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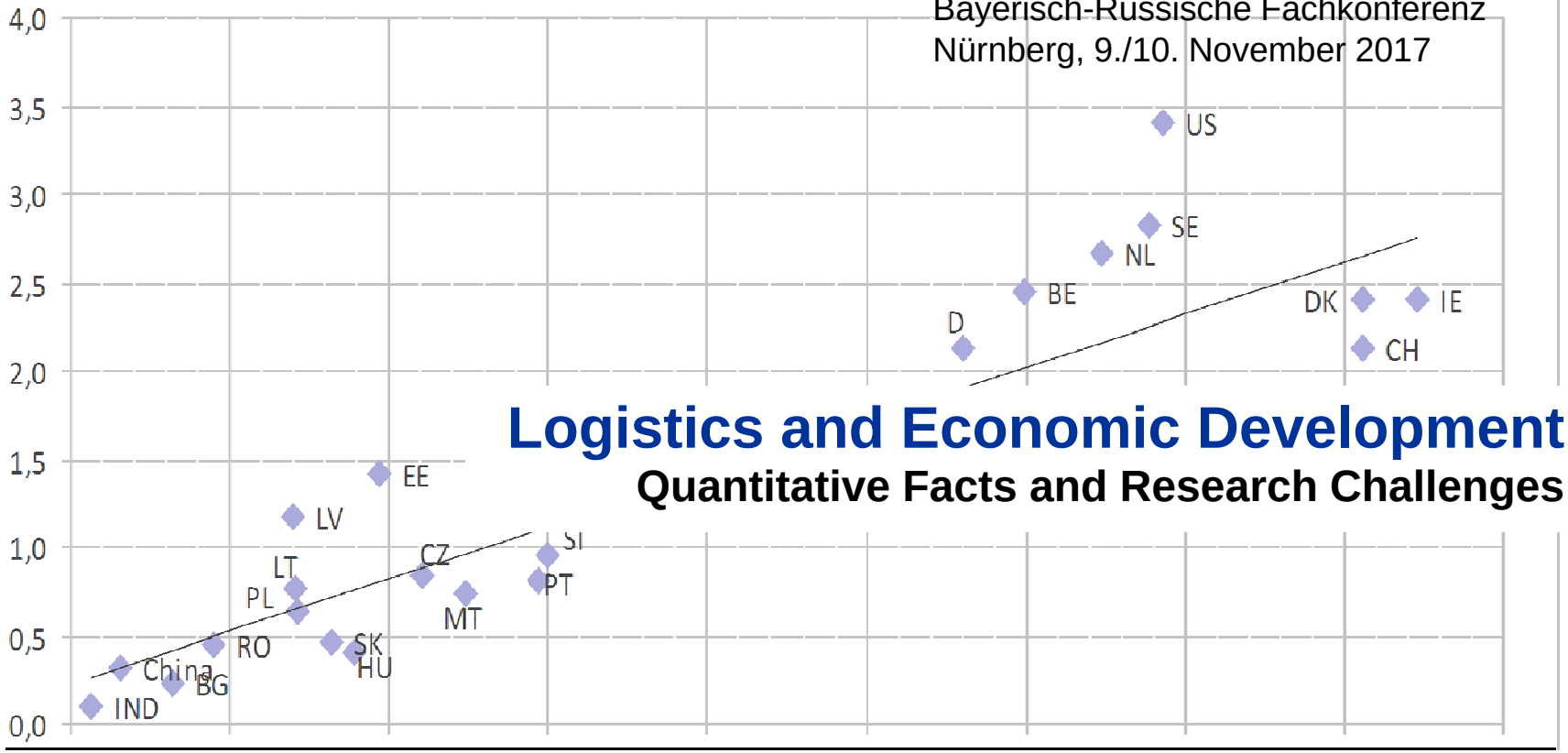
FACHBEREICH WIRTSCHAFTS-WISSENSCHAFTEN

Bayerisch-Russische Fachkonferenz
Nürnberg, 9./10. November 2017



Logistics and Economic Development

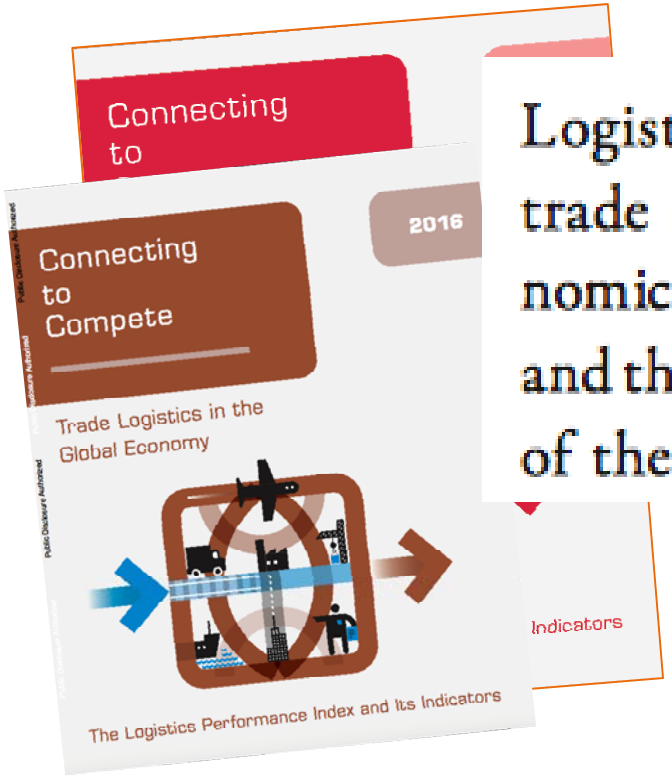
Quantitative Facts and Research Challenges

Prof. Peter Klaus, D.B.A. Boston Univ.
Friedrich-Alexander-University &
Fraunhofer Center for Supply Chain Services (SCS), Nürnberg

Agenda

- **Logistics - driver of economic development?**
- **The “Operationalization“ challenge**
  - A robust definition of logistics „PPP“
  - „Triangulation“ for dealing with data gaps and inconsistencies:
  - Selected results: Germany, Europe, the World
- **The „Causality“ issue**
- **Opportunities for moving research forward**
  - Building a broader empirical base
  - Policy formulation and testing

I-1. A World Bank hypothesis:



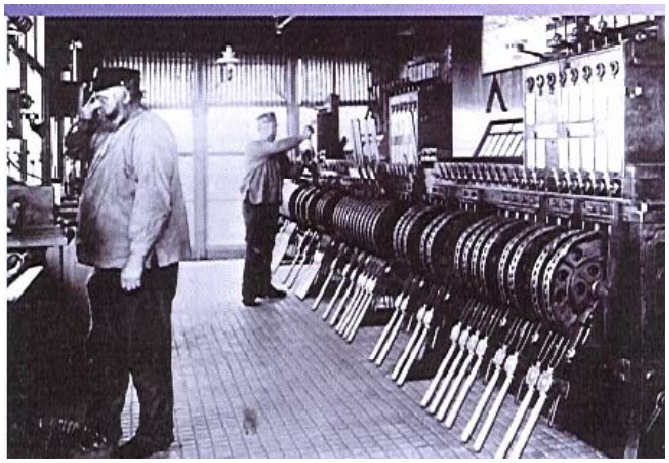
Logistics performance both in international trade and domestically is central to the economic growth and competitiveness of countries, and the logistics sector is now recognized as one of the core pillars of economic development.

shared by ...

Supply Chain Challenges for National Competitiveness through Transport

and else!

II-2. Two research challenges (at least):



- **How to operationalize Logistics as an instrument of economic policy?**
- **How to prove and quantify the Logistics -> Economic Development relationship?**

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- **Logistics - driver of economic development?**
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II-1. Logistics „what and how much?“: Confusion

across industries ...

international comparisons ...

'the operational logistics costs remain high (Chinese in original)'. As shown in the Figure 1, the national logistics costs a of GDP stood at around 18% which was 9% higher than to the United States.

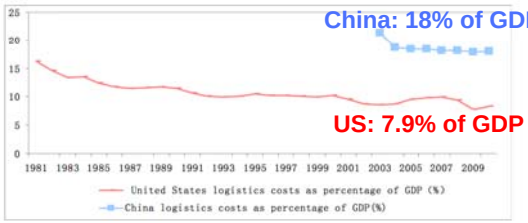
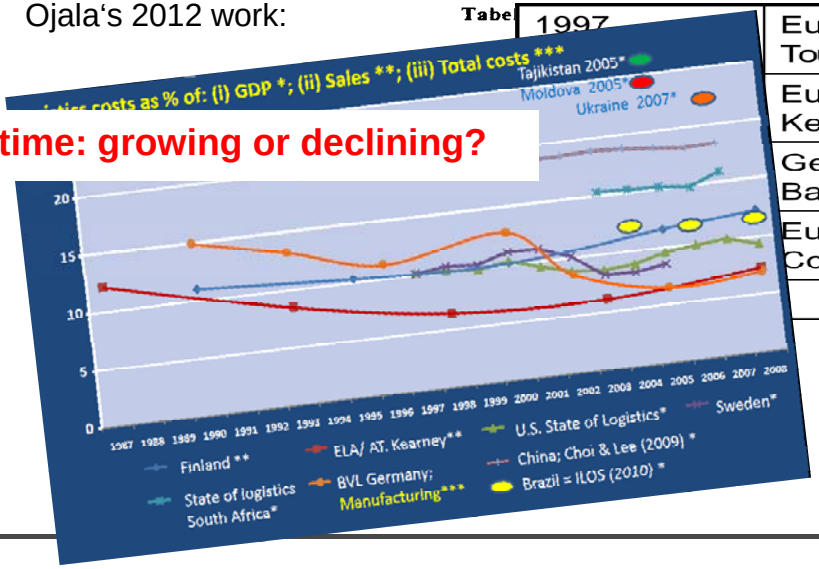


Figure 1 Logistics costs as percentage of GDP in China and the US

Jahr der Untersuchung	Untersuchungsgebiet/ Stichprobengröße	Höhe der Kosten (in % vom Umsatz)
	USA/33 Unternehmen	10 - 32 %
	USA / 270 Unternehmen	21,8 %
	BRD / 150 Unternehmen	9,6 % - 24,1 %
	USA / 105 Unternehmen	13,6 %
	BRD / k.A.	8,6 %
	USA / 160 Unternehmen	6,60 % - 11,35 %
	GB / 70 Unternehmen	12,77 %
	Westeuropa/ 500 Unternehmen	9 - 14 %
	USA/ k.A.	7,97 %

Ojala‘s 2012 work:



over time: growing or declining?

Tabe

1997	
Europe/ELA-Deloitte Touch	5,8 %
Europe/ELA – A.T. Kearney	7,7 %
Germany/BVL - Baumgarten	12,8 – 22%
Europe – McKinsey Consumer Ind.	5.0% + Inv. Carrying
	22?

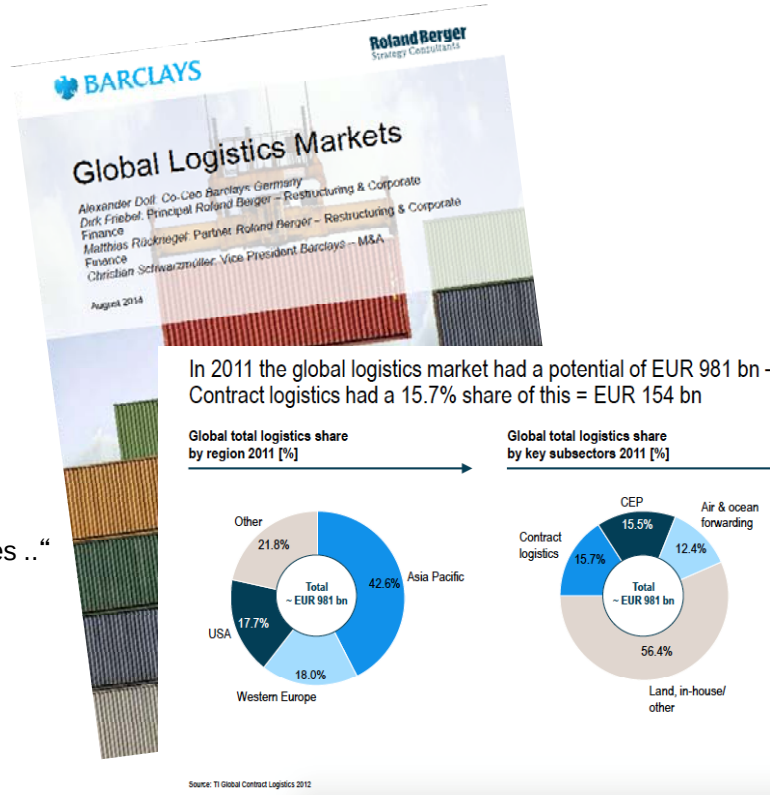
Sources: Bing-Lian et al. (2013), Rantasola/Ojala (2012), author‘s compilation .

II-2. Some offers:

COMPARATIVE GDP AND LOGISTICS EXPENDITURES BY COUNTRY

Region	Country	1997 GDP (US $ Billion)	1997 Logistics (US $ Billion)	1997 Logistics % GDP	2000 GDP (US $ Billion)	2000 Logistics (US $ Billion)	2000 Logistics % GDP
North America	Canada	658	80	12.1%	887	108	12.2%
	Mexico	695	106	15.3%	892	131	14.7%
	United States	8,803	849	10.5%	9,907	997	10.1%
	Region	9,436	1,035	11.0%	11,686	1,237	10.6%
Europe	Belgium	240	27	11.4%	287	33	11.6%
	Denmark	123	16	12.9%	152	20	13.0%
	France	1,320	158	12.0%	1,483	176	11.9%
	Germany	1,740	228	13.1%	2,114	324	15.3%

Source:
Bowersox/Calantone/Rodriguez (2003)
„Estimation of Global Logistics Expenditures ..“
-> $ 6.3 trillion vs. € 46.6 tr. GDP (13.7%)



Region	Country	Trucking	Rail	Water & Mis	Air	Forwarding	Inventory Carrying	Warehousing	Logistic Administratio
North America	Canada	83,3	13,1	5,9	4,5	2,4	44,1	12,4	8,5
	Mexico	68,4	6,3	3,0	5,4	2,1	37,3	11,1	8,7
	United States	628,2	67,9	42,3	32,1	34,6	297,4	120,5	59,0
	Region	**779,8**	**87,3**	**51,2**	**42,0**	**39,2**	**378,8**	**144,0**	**76,2**
Europe	France	79,3	16,0	8,5	23,2	6,2	52,2	58,6	14,2
	Germany	92,1	17,8	7,8	16,0	9,0	59,9	70,2	28,3
	Italy	78,4	10,3	8,7	18,0	6,8	44,4	20,9	23,9
	Netherlands	21,1	4,0	2,0	3,6	2,0	13,8	16,3	6,5
	Spain	69,2	2,2	6,6	8,8	3,8	28,4	18,5	6,9
	United Kingdom	73,8	10,5	6,7	32,9	5,9	42,4	28,5	10,1
	Others	131,6	24,5	18,6	36,8	4,5	64,7	75,8	15,2
	TOTAL	**3.476,0**	**260,8**	**501,2**	**290,1**	**173,6**	**1.778,1**	**848,9**	**570,2**	**7.898,7**

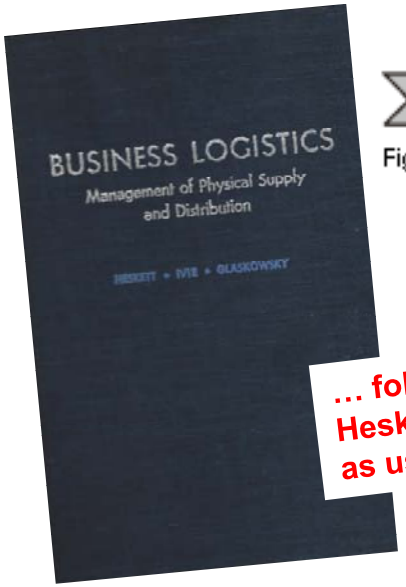
Armstrong & Associates (2011)
„Global Logistics Costs“
-> $ 7.9 tril. vs. $ 70 trill (11.2%)

II-3. Our Fraunhofer SCS „Top 100“ Studies

- **Started in the mid-1990‘s as an effort to identify the „Top 100“ logistics service providers in Germany**
- **Developed three independent estimation approaches for „total national logistics expenditures“ compatible with US**
- **Annual assessment of market shares, market growth, logistics industry segments,**
- **… expanded estimates to other European countries – currently 28+2, Turkey ...**
- **still: „work in progress“**

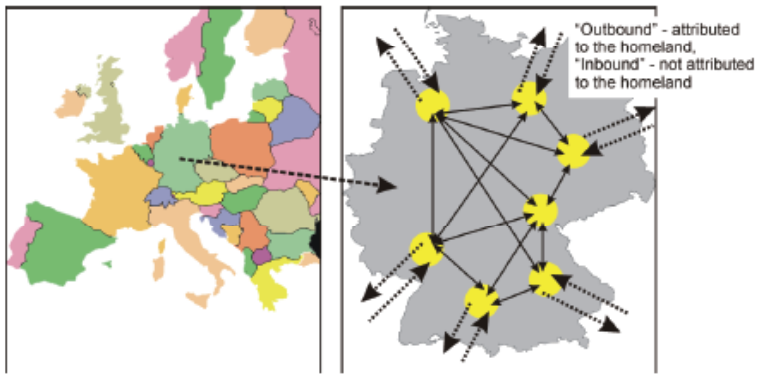
II-4. A robust definition of Logistics and logistics expenditures: „TUL“ resp. „PPP“ (Placing, Pacing, Patterning)

- **supply chain transfer links included, intra-plant and –store-logistics excluded:**



… following the 1973 Heskett et al. definition, as used by CLM/CSCMP

Figure 8 The most basic definition of logistics: transport, handling and storage outside the production process

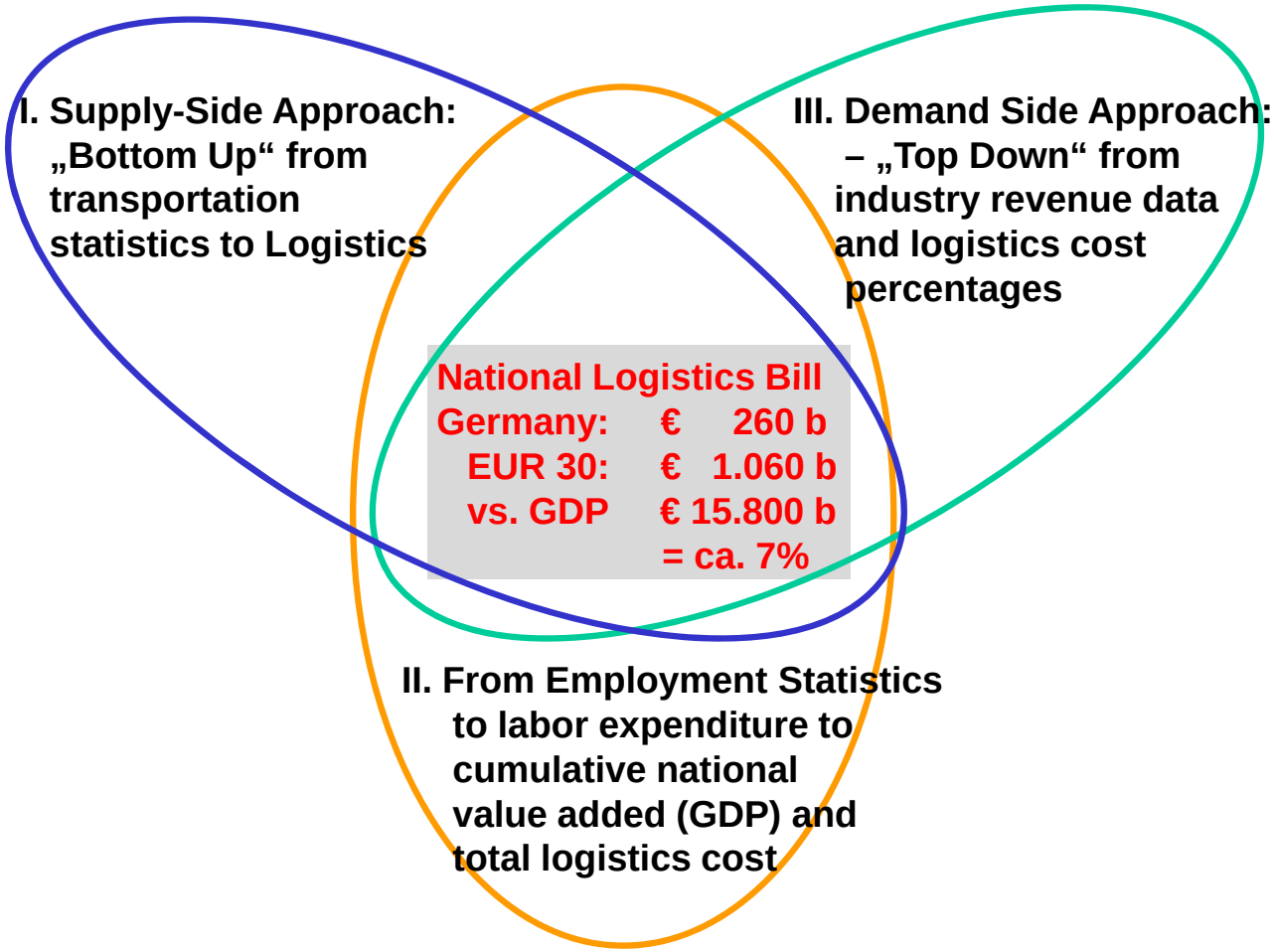


- **Functional (not an „institutional“) approach:**

  Logistics expenditures as the sum of (consolidated) third party and shipper/user cost

Supplementary source:
Klaus/Sheffi (1997) and Klaus (2012) „Third Meaning of Logistics“

II-5. The idea of „triangulation“: three independent estimation approaches



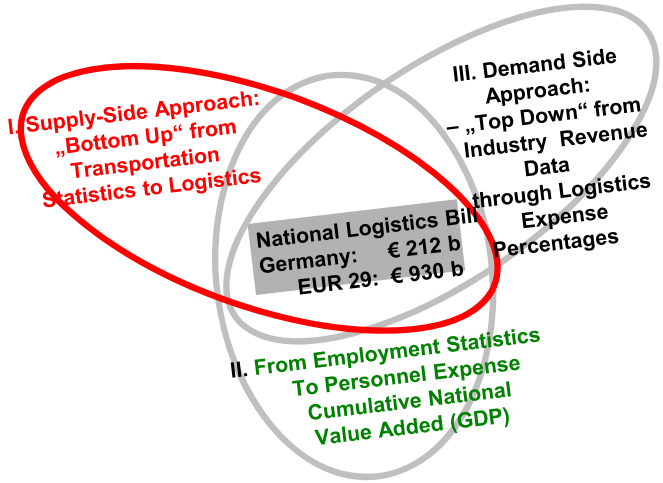
II-6. First: From the „bottom“ of transportation statistics „up“wards to estimating warehouse, inventory & admin. cost

	Transport-Leistungsart	Zahl Fahrzeuge (Tsd.) 2015	Beförderte Tonnage in Mio. t (2012)	Beförderte Tonnage in Mio. t (2013)	Beförderte Tonnage in Mio. t (2014)	Beförderte Tonnage in Mio. t (2015)	Transport-leistung in Mio. tkm (2012)	Transport-leistung in Mio. tkm (2013)	Transport-leistung in Mio. tkm (2014)	Transport-leistung in Mio. tkm (2015)	Durchschnittl. Entfernung (ca. km nur Land)	€-Wert pro Tonne	Wert absolut in Mio. € (Schätzbasis 2013)
	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Gewerblicher Güterverkehr Straße, Insbes. Nahverkehr mit leichteren LKW	118,5	1.554	1.610	1.695	1.715	63.700	66.000	70.600	71.500	42	4,82	8.263
2	Gewerblicher Güterverkehr Straße, Insbes. Fernverkehr mit schweren LKW > 7,5 t Nutzlast	251,8	542	545	550	564	173.100	172.100	172.500	173.759	314	59,69	33.644
3	Sonstige gew. Fahrzeuge (nicht gen.pflichtig), Insbes. < 3,5 t zulässiges Gesamtgewicht	101,3	21	23	25	25	1.435	1.589	1.670	1.773	70	176,00	4.457
4	Werkverkehr Straße, Insbes. Nahverkehr mit leichteren LKW	119,4	704	695	717	726	23.000	23.000	23.500	23.800	33	7,75	5.628
5	Werkverkehr Straße, Insbes. Fernverkehr mit schweren LKW > 7,5 t Nutzlast	109,8	76	73	73	75	20.200	19.500	19.400	19.542	266	131,81	9.833
6	Sonstige Werkverkehrs- und Dienstleistungsfahrzeuge (nicht gen.pflichtig)	1.277,1	137	149	157	160	5.471	5.960	6.268	6.385	40	72,00	11.494
7	Ausländische Fahrzeuge Versand (Versand und Empfang)	107,0	218	226	236	246	83.500	86.500	89.000	92.900	500	50,00	11.775
8			435	451	471	493	(167000)	(173000)	(179000)	(185800)			
9	**Zwischensumme Straßengüterverkehr**	**2.085**	**3.251**	**3.319**	**3.452**	**3.511**	**370.406**	**374.649**	**375.945**	**385.609**	(gew. Mittel) **113**	(gew. Mittel) **24,7**	**85.093**
10	Güterverkehr Bahn (Binnen und internat. outbound)	124,1	292	293	285	289	76.635	77.430	76.724	80.710	198	16,60	4.800
11	(Gesamt binnen und grenzüberschr.)		(366)	(374)	(365)	(367)	(110.065)	(112.613)	(112.629)	(116.632)			

- Transport tonnage and tokm reports-
- national cargo vehicle statistics
- estimates of avg. annual cost per cargo vehicle * nr. vehicles = total national cargo transportation cost

- add estimate for related whse/inv. (based on nat. accounts for inventory-levels)
- add planning/admin expenditures **-> total logistics expenditure estimate**

- add. takeaways: transport productivity stat‘s



Source: Top 2016/17, S. 63

II-7. Second: from Logistics employment statistics to logistics sector „value added“ and total national logistics expenditures

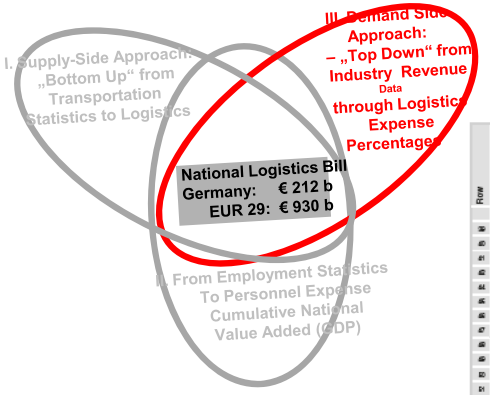
		primäre Klasse der KldB 2010	Bezeichnung Berufsgruppe (KldB 2010)	gemeldete SVP Beschäf-tigte	Jahresgehalt: Lohnsumme je Aggregat	HR auf Bruttolohn-summe
1	2	3	4	5	10	11
Direkte Logistikberufe	Transport und Verkehr	521	Fahrzeugführung im Straßenverkehr	635.473	17.391	20.000
		522	Fahrzeugführung im Eisenbahnverkehr	9.751	393	452
		523	Fahrzeugführung im Flugverkehr	1.411	102	117
		524	Fahrzeugführung im Schiffsverkehr	5.494	299	344
		5132	Post- und Zustelldienste	18.727	562	646
					ansport u. Verkehr	21.559
	Lager und Umschlag	513 (ohne 5132)	Lagerwirtschaft u. Güterumschlag	1.371.740	37.854	646
					ager u. Umschlag	43.532
	administra-tive Funk-	515	Überwachung und Steuerung des Verkehrsbetriebs	28.298		
		516	Kaufleute - Verkehr und Logistik	176.902		

- national employment statistics by job category, total wages per employee and employer industry
- estimate of national logistics labor cost expenditure
- add „other“ value added components (taxes, depreciation, profits,) for logistics sector „value added“
- add logistics sector purchases from other sectors for total national logistics spending

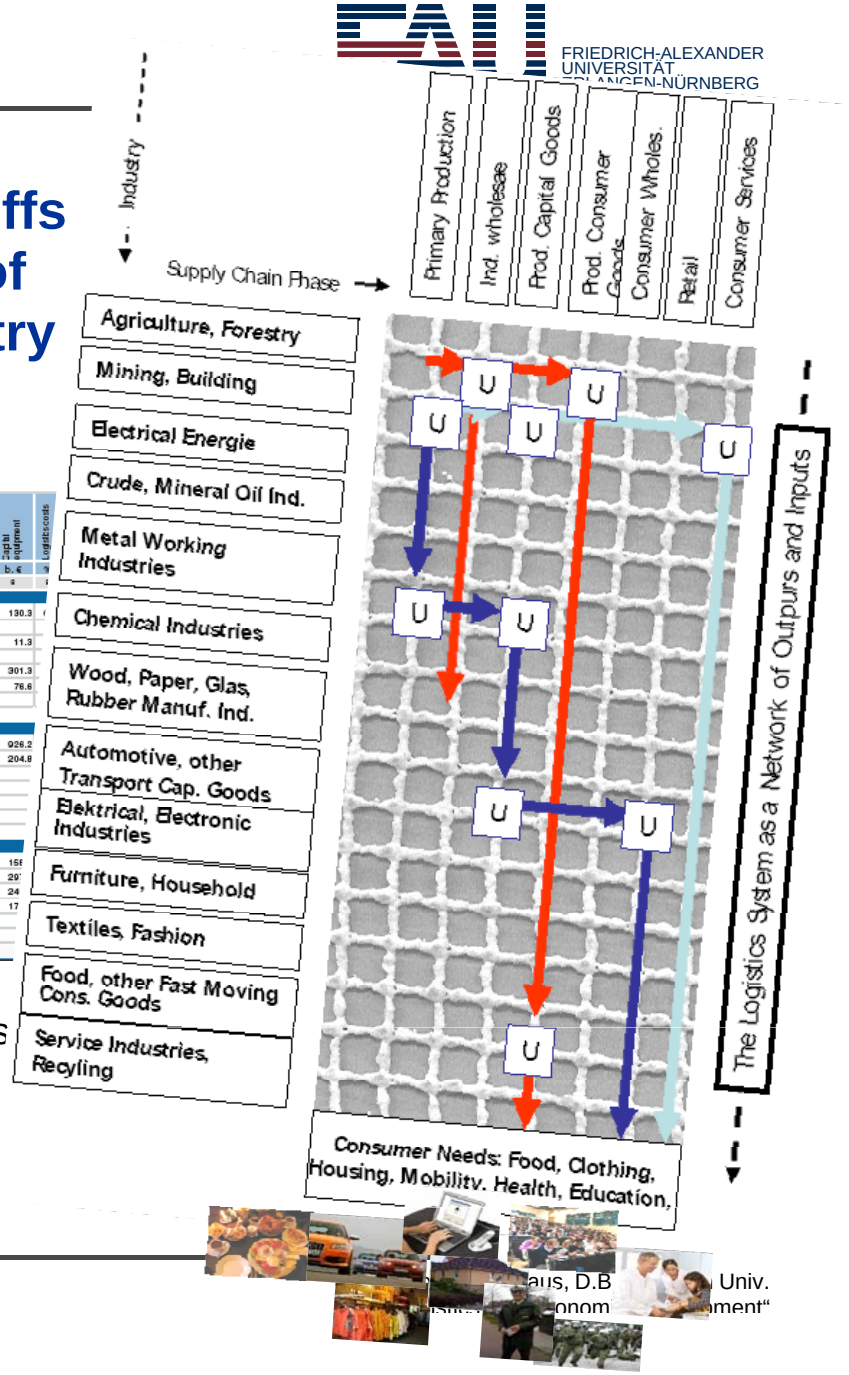
- **addit. take-aways**: VA-and employment perspective, elimination of double counting

Source: Top 2016/17, S. 57

II-8. Third: „top down“ demand-side estimate - in analogy to Leontieffs input-output analysis estimate of to logistics cost share by industry



Row	Industry	Basic material	Logistics costs	Logistics costs abs.	Industrial wholesale	Logistics costs	Logistics costs abs.	Capital equipment	Logistics costs
		b. €	%	b. €	b. €	%	b. €	b. €	
		2	3	4	5	6	7	8	
38	**Wood, paper, glas, rubber, plastic industry**								
40	Wood working industry (excluding furniture)							130.3	
41	Cellulose, paper	83.6	7.0	5.9					
42	Publishing, printing industry							11.3	
44	Book stores, retail newspapers and magazines								
45	Rubber and plastic industry							301.3	
46	Glas, ceramics industry	18.3	5.0	0.9				76.6	
47	Whole sale housewere								
48									
49	**Automotive and other vehicle industry**								
50	Manufacturing of automobiles							926.2	
51	Manufacturing of other vehicles							204.8	
52	Automobile retail								
53	Retail of automobile parts								
54	Repairing of automobiles								
55	Other automotive industry								
56									
57	**Electronic industry**								
58	Data processing machines, PC							15	
59	Equipment for distribution of electricity							29	
60	Medical technology, measuring, control technology etc							24	
61	Broadcast and television engineering							17	
62	Whole sale broadcast and television engineering								
63	Retail electrical household goods								
64									



- Industry revenues based on VAT data – all ec. sectors
- estimates of industry-specific „downstream“ logistics spending as % of industry revenues (here some survey/case-study meth. comes in)
- add up to total spending of all industries

Source: Top 2017/18, S. 30

II-9. Comparability: National Logistics expenditure estimates - comparing the EU30

Figure 15 Spread of European logistics expenditures 2016
Fraunhofer SCS

Source: Top 2017/18, S. 30

II-10. ... Including more data on the LSP industry – top LSPs in the world (2014 data)

Rank	Company	Home country	Data quality	Logistics revenue worldwide 2014 in bn.€	World/ Group/ Consolidated Coop. revenue 2014 in bn.€	Notes
1	2	3	4	5	6	7
1	Deutsche Post DHL	DE	***	48.0	56.6	diversified
2	UPS Inc.	US	***	47.9	47.9	CEP / div.
3	FedEx Corp.	US	***	43.2	43.2	CEP / div.
4	Maersk A/S	DK	***	29.7	39.1	ocean cargo
5	DB Mobility Logistics AG	DE	***	19.8	38.4	diversified
6	Union Pacific Railroad	US	***	18.6	19.7	rail cargo
7	BNSF Railway Company	US	***	18.4	18.7	rail cargo
8	Russian Railways	RU	**	16.9	26.0	rail cargo
9	Nippon Yusen K.K. (NYK Group)	JP	***	16.0	17.7	ocean cargo
10	Kuehne + Nagel International AG	CH	***	14.5	17.7	forwarder
	Sum Top 10			273.0	325.0	
11	CMA-CGM SA	FR	***	13.8	13.8	ocean cargo
12	Indian Railway	IN	**	11.1	17.0	rail cargo
13	Mitsui O.S.K. Lines (MOL)	JP	***	10.9	12.2	ocean cargo
14	Hyundai Glovis Co. Ltd.	KR	***	10.4	10.4	contract logistics
15	CSX Corporation	US	***	10.1	10.4	rail cargo
16	Nippon Express Co. Ltd.	JP	**	10.0	12.4	forwarder
17	Samsung Electronics Europe Logistics B.V.	NL	***	10.0	154.3	contract logistics
18	Norfolk Southern Railway	US	***	9.6	9.6	rail cargo
19	Yamato Holdings Co. Ltd.	JP	**	9.3	10.8	CEP / div.
20	SNCF SA	FR	***	9.0	27.2	diversified
21	China Cosco Holdings	CN	***	8.5	8.9	ocean cargo
22	Kawasaki Kisen Kaisha Ltd. (K Line)	JP	***	8.2	8.7	ocean cargo

Source<. Fraunhofer SCS: The Top 100 of European Logistics, 2015/16

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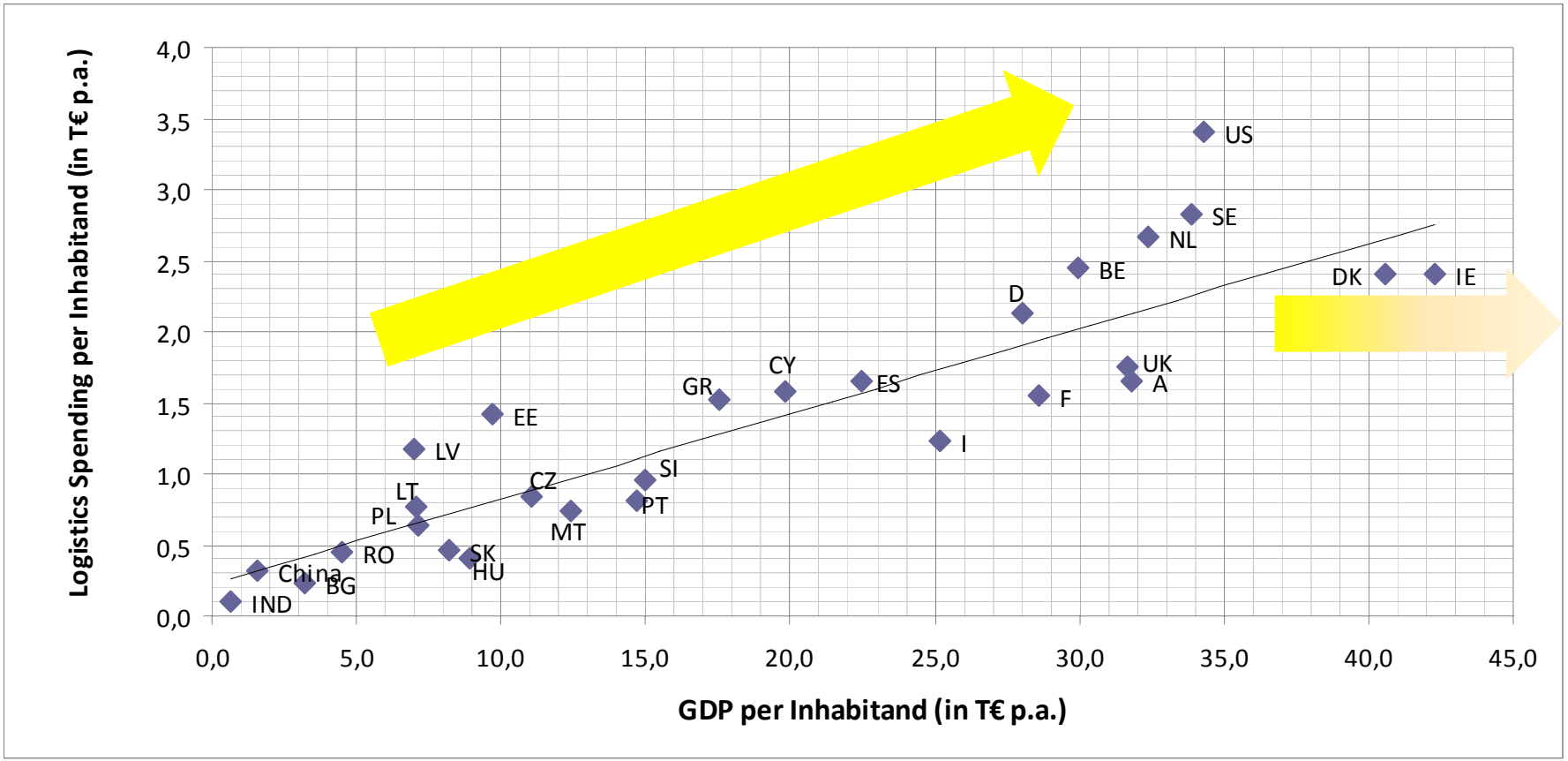
III. A very tentative interpretation of the „Logistics -> Economic Development“ relationship



Source: Klaus, Logistik „Märkte und Marktentwicklngen weltweit“ in: Baumgarten (Hrsg.) 2008

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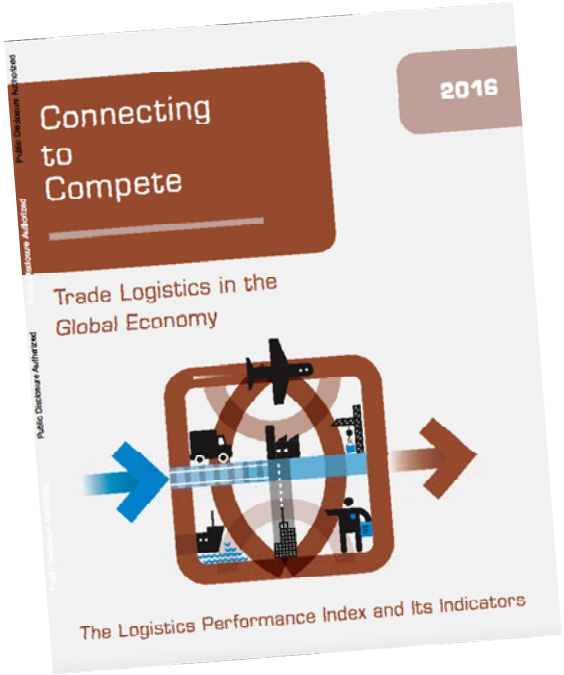
IV-1. Learning about Russian Logistics?



	LPI		Customs		Infrastructure		International shipments		Logistics quality and competence		Tracking and tracing		Timeliness	
Economy	Rank	Mean score	Rank	Mean score	Rank	Mean score	Rank	Mean score	Rank	Mean score	Rank	Mean score	Rank	Mean score
Burkina Faso	96	2.62	93	2.46	86	2.50	105	2.59	91	2.62	115	2.46	91	3.07
Guatemala	97	2.62	76	2.56	109	2.35	110	2.57	105	2.49	96	2.58	85	3.12
Russian Federation	98	2.61	152	2.07	90	2.47	114	2.54	76	2.72	83	2.70	83	3.14
Moldova	99	2.58	113	2.36	100	2.40	88	2.69	117	2.40	98	2.57	95	3.03
Maldives	100	2.57	83	2.51	85	2.53	118	2.52	98	2.55	102	2.53	130	2.79
Mauritius	101	2.57	117	2.33	84	2.53	94	2.65	104	2.50	120	2.42	106	2.96

IV-2. The vision of a global „Logistics Expenditure and Performance Observatory“

- **International agreement on „robust“ logistics definition**
- **… estimation approaches and (minimum) data quality standards**
- **definition of critical KPI‘s such as**
  - logistcs spending per capita
  - logistics spending per unit of GDP
  - corresponding transportation (warehousing, admin) KPI‘s
- **annual updates and publication of the data**
- **Research and policy development based on input-output models: effects of industry structures, GDP composition in post-industrial economies, alternative infrastructures, geographical structures, etc.**

- **financial supported by …. ??**

Thank you!