Influential Article Review - Designing European Output and Demand Flows: The Trading Model Under Transtools3

Timothy Collier

Clayton Francis

Jay Parks

This paper examines product development. We present insights from a highly influential paper. Here are the highlights from this paper: The paper presents a new model for trade flows in Europe that is integrated with a logistics model for transport chain choice through Logsum variables. Logsums measures accessibility across an entire multi-modal logistic chain and are calculated from a logistics model that has been estimated on disaggregated micro data and then used as an input variable in the trade model. Using Logsums in a trade model is new in applied large-scale freight models, where previous models have simply relied on the distance (e.g. crow-fly) between zones. This linkage of accessibility to the trade model makes it possible to evaluate how changes in policies on transport costs and changes in multi-modal networks will influence trade patterns. As an example, the paper presents outcomes for a European-wide truck tolling scenario, which showcases to which extent trade is influenced by such a policy. The paper discusses how such a complex model can be estimated and considers the choice of mathematical formulation and the link between the trade model and logistics model. In the outcomes for the tolling scenario, we decompose the total effects into effects from the trade model and effects from the logistics model. For our overseas readers, we then present the insights from this paper in Spanish, French, Portuguese, and German.

SUMMARY

- In the application of the trade model, apart from the Logsums, we only use the GDP and GDP per capita elasticities from Table 3, assuming that the dummies do not change.
- From these, we can also calculate the percentage growth in GDP per capita. In addition, a change in the Logsum between a production and consumption zone influences the trade level between the zones. In order to account for such an effect, the percentage change in Logsums between a production and consumption zone is calculated.
- The trade model explains the percentage change for each PC matrix cell value F PCg . This relative change is then applied together with the base PC matrix to obtain the future year PC matrix.
- Where in logsum0CPg represent the baseline Logsum and logsumCPg the corresponding scenario variable. The overall elasticity measure for each commodity type g is computed based on a weighted average with respect to the amount of freight between zone pairs. Where %FPCg represents the percentage change in flow for commodity g and F PCg is the base flow.

- The trade model is then followed by the logistics model . We considered doing the application of the transport chain model by means of a prototypical sample of shipments.
- To further test the trade model we have carried out a European-wide kilometre-based truck toll experiment within the Transtools3 freight model. A simulation of the impact of a toll on trade would not be possible in a trade model with distance as the only resistance term. Of course it is possible to increase the distances as a proxy, but not all transport costs are distance-dependent and it would be unclear by how much the distances should be increased to mimic the toll. The Logsum on the other hand makes it possible to simulate both changes in time and in costs , since the transport chain choice model includes both of these factors separately.
- Firstly, we have constructed a reference case, which reflects the base case tolling levels in Europe as shown below in Table 6. The tolls in Table 6 are based on existing tolls, however for countries with hourly truck tolls these have been converted to a kilometre-based toll by assuming 80 km/h. Clearly, this is likely to be an overestimate as it neglects resting hour restrictions; however, it is reasonable as a means to test the sensitivity of the model to tolling.

HIGHLY INFLUENTIAL ARTICLE

We used the following article as a basis of our evaluation:

de Jong, G., Tanner, R., Rich, J., Thorhauge, M., Nielsen, O. A., & Bates, J. (2017). Modelling production-consumption flows of goods in Europe: The trade model within Transtools3. Journal of Shipping and Trade, 2(1), 1–23.

This is the link to the publisher's website:
https://jshippingandtrade.springeropen.com/articles/10.1186/s41072-017-0023-9

INTRODUCTION

Trade models can be used to forecast future trade patterns conditional on scenarios about the economic development of various regions. If they would contain transport time and cost as explanatory factors of the trade volumes, trade models could also be used to simulate the impact of changes in transport costs (e.g. introduction of road toll) or transport time (e.g. constructing new links or expanding existing links) on trade flows. However, most existing large-scale trade models use a simple (e.g. crow-fly) distance variable as the measure of resistance between zones of trade, not transport times and costs. Very little empirical material is available on the impact of changes in transport costs and times (by mode) on the trade flows, but the few studies that have been done show that these effects are potentially large (see de Jong et al. 2010). This paper presents a new European trade model that is integrated with a logistics model (and a network assignment model), where Logsums are consistently used at large-scale. Accessibility is measured in this model across an entire multi-modal logistic chain, on the basis of a logistics model which has been estimated on micro data. This makes it possible to evaluate how changes in policies and changes in multi-modal networks will influence trade patterns.

The trade model presented in this paper is developed as part of the European Transtools3 model. The Transtools3 model is a new forecasting model system for passenger and freight transport in Europe, developed for DG MOVE of the European Commission. It consists of three main blocks: a passenger transport model, a freight and logistics model and a network assignment model. This paper focuses on the trade model, a specific sub-model of the freight and logistics model, as depicted in the top-right box in Fig. 1. The trade model produces growth in goods flows between Production and Consumption zones (PC flows, measured in tonnes) between a base year and a future year. The freight model as a whole was based on the aggregate-disaggregate-aggregate or ADA model (see Ben-Akiva and de Jong 2013).

CONCLUSION

This paper has presented a new European trade model that is integrated with a logistics model, where Logsums are consistently used at large-scale. Accessibility is measured in this model across an entire multi-modal logistic chain, on the basis of a logistics model which has been estimated on micro data. This makes it possible to evaluate how changes in policies and changes in multi-modal networks will influence trade patterns. Most existing large-scale trade models use a simple (e.g. crow-fly) distance variable as the measure of resistance between zones. This makes it hard to simulate the impact of changes in transport costs and transport networks on the trade flows.

The paper has discussed the existing literature on gravity-based trade models. It described the data and model structures used and presented the estimation results for random effects specifications with either distance splines or Logsums as the measure of resistance to trade. Overall elasticities for changes in GDP were provided. The paper also discussed the structure of the overall Transtools3 freight and logistics model and how PC matrices from the trade model are combined with the transport chain choice model in model application.

Trade models that include country-specific fixed or random effects are more in line with modern economic theory, in particular with the relative costs hypothesis. Fixed effects models have the practical problem that they cannot give the full effect of an increase in GDP on trade. Due to this the Transtools3 model has applied a random effects model.

The estimation of the trade model involved a number of considerations in terms of the level of estimation. It was decided to apply a two-stage approach, where in the first stage we estimated a generic random-effects model at the level of the countries. As the trade data originates at the country-to-country level it is natural to estimate GDP and country specific border effects at this level. These parameters were then transferred to a second stage estimation where we estimated regional variables and accessibility effects through a Logsum variable.

In Transtools3 the random effects model is used in the implementation of the freight and logistics model. Through the Logsum variable from the logistics model, there is an influence of transport cost and time on the pattern of PC flows, and not only on the choice of transport chain for each given PC flow.

As a final assessment of model sensitivity, we analysed two truck toll scenarios against a reference tolling scenario. For these three scenarios we compared a complete model run involving both logistics and trade effects with a model run where only the trade model was allowed to change. This allowed us to disentangle the isolated effects from the trade model in the final model framework. Results indicate that logistic effects are dominating although trade effects are substantial.

APPENDIX

FIGURE 1
GENERAL STRUCTURE OF THE TRANSTOOLS3 FREIGHT AND LOGISTICS MODEL

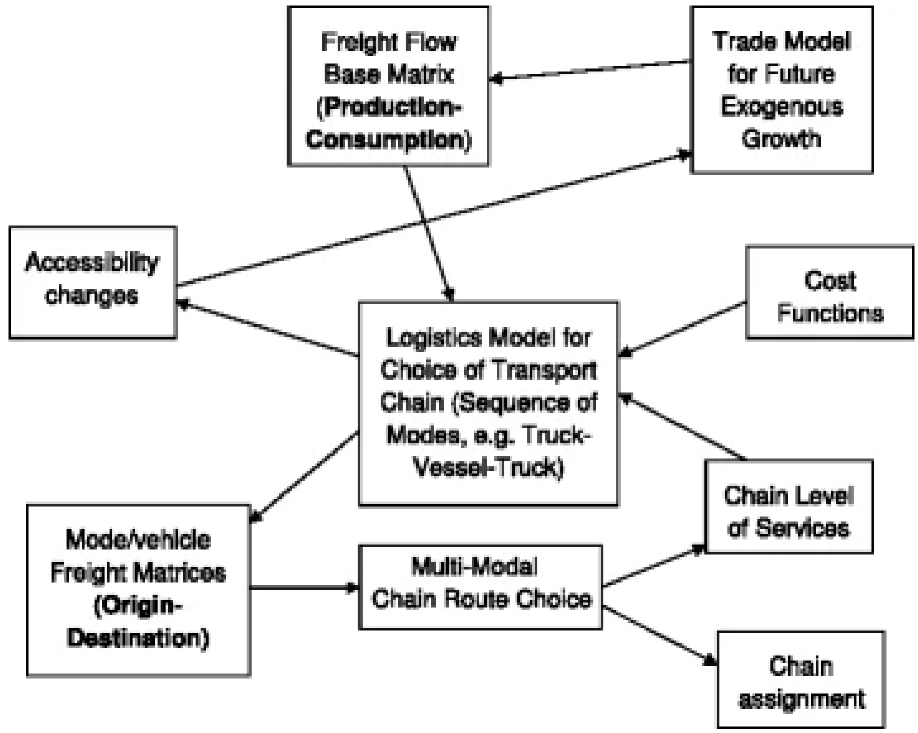

FIGURE 2

OVERALL RELATIVE CHANGE IN TRANSPORT ACTIVITY (TONNE-KILOMETRES) BY MODE FOR THE COMBINED TRADE AND LOGISTICS MODEL AND FOR THE TRADE MODEL ONLY

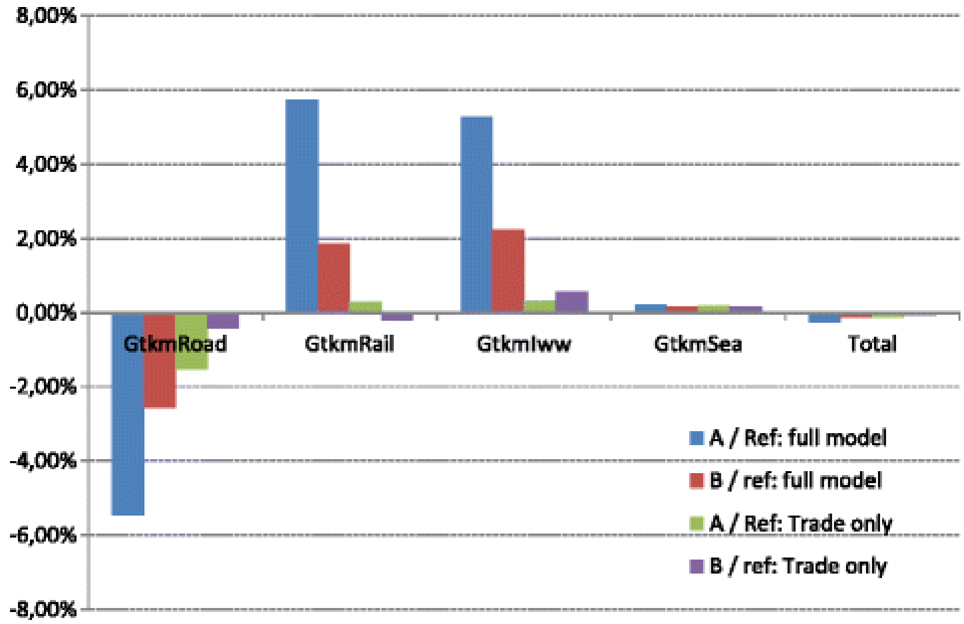

TABLE 1

ESTIMATION RESULTS FOR A MODEL AT THE COUNTRY LEVEL WITH COUNTRY-SPECIFIC RANDOM EFFECTS AT THE DESTINATION AND DISTANCE AS SPLINES

NST/R	(0) ln_tonnes_0	(1) ln_tonnes_1	(2) ln_tonnes_2	(3) ln_tonnes_3	(4) ln_tonnes_4	(5) ln_tonnes_5	(6) ln_tonnes_6	(7) ln_tonnes_7	(8) ln_tonnes_8	(9) ln_tonnes_9
Distance 0–20 km	0	0	−0.701*	−0.533*	−0.398	−0.986*	−0.890*	−0.524*	0	0
	(.)	(.)	(−2.38)	(−2.14)	(−1.45)	(−4.86)	(−4.73)	(−2.17)	(.)	(.)
Distance 20–50 km	0	0	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Distance 50–100 km	0	0	0	0	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
Distance 100–300 km	1.327	0.657	2.068	1.827	−1.257	−0.975	−1.779	1.429	−0.991	0.321
	(0.76)	(0.41)	(0.81)	(0.80)	(−0.55)	(−0.50)	(−1.00)	(0.64)	(−0.69)	(0.22)
Distance 300–500 km	−2.881*	−3.236*	−3.169+	−2.125	−3.409*	−1.358	−2.667*	0.834	−3.191*	−3.548*
	(−2.59)	(−3.21)	(−1.81)	(−1.45)	(−2.29)	(−1.15)	(−2.34)	(0.59)	(−3.51)	(−3.82)
Distance 500–1000 km	−2.025*	−1.985*	−0.481	−2.048*	−2.150*	−2.041*	−3.325*	−1.450*	−2.141*	−1.965*
	(−4.62)	(−4.99)	(−0.60)	(−3.43)	(−3.48)	(−4.39)	(−7.17)	(−2.34)	(−5.95)	(−5.41)
Distance 1000–2000 km	−2.200*	−2.182*	−0.314	−0.655+	−0.558	−2.903*	−2.449*	−0.520	−2.639*	−2.902*
	(−8.90)	(−10.01)	(−0.57)	(−1.80)	(−1.38)	(−10.77)	(−8.90)	(−1.30)	(−13.15)	(−14.83)
Distance 2000 + km	−0.339*	−0.0479	0.399+	−2.141*	−0.0960	−1.005*	−1.177*	−0.547*	−1.075*	−0.696*
	(−4.64)	(−0.80)	(1.89)	(−15.00)	(−0.65)	(−11.17)	(−12.41)	(−3.78)	(−17.63)	(−12.64)
Ln(origin gdp)	**0.824***	**0.899***	**0.474***	**0.735***	**0.587***	**0.921***	**1.054***	**−0.00223**	**1.123***	**1.175***
	(39.12)	**(56.08)**	**(8.42)**	**(20.92)**	**(14.93)**	**(35.88)**	**(39.03)**	**(−0.05)**	**(66.81)**	**(80.25)**
Ln(destination gdp)	**0.598***	**0.618***	**0.430***	**0.499***	**0.532***	**0.781***	**0.625***	**0.619***	**0.931***	**0.814***
	(12.43)	**(20.14)**	**(5.46)**	**(7.80)**	**(5.73)**	**(19.70)**	**(14.80)**	**(11.65)**	**(30.71)**	**(28.93)**
Ln(origingdp/cap)	**−0.274***	**−0.211***	**−1.051***	**−0.425***	**−0.352***	**−0.393***	**−0.556***	**−0.627***	**0.119***	**−0.0177**
	(−8.37)	**(−8.39)**	**(−9.78)**	**(−7.00)**	**(−5.22)**	**(−9.95)**	**(−13.22)**	**(−8.89)**	**(4.32)**	**(−0.78)**
Ln(dest. Gdp/cap)	**−0.111**	**−0.0938***	**0.422***	**0.316***	**−0.0390**	**−0.0936+**	**−0.163***	**−0.390***	**−0.137***	**−0.104***
	(−1.64)	**(−2.10)**	**(3.06)**	**(3.41)**	**(−0.30)**	**(−1.70)**	**(−2.73)**	**(−5.30)**	**(−3.30)**	**(−2.59)**
Both member of EU or EFTA	0.743*	1.103*	0.264	−1.204*	0.357	0.435*	0.357*	−0.0620	0.215+	1.183*
	(5.07)	(8.65)	(0.77)	(−5.44)	(1.45)	(2.72)	(2.15)	(−0.26)	(1.83)	(10.31)
Both Euro as currency	0.596*	−0.0153	0.245	−0.298	0.562*	0.124	0.423*	1.191*	0.324*	0.181
	(3.36)	(−0.10)	(0.76)	(−1.20)	(2.13)	(0.65)	(2.22)	(4.63)	(2.25)	(1.24)
Neighbour countries	1.734*	1.287*	0.949*	1.933*	1.570*	1.184*	1.720*	1.730*	1.037*	0.659*
	(7.03)	(5.77)	(2.36)	(5.85)	(4.60)	(4.54)	(6.76)	(5.38)	(5.12)	(3.21)
Both same language	0.742*	1.020*	0.899*	0.968*	0.903*	0.671*	0.777*	0.106	0.945*	0.963*
	(5.64)	(9.06)	(2.81)	(4.76)	(4.01)	(4.30)	(5.06)	(0.49)	(8.56)	(9.37)
constant	−9.103*	−8.608*	0	0	0	0	0	0	−10.86*	−11.49*
	(−4.88)	(−5.35)	(.)	(.)	(.)	(.)	(.)	(.)	(−7.40)	(−7.73)
N	6388	7905	1379	4039	2619	5063	4442	2380	6465	8686

t statistics in parentheses
+ $p < 0.10$, * $p < 0.05$

TABLE 2

ELASTICITY OF TRADE FLOW IN TONNES IN RANDOM EFFECTS MODEL IF THE GDP INCREASES (BY 1%) AND POPULATION REMAINS CONSTANT

Product type	Elasticity
0 Agricultural prod. & live animals	0.79
1 Foodstuffs and animal fodder	0.86
2 Solid mineral fuels	0.27
3 Petroleum products	1.10
4 Ores and metal waste	0.46
5 Metal products	1.09
6 Crude and manufactured minerals	0.78
7 Fertilisers	−0.24
8 Chemicals	1.69
9 Machinery	1.45

TABLE 3

TRADE MODEL WITH RANDOM EFFECTS WITH ESTIMATION RESULTS FOR LOGSUMS AT THE NUTS3 LEVEL (RESULTS OF STEP 2 OF THE 2-STEP PROCEDURE)

	(1) ln_tonnes_0	(2) ln_tonnes_1	(3) ln_tonnes_2	(4) ln_tonnes_3	(5) ln_tonnes_4	(6) ln_tonnes_5	(7) ln_tonnes_6	(8) ln_tonnes_7	(9) ln_tonnes_8	(10) ln_tonnes_9
ln_o_gdp	0.824	0.899	0.474	0.735	0.587	0.921	1.054	−0.002	1.123	1.175
ln_d_gdp	0.598	0.618	0.43	0.499	0.532	0.781	0.625	0.619	0.931	0.814
ln_o_gdp_cap	−0.274	−0.211	−1.051	−0.425	−0.352	−0.393	−0.556	−0.627	0.119	−0.018
ln_d_gdp_cap	−0.111	−0.094	0.422	0.316	−0.039	−0.094	−0.163	−0.39	−0.137	−0.104
both EU or EFTA	0.743	1.103	0.264	−1.204	0.357	0.435	0.357	−0.062	0.215	1.183
both EURO	0.596	−0.015	0.245	−0.298	0.562	0.124	0.423	1.191	0.324	0.181
neighbour countries	1.734	1.287	0.949	1.933	1.57	1.184	1.72	1.73	1.037	0.659
same language	0.742	1.02	0.899	0.968	0.903	0.671	0.777	0.106	0.945	0.963
same country	2.202	2.428	3.059	2.097	3.486	1.597	2.833	3.432	1.017	1.409
	(278.871)	(341.09)	(236.361)	(390.437)	(375.926)	(224.792)	(416.866)	(322.995)	(159.475)	(224.089)
LogSum_NSTR_0	0.219									
	(168.795)									
LogSum_NSTR_1		0.223								
		(223.05)								
LogSum_NSTR_2			0							
			–							
LogSum_NSTR_3				0.04						
				(91.606)						
LogSum_NSTR_4					0.056					
					(41.201)					
LogSum_NSTR_5						0.301				
						(305.503)				
LogSum_NSTR_6							0.382			
							(373.995)			
LogSum_NSTR_7								0.397		
								(261.085)		
LogSum_NSTR_8									0.41	
									(470.569)	
LogSum_NSTR_9										0.29
										(327.156)
Intercept	−9.538	−9.504	−14.393	−12.59	−11.417	−12.199	−10.299	−0.816	−8.78	−12.604
	(−105.409)	(−118.787)	(−126.565)	(−185.125)	(−64.125)	(−135.462)	(−94.105)	(−8.148)	(−83.572)	(−161.173)
Observations	1,144,042	1,281,877	356,789	1,249,786	636,420	1,005,574	1,150,606	491,506	1,197,438	1,472,537
Adjusted R^2	0.2047	0.3655	0.3094	0.4088	0.3061	0.3155	0.3341	0.3293	0.2556	0.3505

t statistics in parentheses

TABLE 4
DATA STRUCTURE OF TRADE MATRICES

Variable	Description	Transformations
OriginEZ2006	Production zone using the NUTS3 system of 2006	Transfer to TT3 zones
DestinationEZ2006	Consumption zone using the NUTS3 system of 2006	Transfer to TT3 zones
NSTR2	Commodity type using the NST/R classification at 2 digits	Aggregation to NST/R 1 digit
Tonnes	Goods transport flow in tonnes	

TABLE 5
ELASTICITIES FOR THE TRADE MODEL

	NSTR 0	NSTR 1	NSTR 2	NSTR 3	NSTR 4	NSTR 5	NSTR 6	NSTR 7	NSTR 8	NSTR 9
E(gdpPg)E(gdpPg)	0.824	0.899	0.474	0.735	0.587	0.921	1.054	−0.002	1.123	1.175
E(gdpCg)E(gdpCg)	0.598	0.618	0.430	0.499	0.532	0.781	0.625	0.619	0.931	0.814
E(gdpcapPg)E(gdpcapPg)	−0.274	−0.211	−1.051	−0.425	−0.352	−0.393	−0.556	−0.627	0.119	−0.018
E(gdpcapCg)E(gdpcapCg)	−0.111	−0.094	0.422	0.316	−0.039	−0.094	−0.163	−0.390	−0.137	−0.104
E(LogsumCPg)E(LogsumCPg)	0.533	0.141	0.000	0.079	0.110	0.740	0.209	0.322	0.174	0.164

TABLE 6
REFERENCE SCENARIO FOR KILOMETRE-BASED TRUCK TOLLS

Country	Type of tolling	Baseline (Euro/KM)
Austria	KM based	0.35
Czech Republic	KM based	0.26
France	KM based	0.2
Germany	KM based	0.18
Greece	KM based	0.16
Italy	KM based	0.13
Poland	KM based	0.09
Portugal	KM based	0.09
Russia	KM based	0.09
Slovakia	KM based	0.19
Slovenia	KM based	0.22
Spain	KM based	0.17
Switzerland	KM based	0.61
Belgium	Hourly based	0.006

Denmark	Hourly based	0.006
Hungary	Hourly based	0.00375
Lithuania	Hourly based	0.00375
Luxembourg	Hourly based	0.006
Netherlands	Hourly based	0.006
Sweden	Hourly based	0.006

source: Hylen et al. (2013)

TABLE 7
RESULTS FOR KILOMETRE-BASED TRUCK TOLLS BY TRANSPORT MODES AND MODEL

Comparison	GtkmRoad	GtkmRail	GtkmIww	GtkmSea	Total
A / Ref: full model	−5.46%	5.72%	5.26%	0.22%	−0.25%
B / ref.: full model	−2.55%	1.85%	2.25%	0.14%	−0.10%
A / Ref: Logistic only	−3.93%	5.42%	4.94%	0.05%	−0.12%
B / ref.: Logistic only	−2.13%	2.05%	1.68%	−0.01%	−0.05%
A / Ref: Trade only	−1.52%	0.30%	0.33%	0.17%	−0.12%
B / ref.: Trade only	−0.42%	−0.20%	0.57%	0.15%	−0.05%

TABLE 8
ESTIMATION RESULTS BASED ON THE HECKMAN-MODEL AT THE COUNTRY LEVEL

NST/R	(0) ln_tonnes_0	(1) ln_tonnes_1	(2) ln_tonnes_2	(3) ln_tonnes_3	(4) ln_tonnes_4	(5) ln_tonnes_5	(6) ln_tonnes_6	(7) ln_tonnes_7	(8) ln_tonnes_8	(9) ln_tonnes_9
main										
0 – 1000 km	−2.971*	−2.875*	−1.768*	−3.369*	−4.139*	−2.592*	−4.237*	−2.089*	−3.003*	−2.596*
	(−12.67)	(−13.72)	(−3.64)	(−10.00)	(−11.82)	(−10.60)	(−17.40)	(−6.18)	(−16.07)	(−13.63)
1000 – 2000 km	−2.393*	−2.226*	−0.374	−0.556	−1.162*	−3.156*	−2.497*	−1.547*	−2.773*	−3.079*
	(−10.19)	(−10.81)	(−0.64)	(−1.59)	(−2.87)	(−12.80)	(−9.79)	(−4.12)	(−15.06)	(−17.08)
> 2000 km	−0.970*	−0.511*	−0.0223	−2.159*	−0.724*	−1.048*	−1.339*	−0.688*	−1.103*	−0.943*
	(−14.33)	(−9.76)	(−0.10)	(−16.16)	(−5.35)	(−13.54)	(−16.43)	(−5.31)	(−21.16)	(−20.07)
Ln(origin gdp)	0.897*	0.903*	0.538*	0.991*	0.760*	0.984*	1.158*	0.239*	1.130*	1.171*
	(28.96)	(39.97)	(5.20)	(19.00)	(13.90)	(31.05)	(29.75)	(3.76)	(56.82)	(70.38)
Ln(dest. Gdp)	0.761*	0.720*	0.565*	0.818*	0.976*	0.901*	0.762*	0.824*	0.981*	0.856*
	(29.98)	(41.05)	(6.72)	(21.20)	(13.81)	(33.40)	(27.51)	(15.73)	(54.91)	(57.37)
Ln(orig. Gdp/cap)	−0.301*	−0.180*	−1.217*	−0.483*	−0.395*	−0.261*	−0.396*	−0.455*	0.163*	0.122*
	(−9.48)	(−7.58)	(−12.05)	(−7.69)	(−6.54)	(−6.87)	(−10.08)	(−6.39)	(5.86)	(5.48)
Ln(dest. Gdp/cap)	−0.0488	−0.0781*	0.371*	0.276*	−0.100	−0.110*	−0.160*	−0.371*	−0.157*	−0.0943*
	(−1.60)	(−3.13)	(3.26)	(5.53)	(−1.62)	(−3.28)	(−4.59)	(−6.40)	(−6.73)	(−4.61)
Constant	28.83*	28.57*	15.23*	32.63*	40.96*	21.23*	41.89*	19.87*	26.03*	22.24*
	(9.16)	(10.11)	(2.72)	(7.34)	(9.29)	(6.44)	(13.02)	(4.69)	(10.32)	(8.63)
select										
0 – 1000 km	−1.348*	−0.911*	−0.751*	−1.801*	−1.510*	−0.991*	−1.751*	−1.470*	−1.413*	−2.426+
	(−3.89)	(−2.74)	(−4.88)	(−6.62)	(−8.42)	(−4.20)	(−6.50)	(−8.96)	(−3.84)	(−1.73)
1000 – 2000 km	−1.384*	−1.094*	−1.102*	−0.917*	−1.405*	−1.766*	−1.318*	−0.843*	−1.660*	−1.050*
	(−8.18)	(−6.30)	(−8.65)	(−6.28)	(−10.54)	(−10.84)	(−8.65)	(−6.62)	(−8.42)	(−3.90)
> 2000 km	−0.245*	0.0569+	−0.238*	−0.693*	−0.284*	−0.560*	−0.441*	−0.354*	−0.443*	−0.282*
	(−7.94)	(1.77)	(−6.11)	(−21.10)	(−8.11)	(−16.77)	(−13.18)	(−10.20)	(−12.57)	(−7.03)
ln(origin gdp)	0.420*	0.328*	0.259*	0.440*	0.322*	0.526*	0.576*	0.386*	0.491*	0.376*
	(38.70)	(29.97)	(20.62)	(38.45)	(27.82)	(42.12)	(44.86)	(31.70)	(38.98)	(27.42)
Ln(dest. Gdp)	0.278*	0.144*	0.183*	0.240*	0.469*	0.364*	0.300*	0.301*	0.339*	0.236*
	(28.95)	(14.89)	(15.13)	(24.28)	(37.57)	(33.26)	(28.16)	(26.84)	(29.74)	(19.27)
Ln(orig. Gdp/cap)	−0.208*	−0.0809*	0.0827*	0.221*	−0.0297+	0.152*	0.109*	0.196*	0.338*	0.179*
	(−15.57)	(−5.98)	(4.30)	(14.41)	(−1.86)	(10.38)	(7.20)	(11.23)	(21.99)	(11.45)
Ln(dest. Gdp/cap)	0.0248+	0.0834*	0.142*	−0.00516	0.0499*	−0.0346*	0.0251+	−0.118*	−0.124*	−0.0637*
	(1.91)	(6.21)	(7.38)	(−0.37)	(2.98)	(−2.43)	(1.73)	(−7.58)	(−8.37)	(−3.83)
Both member of EU or EFTA	0.832*	0.725*	0.0739	0.595*	0.325*	0.611*	0.595*	0.202*	1.359*	7.693
	(6.95)	(5.48)	(0.96)	(6.34)	(4.06)	(5.16)	(5.89)	(2.68)	(6.10)	(0.00)
Both EURO as currency	0.199	0.201	0.589*	−0.295*	0.348*	0.198	0.0554	0.125	0.280	0.624
	(1.06)	(0.97)	(6.07)	(−2.30)	(3.06)	(1.11)	(0.38)	(1.20)	(0.76)	(0.00)
Neighbour countries	0.430	0.638	0.861*	0.617*	0.231	0.000327	0.674+	0.334*	−0.173	6.109
	(0.99)	(1.45)	(5.78)	(1.97)	(1.30)	(0.00)	(1.89)	(2.04)	(−0.48)	(0.00)
Both same language	0.299*	0.268*	0.180*	0.295*	0.263*	0.155+	0.388*	0.367*	0.458*	0.153+
	(3.92)	(3.26)	(2.24)	(3.73)	(3.60)	(1.93)	(4.84)	(4.94)	(5.23)	(1.66)
Constant	11.47*	8.843+	5.977*	19.11*	12.25*	5.978+	16.00*	12.74*	13.35*	29.64
	(2.42)	(1.94)	(2.88)	(5.15)	(5.05)	(1.87)	(4.36)	(5.76)	(2.65)	(1.53)
athrho_cons	0.163*	0.0460	−0.0216	0.449*	0.354*	0.179*	0.199*	0.381*	0.0787*	0.109*
	(3.07)	(0.80)	(−0.14)	(7.79)	(4.83)	(4.76)	(4.12)	(5.24)	(2.30)	(2.65)
lnsigma_cons	0.947*	0.846*	1.179*	1.264*	1.168*	0.968*	0.942*	1.083*	0.732*	0.767*
	(99.86)	(105.69)	(61.56)	(84.99)	(62.99)	(94.15)	(83.68)	(52.31)	(82.87)	(100.09)
N	10,205	10,205	10,205	10,205	10,205	10,205	10,205	10,205	10,205	10,205

t statistics in parentheses
+ $p < 0.10$, * $p < 0.05$

REFERENCES

Anderson JE, van Wincoop E (2003) Gravity with gravitas: a solution to the border puzzle. Am Econ Rev 93-3:171–192
Ben-Akiva ME, de Jong GC (2013) The aggregate-disaggregate-aggregate (ADA) freight model system. In: Ben-Akiva ME, Meersman H, van de Voorde E (eds) Freight transport Modelling. Emerald, Bingley
Ben-Akiva ME, Lerman SR (1985) Qualitative choice analysis: theory and application to travel demand. MIT Press, Cambridge
Bergstrand JH, Egger P, Larch M (2013) Gravity redux: estimation of gravity equation coefficients, elasticities of substitution, and general equilibrium comparative statics under asymetric bilateral trades costs. J Int Econ 89:110–121
Bröcker J, Korzhenevych A, Schuermann C (2010) Assessing spatial equity and efficiency impacts of transport infrastructure projects. Transp Res B 44:795–811
Daly AJ, Fox J and Patruni B (2011) Pivoting in travel demand models. Paper presented at the European Transport Conference 2011, Glasgow
de Jong GC, Nielsen OA, Henriques M, Tanner R, Johnson D, Sowa V, Vierth I, Bates J (2016) Deliverable 7.2 - Final report on the freight and logistics model. Seventh Framework Programme theme [SST.2010.1.3–1.], MOVE/FP7/266182/TRANSTOOLS 3, DTU Transport, Copenhagen. http://www.transportmodel.eu/system/files/TT3%20WP7%20_D7.2_freight%20and%20logistics%20model_3.0_Final.pdf. Accessed 18 Oct 2017.
de Jong GC, Schroten A, van Essen H, Otten M, Bucci P (2010) The price sensitivity of road freight transport – a review of elasticities. In: E. van de Voorde, TH. Vanelslander (eds) Applied transport economics, a management and policy perspective. De Boeck, Antwerpen
Deardorff A (1998) Determinants of bilateral trade: does gravity work in a neoclassic world? In: Frankel JA (ed) The regionalization of the world economy. University of Chicago Press, Chicago
Eaton J, Kortum S (2001) Trade in capital goods. Eur Econ Rev 45:1195–1235
Eaton J, Kortum S (2002) Technology, geography, and trade. Econometrica 70:1741–1779
Edwards H with assistance from Bates J and Swahn H (2008) Swedish base matrices report – estimates for 2004, methodology, data and procedures. Stockholm, SIKA PM
ETISplus (2014) D8 ETISplus Final Report, Panteia/NEA: Sean Newton, ISIS: Riccardo Enei, TRT:Claudia de Stasio, KIT: Eckhard Szimba, NTU: Michael Stie Laugesen, TIS: Daniela Carvalho, NTUA: Athanassios Ballis, ITC: Kristiana Chakarova, Zoetermeer
Gomez Herrera E (2010) Comparing alternative methods to estimate gravity models of bilateral trade. Department on Economic Theory, University of Granada, Granada
Heckman JJ (1979) Sample selection error as a specification bias. Econometrica 47:153–161
Hylen B, Kauppila J, Edouard C (2013) Road Haulage Charges and Taxes, Summary analysis and data tables 1998–2013, OECD, discussion paper 2013.08
Ivanova O (2014) Modelling inter-regional freight demand with input-output, gravity and SCGE methodologies. In: Tavasszy LA, de Jong GC (eds) Modelling freight transport, Elsevier Insights Series. Elsevier, Amsterdam
Ivanova O, Heyndrickx C, Spitaels K, Tavasszy L, Manshanden W, Snelder M, Koops O (2007) RAEM version 3.0. Transport Mobility Leuven, Leuven
Ivanova O, Vold A, Jean-Hansen V (2006) PINGO – a model for prediction of regional and interregional freight transport, TØI report 578/2002 (revised). Institute of Transport Economics, Oslo
Jong GC d, Ben-Akiva ME (2007) A micro-simulation model of shipment size and transport chain choice. Transp Res B 41:950–965
Kepaptsoglou K, Karlaftis MG, Tsamboulas D (2010) The gravity model specification for modeling international trade flows and free trade agreement effects: a 10-year review of empirical studies. Open Econ J 3:1–13
Linders G-JM, de Groot HLF (2006) Estimation of the gravity equation in the presence of zero flow, Tinbergen Institute Discussion Paper TI 2006–072/3. VU University Amsterdam, Amsterdam

Marzano V, Papola A (2004) Modeling freight demand at a national level: theoretical developments and application to Italian demand. Paper presented at the European Transport Conference 2004, Strasbourg
Plummer MG, Cheong D, Hamanaka S (2010) Methodology for impact assessment for free trade agreements. Asian Development Bank, Mandaluyong City
Rich J, Kveiborg O, Hansen CO (2011) On structural inelasticity of modal substitution in freight transport. J Transp Geogr 19(1):134–146
Significance, NEA and Demis (2010) Schatting BasGoed, Report for DVS. Significance, The Hague

TRANSLATED VERSION: SPANISH

Below is a rough translation of the insights presented above. This was done to give a general understanding of the ideas presented in the paper. Please excuse any grammatical mistakes and do not hold the original authors responsible for these mistakes.

VERSION TRADUCIDA: ESPAÑOL

A continuación se muestra una traducción aproximada de las ideas presentadas anteriormente. Esto se hizo para dar una comprensión general de las ideas presentadas en el documento. Por favor, disculpe cualquier error gramatical y no responsabilite a los autores originales de estos errores.

INTRODUCCIÓN

Los modelos comerciales pueden utilizarse para pronosticar las pautas comerciales futuras condicionadas a escenarios sobre el desarrollo económico de varias regiones. Si contenían el tiempo y el costo del transporte como factores explicativos de los volúmenes comerciales, los modelos comerciales también podrían utilizarse para simular el impacto de los cambios en los costos de transporte (por ejemplo, la introducción de peajes por carretera) o el tiempo de transporte (por ejemplo, la construcción de nuevos enlaces o la ampliación de los vínculos existentes) en las corrientes comerciales. Sin embargo, la mayoría de los modelos comerciales a gran escala existentes utilizan una variable de distancia simple (por ejemplo, crow-fly) como la medida de la resistencia entre las zonas en el comercio, no los tiempos y costos de transporte. Se dispone de muy poco material empírico sobre el impacto de los cambios en los costos y tiempos de transporte (por modo) en los flujos comerciales, pero los pocos estudios que se han hecho muestran que estos efectos son potencialmente grandes (véase de Jong et al. 2010). Este documento presenta un nuevo modelo comercial europeo que se integra con un modelo logístico (y un modelo de asignación de red), donde los Logsums se utilizan constantemente a gran escala. La accesibilidad se mide en este modelo a través de toda una cadena logística multimodal, sobre la base de un modelo logístico que se ha estimado en micro datos. Esto permite evaluar cómo los cambios en las políticas y los cambios en las redes multimodales influirán en los patrones comerciales.

El modelo comercial presentado en este documento se desarrolla como parte del modelo Europeo Transtools3. El modelo Transtools3 es un nuevo sistema modelo de predicción para el transporte de pasajeros y mercancías en Europa, desarrollado para la DG MOVE de la Comisión Europea. Consta de tres bloques principales: un modelo de transporte de pasajeros, un modelo de flete y logística y un modelo de asignación de red. Este documento se centra en el modelo comercial, un submodelo específico del modelo de flete y logística, tal como se muestra en la caja superior derecha de la Fig. 1. El modelo comercial produce un crecimiento de los flujos de mercancías entre las zonas de producción y de consumo (flujos de PC, medidos en toneladas) entre un año base y un año futuro. El modelo de flete en su conjunto se basó en el modelo agregado-desagregado-agregado o ADA (véase Ben-Akiva y de Jong 2013).

CONCLUSIÓN

Este documento ha presentado un nuevo modelo comercial europeo que se integra con un modelo logístico, en el que los Logsums se utilizan constantemente a gran escala. La accesibilidad se mide en este modelo a través de toda una cadena logística multimodal, sobre la base de un modelo logístico que se ha estimado en micro datos. Esto permite evaluar cómo los cambios en las políticas y los cambios en las redes multimodales influirán en los patrones comerciales. La mayoría de los modelos comerciales a gran escala existentes utilizan una variable de distancia simple (por ejemplo, cuervo-mosca) como medida de resistencia entre zonas. Esto dificulta la simulación del impacto de los cambios en los costes de transporte y las redes de transporte en los flujos comerciales.

En el documento se ha debatido la literatura existente sobre modelos comerciales basados en la gravedad. Describió los datos y las estructuras de modelo utilizadas y presentó los resultados de estimación para las especificaciones de efectos aleatorios con splines de distancia o Logsums como medida de resistencia al comercio. Se proporcionaron elasticidades generales para los cambios en el PIB. El documento también discutió la estructura del modelo general de flete y logística Transtools3 y cómo se combinan las matrices de PC del modelo comercial con el modelo de elección de la cadena de transporte en la aplicación del modelo.

Los modelos comerciales que incluyen efectos fijos o aleatorios específicos de cada país están más en consonancia con la teoría económica moderna, en particular con la hipótesis de los costos relativos. Los modelos de efectos fijos tienen el problema práctico de que no pueden dar el efecto completo de un aumento del PIB en el comercio. Debido a esto, el modelo Transtools3 ha aplicado un modelo de efectos aleatorios.

La estimación del modelo comercial implicó una serie de consideraciones en términos del nivel de estimación. Se decidió aplicar un enfoque de dos etapas, donde en la primera etapa estimamos un modelo genérico de efectos aleatorios a nivel de los países. Dado que los datos comerciales se originan a nivel de país a país, es natural estimar el PIB y los efectos fronterizos específicos del país a este nivel. Estos parámetros se transfirieron a una segunda etapa de estimación donde estimamos variables regionales y efectos de accesibilidad a través de una variable Logsum.

En Transtools3 el modelo de efectos aleatorios se utiliza en la implementación del modelo de flete y logística. A través de la variable Logsum del modelo logístico, hay una influencia del costo de transporte y el tiempo en el patrón de los flujos de PC, y no sólo en la elección de la cadena de transporte para cada flujo de PC dado.

Como evaluación final de la sensibilidad del modelo, analizamos dos escenarios de peaje de camiones en un escenario de peaje de referencia. Para estos tres escenarios comparamos una ejecución de modelo completa que implicaba efectos logísticos y comerciales con una ejecución de modelos en la que solo se permitía cambiar el modelo comercial. Esto nos permitió desenredar los efectos aislados del modelo comercial en el marco modelo final. Los resultados indican que los efectos logísticos son dominantes, aunque los efectos comerciales son sustanciales.

TRANSLATED VERSION: FRENCH

Below is a rough translation of the insights presented above. This was done to give a general understanding of the ideas presented in the paper. Please excuse any grammatical mistakes and do not hold the original authors responsible for these mistakes.

VERSION TRADUITE: FRANÇAIS

Voici une traduction approximative des idées présentées ci-dessus. Cela a été fait pour donner une compréhension générale des idées présentées dans le document. Veuillez excuser toutes les erreurs grammaticales et ne pas tenir les auteurs originaux responsables de ces erreurs.

INTRODUCTION

Les modèles commerciaux peuvent être utilisés pour prévoir les tendances commerciales futures sous réserve de scénarios concernant le développement économique de diverses régions. S'ils contenaient le temps et le coût de transport comme facteurs explicatifs des volumes d'échanges, les modèles commerciaux pourraient également être utilisés pour simuler l'impact des changements dans les coûts de transport (par exemple l'introduction du péage routier) ou le temps de transport (par exemple la construction de nouvelles liaisons ou l'élargissement des liaisons existantes) sur les flux commerciaux. Toutefois, la plupart des modèles commerciaux existants à grande échelle utilisent une variable de distance simple (p. Ex. La mouche du corbeau) comme mesure de la résistance entre les zones sur le commerce, et non pas les temps et les coûts de transport. Très peu de documents empiriques sont disponibles sur l'impact des changements dans les coûts et les horaires de transport (par mode) sur les flux commerciaux, mais les quelques études qui ont été faites montrent que ces effets sont potentiellement importants (voir de Jong et al. 2010). Ce document présente un nouveau modèle commercial européen qui est intégré à un modèle logistique (et un modèle d'affectation réseau), où les logsums sont constamment utilisés à grande échelle. L'accessibilité est mesurée dans ce modèle sur l'ensemble d'une chaîne logistique multimodale, sur la base d'un modèle logistique qui a été estimé sur des micro-données. Cela permet d'évaluer comment les changements dans les politiques et les changements dans les réseaux multimodaux influenceront les modèles commerciaux.

Le modèle commercial présenté dans ce document est développé dans le cadre du modèle européen Transtools3. Le modèle Transtools3 est un nouveau modèle de prévision pour le transport de passagers et de marchandises en Europe, développé pour la DG MOVE de la Commission européenne. Il se compose de trois blocs principaux : un modèle de transport de passagers, un modèle de fret et de logistique et un modèle d'affectation réseau. Ce document se concentre sur le modèle commercial, un sous-modèle spécifique du modèle de fret et de logistique, tel qu'il est représenté dans la boîte supérieure droite de la figure 1. Le modèle commercial produit une croissance des flux de marchandises entre les zones de production et de consommation (flux de PC, mesurés en tonnes) entre une année de base et une année à venir. Le modèle de fret dans son ensemble était basé sur le modèle ada agrégé ou ADA (voir Ben-Akiva et de Jong 2013).

CONCLUSION

Cet article a présenté un nouveau modèle commercial européen qui est intégré à un modèle logistique, où les logsums sont constamment utilisés à grande échelle. L'accessibilité est mesurée dans ce modèle sur l'ensemble d'une chaîne logistique multimodale, sur la base d'un modèle logistique qui a été estimé sur des micro-données. Cela permet d'évaluer comment les changements dans les politiques et les changements dans les réseaux multimodaux influenceront les modèles commerciaux. La plupart des modèles commerciaux existants à grande échelle utilisent une variable de distance simple (p. Ex. La mouche du corbeau) comme mesure de la résistance entre les zones. Il est donc difficile de simuler l'impact des changements dans les coûts de transport et les réseaux de transport sur les flux commerciaux.

L'article a discuté de la littérature existante sur les modèles commerciaux basés sur la gravité. Il a décrit les données et les structures de modèle utilisées et a présenté les résultats d'estimation pour les spécifications d'effets aléatoires avec un splines de distance ou des logsums comme mesure de la résistance au commerce. Des élasticités globales pour l'évolution du PIB ont été fournies. Le document a également discuté de la structure du modèle global de fret et de logistique Transtools3 et de la façon dont les matrices PC du modèle commercial sont combinées avec le modèle de choix de chaîne de transport dans l'application du modèle.

Les modèles commerciaux qui incluent des effets fixes ou aléatoires spécifiques à chaque pays sont plus conformes à la théorie économique moderne, en particulier avec l'hypothèse des coûts relatifs. Les modèles d'effets fixes ont le problème pratique qu'ils ne peuvent pas donner le plein effet d'une augmentation du PIB sur le commerce. Pour cette raison, le modèle Transtools3 a appliqué un modèle d'effets aléatoires.

L'estimation du modèle commercial comportait un certain nombre de considérations en ce qui concerne le niveau d'estimation. Il a été décidé d'appliquer une approche en deux étapes, où, dans un premier temps, nous avons estimé un modèle générique d'effets aléatoires au niveau des pays. Comme les données commerciales proviennent du niveau pays-pays, il est naturel d'estimer à ce niveau les effets du PIB et des frontières spécifiques à chaque pays. Ces paramètres ont ensuite été transférés à une deuxième estimation de la deuxième étape où nous avons estimé les variables régionales et les effets d'accessibilité à l'aide d'une variable Logsum.

Dans Transtools3, le modèle d'effets aléatoires est utilisé dans la mise en œuvre du modèle de fret et de logistique. Grâce à la variable Logsum du modèle logistique, il y a une influence sur le coût et le temps de transport sur le modèle des flux pc, et pas seulement sur le choix de la chaîne de transport pour chaque flux pc donné.

En tant qu'évaluation finale de la sensibilité du modèle, nous avons analysé deux scénarios de péage de camion par rapport à un scénario de péage de référence. Pour ces trois scénarios, nous avons comparé un modèle complet impliquant à la fois la logistique et les effets commerciaux avec un modèle d'exécution où seul le modèle commercial a été autorisé à changer. Cela nous a permis de démêler les effets isolés du modèle commercial dans le cadre modèle final. Les résultats indiquent que les effets logistiques dominent bien que les effets commerciaux soient importants.

TRANSLATED VERSION: GERMAN

Below is a rough translation of the insights presented above. This was done to give a general understanding of the ideas presented in the paper. Please excuse any grammatical mistakes and do not hold the original authors responsible for these mistakes.

ÜBERSETZTE VERSION: DEUTSCH

Hier ist eine ungefähre Übersetzung der oben vorgestellten Ideen. Dies wurde getan, um ein allgemeines Verständnis der in dem Dokument vorgestellten Ideen zu vermitteln. Bitte entschuldigen Sie alle grammatikalischen Fehler und machen Sie die ursprünglichen Autoren nicht für diese Fehler verantwortlich.

EINLEITUNG

Handelsmodelle können verwendet werden, um zukünftige Handelsmuster unter der Bedingung zu prognostizieren, dass Szenarien über die wirtschaftliche Entwicklung verschiedener Regionen abhängen. Wenn sie Transportzeit und -kosten als erklärende Faktoren des Handelsvolumens enthalten würden, könnten Handelsmodelle auch verwendet werden, um die Auswirkungen von Veränderungen der Transportkosten (z. B. Einführung der Maut) oder der Transportzeit (z. B. Bau neuer Verbindungen oder Ausbau bestehender Verbindungen) auf die Handelsströme zu simulieren. Die meisten bestehenden Großhandelsmodelle verwenden jedoch eine einfache (z. B. Krähenfliegen)-Entfernungsvariable als Maß für den Widerstand zwischen Handelszonen, nicht transportalierende Zeiten und Kosten. Es gibt nur sehr wenig empirisches Material über die Auswirkungen von Veränderungen der Transportkosten und -zeiten (nach Modus) auf die Handelsströme, aber die wenigen Studien, die durchgeführt wurden, zeigen, dass diese Effekte potenziell groß sind (siehe de Jong et al. 2010). In diesem Papier wird ein neues europäisches Handelsmodell präsentiert, das in ein Logistikmodell (und ein Netzwerkzuweisungsmodell) integriert ist, bei dem Logsums konsequent in großem Maßstab eingesetzt werden. Die Zugänglichkeit wird in diesem Modell über eine gesamte multimodale Logistikkette auf der Grundlage eines Logistikmodells gemessen, das anhand von Mikrodaten geschätzt wird. Auf diese Weise kann bewertet werden, wie Änderungen in der Politik und Änderungen in multimodalen Netzwerken das Handelsgefüge beeinflussen werden.

Das in diesem Papier vorgestellte Handelsmodell wird im Rahmen des europäischen Transtools3-Modells entwickelt. Das Modell Transtools3 ist ein neues Prognosemodell für den Personen- und Güterverkehr in Europa, das für die GD MOVE der Europäischen Kommission entwickelt wurde. Es besteht aus drei Hauptblöcken: einem Personenbeförderungsmodell, einem Fracht- und Logistikmodell und einem Netzwerkzuweisungsmodell. Das Papier konzentriert sich auf das Handelsmodell, ein spezifisches Teilmodell des Fracht- und Logistikmodells, wie es in der rechten oberen Box in Abb. 1 dargestellt ist. Das Handelsmodell erzeugt ein Wachstum der Warenströme zwischen Produktions- und Verbrauchszonen (PC-Ströme, gemessen in Tonnen) zwischen einem Basisjahr und einem fürdaskommenden Jahr. Das Frachtmodell als Ganzes basierte auf dem Aggregat-Disaggregat-Aggregat oder ADA-Modell (siehe Ben-Akiva und de Jong 2013).

SCHLUSSFOLGERUNG

In diesem Papier wurde ein neues europäisches Handelsmodell vorgestellt, das in ein Logistikmodell integriert ist, bei dem Logsums konsequent in großem Maßstab eingesetzt werden. Die Zugänglichkeit wird in diesem Modell über eine gesamte multimodale Logistikkette auf der Grundlage eines Logistikmodells gemessen, das anhand von Mikrodaten geschätzt wird. Auf diese Weise kann bewertet werden, wie Änderungen in der Politik und Änderungen in multimodalen Netzwerken das Handelsgefüge beeinflussen werden. Die meisten bestehenden großflächigen Handelsmodelle verwenden eine einfache (z.B. Krähenfliegen) Entfernungsvariable als Maß für den Widerstand zwischen Zonen. Dies macht es schwierig, die Auswirkungen von Veränderungen der Transportkosten und der Verkehrsnetze auf die Handelsströme zu simulieren.

Das Papier hat die bestehende Literatur über gravitationsbasierte Handelsmodelle diskutiert. Sie beschrieb die verwendeten Daten und Modellstrukturen und stellte die Schätzergebnisse für Vorfallseffekte-Spezifikationen mit einem Entweder-Abstandssplines oder Logsums als Maß für den Widerstand gegen den Handel dar. Insgesamt wurden Elastizitäten für die Veränderung des BIP bereitgestellt. In dem Papier wurde auch die Struktur des gesamten Transtools3 Fracht- und Logistikmodells und die Kombination von PC-Matrizen aus dem Handelsmodell mit dem Transportkettenwahlmodell in modellweiser Anwendung erörtert.

Handelsmodelle, die länderspezifische fixe oder zufällige Effekte enthalten, entsprechen eher der modernen Wirtschaftstheorie, insbesondere der relativen Kostenhypothese. Modelle für feste Effekte haben das praktische Problem, dass sie nicht die volle Wirkung eines anstiegs des BIP auf den Handel haben können. Aus diesem Grund hat das Transtools3-Modell ein Zufallseffektmodell angewendet.

Die Schätzung des Handelsmodells beinhaltete eine Reihe von Überlegungen in Bezug auf den Grad der Schätzung. Es wurde beschlossen, einen zweistufigen Ansatz anzuwenden, bei dem wir in der ersten Phase ein generisches Zufallseffektmodell auf der Ebene der Länder geschätzt haben. Da die Handelsdaten auf Länderebene stammen, ist es natürlich, das BIP und die länderspezifischen Grenzeffekte auf dieser Ebene abzuschätzen. Diese Parameter wurden dann auf eine zweite Stufe übertragen, in der wir regionale Variablen und Barrierefreiheitseffekte über eine Logsum-Variable geschätzt haben.

In Transtools3 wird das Zufallseffektmodell bei der Implementierung des Fracht- und Logistikmodells verwendet. Durch die Logsum-Variable aus dem Logistikmodell wirkt sich der Transportkosten und die Zeit nicht nur auf die Wahl der Transportkette für jeden pc-Flow aus.

Als abschließende Bewertung der Modellempfindlichkeit haben wir zwei Lkw-Mautszenarien anhand eines Referenzmautszenarios analysiert. Für diese drei Szenarien haben wir eine komplette Modelldurchlaufmit logistischen und handelspolitischen Effekten mit einem Modelllauf verglichen, bei dem sich nur das Handelsmodell ändern durfte. Dies ermöglichte es uns, die isolierten Effekte vom Handelsmodell im endgültigen Modellrahmen zu entwirren. Die Ergebnisse deuten darauf hin, dass logistische Effekte dominieren, obwohl die Handelseffekte erheblich sind.

TRANSLATED VERSION: PORTUGUESE

Below is a rough translation of the insights presented above. This was done to give a general understanding of the ideas presented in the paper. Please excuse any grammatical mistakes and do not hold the original authors responsible for these mistakes.

VERSÃO TRADUZIDA: PORTUGUÊS

Aqui está uma tradução aproximada das ideias acima apresentadas. Isto foi feito para dar uma compreensão geral das ideias apresentadas no documento. Por favor, desculpe todos os erros gramaticais e não responsacule os autores originais responsáveis por estes erros.

INTRODUÇÃO

Modelos comerciais podem ser usados para prever padrões comerciais futuros condicionados a cenários sobre o desenvolvimento econômico de várias regiões. Se contiverem o tempo de transporte e o custo como fatores explicativos dos volumes comerciais, os modelos comerciais também poderiam ser usados para simular o impacto das mudanças nos custos de transporte (por exemplo, introdução do pedágio rodoviário) ou tempo de transporte (por exemplo, construir novos links ou expandir os elos existentes) nos fluxos comerciais. No entanto, a maioria dos modelos de comércio em larga escala existentes usam uma variável de distância simples (por exemplo, crow-fly) como medida de resistência entre zonas no comércio, não tempos de transporte e custos. Muito pouco material empírico está disponível sobre o impacto das mudanças nos custos e horários de transporte (por modo) nos fluxos comerciais, mas os poucos estudos que foram feitos mostram que esses efeitos são potencialmente grandes (ver de Jong et al. 2010). Este artigo apresenta um novo modelo comercial europeu que é integrado a um modelo logístico (e um modelo de atribuição de rede), onde os Logsums são consistentemente usados em larga escala. A acessibilidade é medida neste modelo em toda uma cadeia logística multimodal, com base em um modelo logístico estimado em micro dados. Isso possibilita avaliar como as mudanças nas políticas e mudanças nas redes multimodal influenciarão os padrões comerciais.

O modelo comercial apresentado neste artigo é desenvolvido como parte do modelo Europeu Transtools3. O modelo Transtools3 é um novo sistema de modelo de previsão para o transporte de passageiros e cargas na Europa, desenvolvido para dg move da Comissão Europeia. Consiste em três blocos principais: um modelo de transporte de passageiros, um modelo de frete e logística e um modelo de cessão de rede. Este artigo se concentra no modelo de comércio, um subgê modelo específico do modelo de frete e logística, como retratado na caixa superior direita na Fig. 1. O modelo de comércio produz crescimento nos fluxos de mercadorias entre as zonas de Produção e Consumo (fluxos de PC, medidos em toneladas) entre um ano base e um ano futuro. O modelo de frete como um todo foi baseado no modelo agregado agregado agregado ou ADA (ver Ben-Akiva e de Jong 2013).

CONCLUSÃO

Este artigo apresentou um novo modelo comercial europeu que está integrado a um modelo logístico, onde os Logsums são consistentemente utilizados em larga escala. A acessibilidade é medida neste modelo em toda uma cadeia logística multimodal, com base em um modelo logístico estimado em micro dados. Isso possibilita avaliar como as mudanças nas políticas e mudanças nas redes multimodal influenciarão os padrões comerciais. A maioria dos modelos de comércio em larga escala existentes usa uma variável de distância simples (por exemplo, crow-fly) como medida de resistência entre as zonas. Isso dificulta a simulação do impacto das mudanças nos custos de transporte e redes de transporte nos fluxos comerciais.

O artigo discutiu a literatura existente sobre modelos comerciais baseados na gravidade. Descreveu os dados e as estruturas de modelo utilizadas e apresentou os resultados de estimativa para especificações de efeitos aleatórios com splines de distância ou Logsums como medida de resistência ao comércio. Foram fornecidas elasticidades globais para as mudanças no PIB. O artigo também discutiu a estrutura do modelo global de frete e logística da Transtools3 e como as matrizes de PC do modelo de comércio são combinadas com o modelo de escolha da cadeia de transporte na aplicação do modelo.

Modelos comerciais que incluem efeitos fixos ou aleatórios específicos do país estão mais alinhados com a teoria econômica moderna, em particular com a hipótese relativa de custos. Os modelos de efeitos fixos têm o problema prático de que não podem dar o efeito total de um aumento do PIB sobre o comércio. Devido a isso, o modelo Transtools3 aplicou um modelo de efeitos aleatórios.

A estimativa do modelo de comércio envolveu uma série de considerações em termos do nível de estimativa. Decidiu-se aplicar uma abordagem em duas etapas, onde na primeira etapa estimamos um modelo genérico de efeitos aleatórios ao nível dos países. Como os dados comerciais se originam no nível país-país, é natural estimar o PIB e os efeitos específicos das fronteiras do país neste nível. Esses parâmetros foram então transferidos para uma estimativa de segundo estágio onde estimamos variáveis regionais e efeitos de acessibilidade por meio de uma variável Logsum.

Na Transtools3, o modelo de efeitos aleatórios é utilizado na implementação do modelo de frete e logística. Através da variável Logsum a partir do modelo logístico, há uma influência do custo de transporte e do tempo no padrão dos fluxos de PC, e não apenas na escolha da cadeia de transporte para cada fluxo de PC dado.

Como avaliação final da sensibilidade do modelo, analisamos dois cenários de pedágio de caminhões em relação a um cenário de pedágio de referência. Para esses três cenários comparamos um modelo completo envolvendo efeitos logísticos e comerciais com um modelo de execução onde apenas o modelo comercial foi autorizado a mudar. Isso nos permitiu desembaraçar os efeitos isolados do modelo comercial no quadro modelo final. Os resultados indicam que os efeitos logísticos estão dominando, embora os efeitos comerciais sejam substanciais.