.194)	0.477 ** (0.196)	0.439 ** (0.195)
CAPOWN	0.999 (2.152)	1.295 (2.291)	1.155 (2.205)
STATE	0.798 *** (0.228)	0.778 *** (0.233)	0.796 *** (0.229)
log (ASSETS)	0.489 *** (0.078)	0.479 *** (0.080)	0.485 *** (0.079)
log (TRUST1)		-0.161 ** (0.076)	
TRUST2			-0.116 (0.184)

- **Proposition 1 can be confirmed**
- Statistically significant exogenous variables provide some interesting findings
- **Proposition 2 can be confirmed**
- Control variables show similar results to the simple Probit model
- **Proposition 3 can be confirmed**

Limitation of the study: Since we are not able to measure TAC or performance on a transaction level we cannot test for structural equations derived from theory.

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Thank you very much for your attention!
Any questions or comments?

sophia.ruester@tu-dresden.de EE²

Chair of Energy Economics and Public Sector Management

References (Selected)

- Coase, RH 1937, 'The Nature of the Firm', Economica, vol. 4, no. 4, pp. 386-405.
- Day, GS & Klein, S 1987, 'Cooperative Behavior in Vertical Markets: The Influence of Transaction Costs and Competitive Strategies', in Houston, MJ (Eds), Review of Marketing, American Marketing Association, Chicago, IL, pp. 39-66.
- Davis, LE & North, DC 1971, 'Institutional Change and American Economic Growth, Cambridge University Press, Cambridge, UK.
- Gosh, M & John, G 1999, 'Governance Value Analysis and Marketing Strategy', Journal of Marketing, vol. 63, no. 4, pp. 131-145.
- Gulati, R & Nickerson JA 2005, 'Interorganizational-trust; the Choice of Make, Buy, or Ally; and the Performance of Interorganizational Relationships in the US Auto Industry', Forthcoming in Organization Science.
- Heide, Jan B. and George John (1990): Alliances in Industrial Purchasing: The Determinants of Joint Action in Buyer-Supplier Relationships. Journal of Marketing Research, Vol. 17, No. 1, pp. 24-36.
- Henisz, WJ 2000, 'The Institutional Environment for Economic Growth', Economics and Politics, vol. 12, no. 1, pp. 1-31.
- Henisz, WJ & Williamson, OE 1999, 'Comparative Economic Organization – Within and Between Countries', Business and Politics, vol. 1, no. 3, pp. 261-77.
- Klein, B, Crawford, RG, & Alchian, AA 1978, 'Vertical Integration, Appropriable Rents, and the Competitive Contracting Process', Journal of Law and Economics, vol. 21, no. 4, pp. 297-326.
- Klein, Saul (1989): A Transaction Cost Explanation of Vertical Control in International Markets. Journal of the Academy of Marketing Science, Vol. 17, No. 3, pp. 253-60.
- Klein, Saul, Gary L. Frazier, and Victor J. Roth (1990): A Transaction Cost Analysis Model of Channel Integration in International Markets. Journal of Marketing Research, Vol. 17, No. 2, pp. 196-208.
- Masten, S 1995, 'Empirical research in transaction cost economics: challenges, progress, directions', in: Groenewegen, J (Ed.), 'Transaction Cost Economics and Beyond', Kluwer, Amsterdam.
- Milgrom, Paul and John Roberts (1992): Economics, Organization and Management. Prentice Hall, Englewood Cliffs, New Jersey.
- Nickerson, JA 1997, 'Towards an Economizing Theory of Strategy', Olin Working Paper 97-107.
- Nickerson, JA, Hamilton, BH, & Wada, T 2001, 'Market Position, Resource Profile, and Governance: Linking Porter and Williamson in the Context of International Courier and Small Package Services in Japan', Strategic Management Journal, vol. 22, no. 3, pp. 251-273.
- Oxley, JE 1999, 'Institutional Environment and the Mechanisms of Governance: The Impact of Intellectual Property Protection on the Structure of Inter-Firm Alliances', Journal of Economic Behavior and Organization, vol. 38, no. 3, pp. 283-309.
- Poppo, L & Zenger, T 1998, 'Testing Alternative Theories of the Firm: Transaction Cost, Knowledge Based, and Measurement Explanations for Make-or-Buy Decisions in Information Services', Strategic Management Journal, vol. 19, no. 2, pp. 853-877.
- Porter, ME 1996, 'What is Strategy?', Harvard Business Review, November/December, pp. 61-78.
- Williamson, OE 1991a, 'Strategizing, Economizing, and Economic Organization', Strategic Management Journal, vol. 12, no. 2, pp. 75-94.
- Williamson, OE 1991b, 'Comparative Economic Organization: The Analysis of Discrete Structural Alternatives', Administrative Science Quarterly, vol. 36, no. 2, pp. 269-96.
- Zaheer, A, McEvily, B & Perrone, V 1998, 'Does Trust Matter? Exploring the Effects of Interorganizational and Interpersonal Trust on Performance', Organization Science, vol. 9, no. 2, pp. 141-59.

Backup

Linking Porter and Williamson

Nickerson, Hamilton and Wada (2001)

- **Link Porter's strategic positioning framework and Williamson's TCE**
- **Application to the international courier and small package service in Japan**
- **Assumptions underlying both theories are not contradictory; theories have a consistent unit of analysis: the value chain and transactions (unbundled value chain)**
- *"Proposition 1: For each IC&SP transportation segment, document specialists rely on more idiosyncratic IT than that used by full-service couriers, and full-service couriers rely on more idiosyncratic IT than that used by package specialists."*

  "Proposition 2: The greater the idiosyncrasy of IT in any particular IC&SP transportation segment, the greater the likelihood of integration."

  "Proposition 3: Vertical integration into any of the three transportation segments reduces delivery tin
- **Three-stage, reduced form, endogenous self-selection model**
- **Results support that choices of market positio resource profile and organizational form are interdependent and endogenous (reinforce one another)**