



# Determinants of business logistics performance in rich and poor countries

PhD Trial lecture

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30<sup>th</sup> April. 2014



# OUTLINE

- Define logistics and logistics performance
- Theoretical gap
- Country's logistics gap
- Determinants of logistics performance
- Estimation of the business LP model
- Implications and conclusions



# Background information

## What is logistics?

**Definition:** it is that part of the supply chain process that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from point of origin to point of consumption in order to meet customer requirements (CSCMP, 2007)



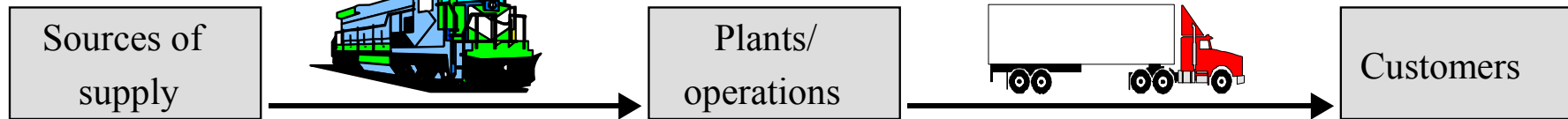
# Business logistics

The process of supplying products and services when and where they are needed, on time (Luo *et al.*, 2001)

## Business logistics

Physical supply  
(Materials management)

Physical distribution



- Transportation
- Inventory maintenance
- Order processing
- Acquisition
- Protective packaging
- Warehousing
- Materials handling
- Information maintenance

- Transportation
- Inventory maintenance
- Order processing
- Product scheduling
- Protective packaging
- Warehousing
- Materials handling
- Information maintenance



# Logistics deserves a serious attention

- Major expenditure; (Lambert *et al.*, 1998)
- Important component of national economy: Supports movement and flow of economic transactions (Lambert *et al.*, 1998)

**Logistics performance deserves a special attention; as the core for economic growth**



# Logistics performance (LP) dimensions

- Effectiveness; efficiency (Mentzer and Konrad, 1991)
- Effectiveness: the extent to which the logistics function's goals are accomplished, for example product guarantee, in-stock availability, fulfilment time, convenience (Fugate *et al.*, 2010)
- Efficiency is considered as the ability to provide the desired product/service mix at a level of cost that is acceptable to customer (Langley and Holcomb, 1992)



# Theoretical gap

- With the ever-increasing globalisation, the ability to manage logistics in a global context is crucial for the success of the business world.
- However cross-cultural logistics research is rare (Luo *et al.*, 2001).
- Comparative research is neglected (Luo *et al.*, 2001), except for the World Bank survey on countries logistics performance, measured by the Logistics Performance Index (LPI) on a scale of 1 to 5.



# Theoretical gap

- Modern logistics concepts and practices have been developed in western developed countries (rich), and in their business and logistical operating environments (Luo *et al.*, 2001)
- Country specific / cross-cultural studies on logistics in poor countries are rare.
- In contrast to rich countries, there is an expanding literature on logistics systems and management (Razzaque, 1997)
- Studies and data which compares rich and poor at a micro-level (firm/industry) are missing, therefore this lecture will use the World Bank's 2014 LP survey data, which provides a comparative overview to countries logistics structures





# An unbridged logistics gap

- General trend rich countries performs better than poor countries (Arvis *et al.*, 2014)
- World bank classification: low income (poor) economies have a GNI \$1,035 or less; high income (rich) have a GNI \$12,616 or more
- Based on the World Bank's 2014 logistics performance survey, on average LP scores in high income countries outperform low income countries by 53%.
- Shown by a huge gap between rich and poor countries: e.g Germany (4.12) while Somalia (1.77) (Arvis *et al.*, 2014)



# An unbridged logistics gap

-Rich countries dominate the top rankings while 10 economies in the bottom of the ranking are poor countries (6 from Africa) (Arvis *et al.*, 2014).

- Moreover it has been observed that, income alone can not explain the variation. For example,

-Some of the underperforming non-high income countries are resource rich, e.g. Iraq, Turkmenistan. **This may suggest that logistics performance has not been given priority in the policies**



# Determinants of logistics performance

- General attributes of world class logistics system (Bookbinder and Tan (2003); Wood *et al.*, 1995)
  - Infrastructure
  - Information systems
  - Human resources
  - Business environment
  - Political environment



# Overview of country differences in logistics performance attributes

Attribute	High-income (rich) countries	Low-income (poor) countries
Infrastructure (maintenance &)	Highly developed	Insufficient to support advanced logistics
Supplier operating standards	High	Typical not considered
Information system availability	Generally available	Not available
Human resources	Available	Often difficult to find
Political and currency exchange stability	Highly stable	Some risk of instability

Source: Wood *et al.*, (1995) summarised by Simchi-Levi *et al.*, (2000)



# Determinants of logistics performance

- Integrated logistics; information based capability; cooperation; internal integration; downstream integration (Daugherty *et al.*, 1996; Daugherty *et al.*, 2009; Morris and Carter 2005; Shang and Marlow, 2005)
- Interaction of internal and downstream integration (Germain and Iyer, 2006); Interaction of supplier integration and output monitoring (Salema, 2014)
- Specific logistics investments; ex-post transaction cost; output monitoring; supplier integration (Salema, 2014)



# Determinants of logistics performance: World bank survey

- The World bank's LPI provides a reference point, but it should not be considered an exhaustive diagnostic tool
- The 2014 LP survey was conducted in more than 1000 professionals from 160 countries
- It identifies the bottlenecks in each country



# Estimation of LP determinants using LPI antecedents

- International factors ( measured in a scale of 1 (worst) to 5 (best))
- Domestic factors



# World Bank, Logistics performance index indicators

- 1) CUSTOMS (CUS): measures the effectiveness and efficiency of the clearance process (speed, simplicity and predictability of formalities) by border control agencies, including customs
- 2) INFRASTRUCTURE (INF): Measures the country's quality of ports, railroads, roads, information technology, telecommunication
- 3) INTERNATIONAL SHIPMENT (INT): Measures the ease of arranging competitively priced shipments;
- 4) LOGISTICS COMPETENCE (LOGCO): Measures the logistics competence and quality of logistics services ( e.g. transport operators, customs brokers)
- 5) TRACK & TRACING (TRA): Measures the ability to track and trace consignments;
- 6) TIMELINESS (TIM): Measures timeliness of shipments delivery time.





# Analysis of differences on LP antecedents between rich and poor countries ( $n_{rich}=30: n_{poor}=30$ )

DIMENSION	Tvalue (2 tailed)
(1) CUS	33.918 p <0.05
(2) INF	46.525 p <0.05
(3) INT	27.375 p <0.05
(4) LOGCO	48.052 p <0.05
(5) TRA	35.183 p <0.05
(6) TIM	34.250 p <0.05

❖ The findings from mean differences test between rich and poor countries suggest that, rich countries significantly outperform poor countries in all 6 indicators

❖ Generally, poor countries have problem in all areas, e.g.

- Inefficient customs clearance processes
- Poor infrastructure
- Inefficient /poor quality logistics service providers
- Ability to track and trace shipments
- Delays



# Example: Rich VS poor country's infrastructure

Poor income



Rich countries





## LP international indicators : Bivariate correlations for rich countries (n = 30)

	1	2	3	4	5	6	LPI shared variance
(1) CUS	1	.566	.218	.549	.060	.347	.645
(2) INF	.752	1	.193	.680	.411	.523	.868
(3) INT	.467	.440	1	.137	.021	.329	.355
(4) COMP	.741	.825	.370	1	.370	.484	.812
(5) TRA	.244	.641	.147	.608	1	.192	.446
(6) TIM	.589	.723	.574	.696	.438	1	.705
LPI Score	.803	.931	.596	.901	.668	.840	1

Coefficients above the diagonal = shared variance:

Coefficients below the diagonal = bivariate correlations ( $r$  sign at  $p < 0.01$ ; 2 tail)

• LPI correlates significantly with all 6 indicators



## LP international indicators : Bivariate correlations for poor countries (n = 30)

	1	2	3	4	5	6	LPI variance
(1) CUS	1	.226	.052	.006	.003	.002	.220
(2) INF	.476	1	.175	.146	.156	.163	.602
(3) INT	.228	.418	1	.189	.072	.016	.461
(4) LOGCO	.079	.383	.434	1	.206	.222	.497
(5) TRA	.059	.395	.268	.454	1	.173	.411
(6) TIM	.041	.403	.127	.471	.416	1	.397
LPI score	.469	.776	.679	.705	.641	.630	1

Coefficients above the diagonal = shared variance: Coefficients below the diagonal = bivariate correlations (r sign at  $p < 0.01$ ; 2 tail)



# Summary of relationships between LP indicators

	Rich countries	Poor countries
Infrastructure matters first	Positively related with all other indicators - Shares the biggest variance (87%) in LP	Positively related with all other indicators - Shares the biggest variance (60%) in LP
Competence and quality of LSP	Follows infrastructure in terms of LPI variance (81%) <b>-The difference is (87%-81% = 6%)</b>	Follows infrastructure in terms of LPI variance (49%) <b>- The difference is (60% -49% = 11%); suggesting infrastructure is outstanding)</b>
Timeliness	Positively related with all other 5 indicators	Positively related with all other 3 indicators , except customs, and competitive shipment

The observed inter-correlation between indicators suggest that LP improvement requires a holistic approach (integrated-system wide)



# Estimating determinants of LP based on international indicators

- Timeliness has been considered an important dimension of LP (Rhea and Shrock, 1987)
- Timeliness has been regressed on the five factors :
  - (1) Efficiency of the clearance process
  - (2) Quality of trade and transport related infrastructure
  - (3) Ease of arranging competitively priced shipments;
  - (4) Competence and quality of logistics services
  - (5) Ability to track and trace consignments



# Regression results

LPI	Rich countries (n = 30) Model 1: $R^2 = 0.566$ ; F = 8.559 P <0.05		Poor countries (n=30) Model 2: $R^2 = 0.346$ ; F = 6.640 P <0.05	
	b	t value	b	t value
Constant	0.136		0.807	1.140
CUSTOMS	-0.125	-0.617	-0.133	-0.579
INFRASTRUCTURE	0.378	1.591	0.391	1.492
INTERNSHIP	0.468	2.383	-0.194	-0.967
QUALCOMPETSERV	0.417	1.527	0.53	1.748
TRACKNTRACIN	-0.074	-0.425	0.244	0.948

Note: the analyses are not comprehensive



# Summary of regression findings

- Ease of arranging competitively priced shipments positively and significantly predict LP in rich countries but not in poor countries
- Both, infrastructure; Quality and competence of logistics services positively and significantly predicts LP in both rich and poor countries. (no serious difference observed)
- However, quality and competence of logistics service is somehow highly important in poor countries ( $b = 0.417$ ) than in rich countries ( $b = 0.53$ )
- Within poor countries; quality and competence of logistics services ( $b = 0.53$ ) was indicated more important than that of infrastructure ( $b = 0.39$ ) (the differences were not substantial in rich countries).





# Logistics performance :Domestic logistics indicators

i. Logistics processes

ii. Institutions

iii. Time

iv. Cost



# Domestic environment: Rich VS Poor countries

Indicator	Rich countries (Average) (n=7)	Poor countries (Average) (n=7)
Number of agencies - exports	2	5
Number of agencies - imports	2	4
Number of documents - exports	2	4
Number of documents - imports	2	5
Clearance time without physical inspection (days)	1	4
Clearance time with physical inspection (days)	1	5
Physical inspection (% of shipments)	3.63%	40 %
Multiple inspection (% of shipment)	2.02%	24 %
LPI	4	2.27

## Based on domestic logistics performance indicators:

- Poor countries are accompanied by **high bureaucratic processes** (e.g. multiple agencies, documents) compared to rich countries
- Percentage of manual (physical) inspection is higher in poor countries as compared to rich countries (**suggesting high use of outmoded systems**)
- Time wastage is high in poor as compared to rich countries



# Example: Time and Cost

- Rich countries have better business logistics environment compared to poor countries;

E.g. in Tanzania import lead time by land is 8 days and it cost USD 4472, while in Germany it is 3 days at USD 1326 (Arvis *et al.*, 2014).



# Implications

- ❑ To bridge the LP gap;
  - Factors influencing LP are context specific, e.g ease of arranging competitively priced shipments is an important factor in rich countries but not in poor countries
  - Infrastructure matters, however the focus on the LP problem in a holistic manner: a system approach.
  - The influence of infrastructure should be considered different in rich and poor countries ( marginal returns from more investment may be higher in poor countries as compared to rich countries) .



# Implications

- There is no single strategy for both rich and poor countries: For example, rich countries may focus more on improving how they arrange competitively priced shipments, while rich countries may focus on the quality and competence of logistics service



# Suggested propositions

- (i) Business logistics performance is a function of the logistics business environment (e.g organisation structure-bureaucracy)
  - (ii) In poor countries infrastructure investment matters more than in rich countries:
  - (iii) In poor countries:
    - Efficiency of the clearance process;
    - ease of arranging competitively priced shipments;
    - competence and quality of logistics services;
    - ability to track and trace consignments; and
    - timeliness of shipments
- Are infrastructure related.



**!!!!!!!!!!!!!!!!!!THANK YOU!!!!!!!!!!!!!!!!!!!!**