Using National Behavioral Data on Commercial Traffic for Local and Regional Applications

Experiences from Germany: Data Sources and Gaps, Opportunities and Limits

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ABSTRACT

Commercial traffic as combination of freight and business passenger traffic represents, besides the private passenger transport, a substantial share of the complete regional traffic [% of the traffic volume]. Nevertheless, commercial traffic, which arises from the economic activities of local businesses, is often neglected by the municipalities. As a consequence, problems due to the concurrent use of the infrastructure in agglomeration areas by private passenger traffic and commercial traffic are concealed. Only very few cities and regions in Germany collect and maintain data or use traffic demand models to estimate commercial traffic. So, the question about the traffic volume and the effectiveness of measures cannot be answered.

The combination of regional data about businesses and their commercial vehicles with national behavioral data regarding trips and distances per vehicle and day allows the estimation of commercial traffic caused by local businesses and thus represents a straight-forward approach to fill this gap. The data sources used are:

- the Business Register with information about the meaning and the location of the businesses of the Statistical Office of Berlin,
- the Central Vehicle Register of the Federal Bureau of Motor Vehicles and
- national behavioral data from the 'Continuous Commercial Traffic Survey in different Settlement Areas' called "Motor Vehicle Traffic in Germany" ("Kraftfahrzeugverkehr in Deutschland" KiD 2002).

In this paper the existing data, the estimation method and the findings that can be generated will be explained and illustrated. Furthermore the possibilities and limits of the approach are critically discussed.

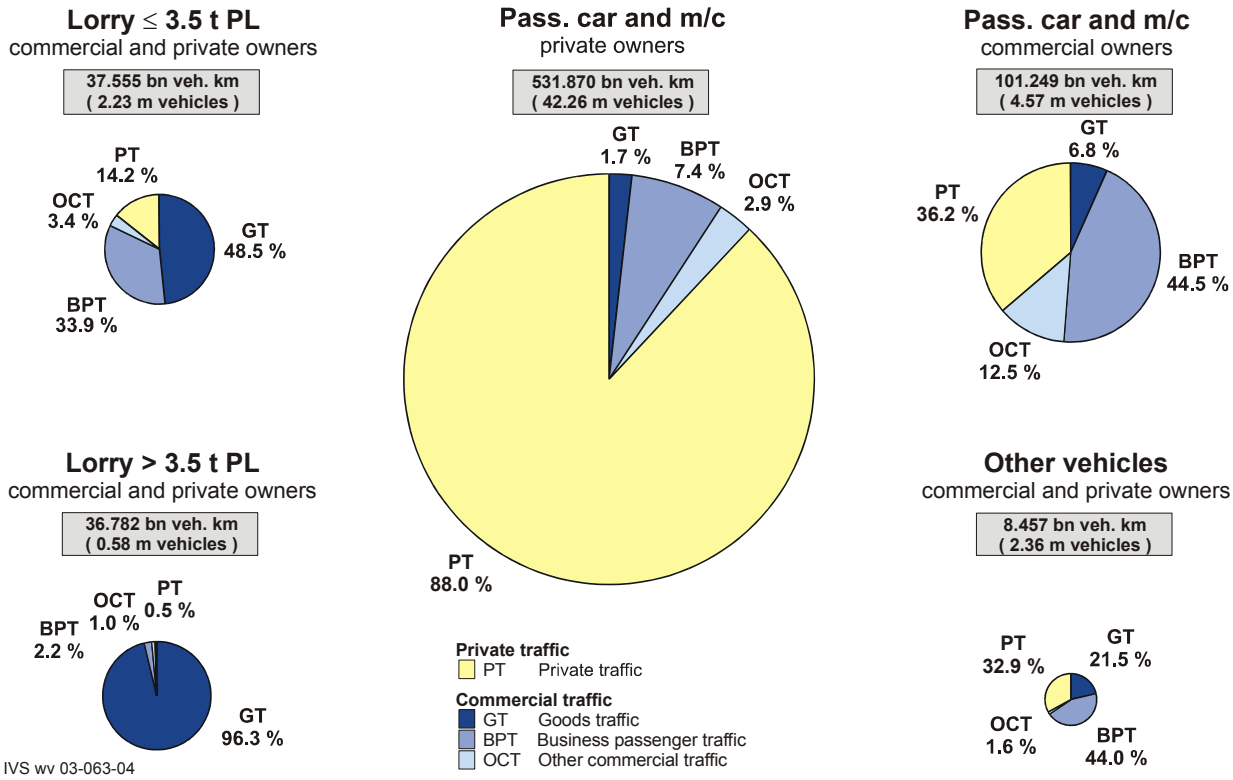
1 INTRODUCTION

Freight traffic and the traffic for commercial services form an increasing share of today's traffic volume. This development is due to the structural change from an industrial era to a service economy. The effects of this structural change are an increase in traffic volume and vehicle-km traveled (VKT) and an ever growing demand in road traffic and particularly in the emerging segment of business passenger traffic. Business passenger traffic is generated by professional activities, not for private reasons, with light commercial vehicles and passenger cars. It includes commercial trips (local and long distance) as well as service trips and takes place mainly in urban areas.

Unlike private traffic, this sector has not been studied in depth so far.

Figure 1 shows central findings of the national behavioral data from the 'Continuous Commercial Traffic Survey in different Settlement Areas' called "Motor Vehicle Traffic in Germany" (KiD 2002).

Figure 1: Annual road performance per vehicle type in the Federal Republic of Germany (*1*)



The importance of commercial traffic and primarily business passenger traffic depending on the type of vehicle is obvious. 10 % of the annual road performance of passenger cars (private owners) is commercial traffic, while 45 % of the use of commercial passenger cars is for business passenger traffic.

A current publication (*2*) is focusing on commercial vehicles up to a payload of 3.5 tons (t PL). The Reason: In Europe the number of vehicles up to 3.5 t PL still increases, while the number of vehicles above 3.5 t PL decreases. Although this contains more than freight traffic, commercial traffic is not understood comprehensively enough. This particularly applies to metropolitan areas, such as Berlin or Hamburg!

Hamburg had a population of 1.8 Mio. inhabitants and 960 thousand registered vehicles on January 1st, 2004. 840 thousand are passenger cars including 199 thousand commercially owned passenger cars. Furthermore, 54 thousand trucks are registered (92 % up to 3.5 t PL and 8 % above 3.5 t PL) (*3*, p. 41, 42, 130, 148, 176). At the same time 1.4 Mio. motor vehicles were registered in Berlin with its 3.5 Mio. inhabitants. Only 200 thousand vehicles were commercially owned vehicles: 105 thousand passenger cars, 76 thousand trucks up to 3.5 t PL and only 6 thousand trucks above 3.5 t PL.

Up to now the perception, the technical discussions, the concepts and measures in transportation science and planning focus on long-distance freight trucking with large vehicles. Commercial traffic plays a rather neglected role in the city's and local area's point of view. Most data and statistics concentrate on freight traffic. Applied measures are reduced to freight transport or distribution centers, city logistics, truck-guidance, loading areas in the cities, etc. (*4*). This focus on freight traffic disguises the problems that are caused by private and commercial traffic sharing the same infrastructure in urban regions (*5*).

Currently, only a few cities in Germany (or in the US) maintain useful data or models that can estimate and visualize commercial traffic (*6*). But it is necessary to develop new planning tools and estimation methods to be able to evaluate the effectiveness of measures planned and implemented.

The survey „Motor Vehicle Traffic in Germany" (KiD 2002) (*7*) has been generated valid data about the commercial traffic on a national level for the first time. As a result, there is knowledge about trucks up to 3.5 t PL, business passenger traffic and about the usage of private vehicles for commercial reasons. The question is how the results can be used for regional applications without using a complete traffic demand model (because these models are rare).

One possibility is a combination of regional data about businesses, employees and registered vehicles with the national behavioral data about trip generation and vehicle-km traveled (VKT) of commercial vehicles. The approach is based on the following data sources:

- Regional information about businesses, their location and their number of employees (⇒ Business Register)
- Regional information on vehicles per type, size and payload (⇒ Central Vehicle Register)
- National findings about the travel behavior for different vehicle types (⇒ KiD 2002).

After a short description of the existing data, the methodology and the results that can be worked out are presented. Furthermore the approach is critically discussed. The aim is to show the opportunities and limits of the presented approach and to draw conclusions concerning further requirements for regional planning.

But first, existing data sources for commercial traffic in Germany and data gaps will be described in the following section.

2 DATA SOURCES FOR COMMERCIAL TRAFFIC IN GERMANY

Regarding commercial traffic with all its elements (business passenger and freight traffic by all modes), the main problems are incompatible and incomplete data in most of the model areas. The transport volumes of air cargo, railway and ship are normally very well documented. Especially road-related traffic data are incomplete, because data on freight traffic, collected by annual surveys, concentrate on trucks above 3.5 t PL. The official statistics contain data on freight traffic with trucks above 3.5 tons of payload and mainly as long-distance trucking. Supplementary information about passenger cars and trucks up to 3.5 t PL and especially about local commercial traffic can hardly be found. There are no official statistics for business passenger traffic in Germany (*8*).

A first evaluation of available information reveals that data and figures on road-based commercial traffic exclusively base on the following sources:

- the Business Register of the Statistical Offices of the federal states of Germany, according to the Council Regulation (EEC) No 2186/93 of the European Union,
- the vehicle population (fleet) according to the Central Vehicle Register of the Federal Bureau of Motor Vehicles (Kraftfahrt-Bundesamt, KBA),
- official statistics on freight traffic published by the Federal Bureau of Freight Traffic (Bundesamt für Güterverkehr, BAG),
- the surveys of the annual road performance (Fahrleistungserhebung) from 1990/1993 and 2002 on behalf of the Federal Highway Research Institute (Bundesanstalt für Straßenwesen, BASt),
- basic traffic data („Verkehr in Zahlen“) by the German Institute of Economics Research (Deutsches Institut für Wirtschaftsforschung, DIW), edited by the Federal Minister for Transport, Building and Housing (Bundesministerium für Verkehr, Bau- und Wohnungswesen, BMVBW)
- since 2003 the national surveys „Mobility in Germany“ (MiD 2002) and „Motor Vehicle Traffic in Germany“ (KiD 2002), both on behalf of the Federal Ministry for Transport, Construction and Housing (Bundesministerium für Verkehr, Bau- und Wohnungswesen, BMVBW),
- singular data which can be derived from regional business surveys or from local traffic counts as well as
- some findings which arise from travel demand models.

Up to now, there was no source which contains comprehensive data on commercial traffic neither on a national nor on a regional level. Furthermore the data sources usually are not comparable to each other or they are obsolete. KiD 2002 closes some of the gaps and the results can also be used for regional applications. The necessary data sources for this paper will be explained:

The Business Register
The Business Register contains information about businesses in the responsibility area of the respective Statistical Office. Its legal framework is the Council Regulation (EEC) No 2186/93 of the European Union. The tax authorities, the Federal Employment Office (Bundesanstalt für Arbeit, BfA), the chambers of industry and commerce, the trade corporations as well as professional organizations transmit the following information: Name, address, municipality key, legal form, business group, number of the employees (with welfare contribution), as well as controllable sales and earnings (*9*), but no traffic related information.

The Central Vehicle Register
The Central Vehicle Register of the Federal Bureau of Motor Vehicles (KBA) contains all vehicles which are registered in the Federal Republic of Germany according to the road traffic registration ordinance (Straßenverkehrszulassungsverordnung, StVZO). The information is published annually illustrating different thematic and spatial parameters. One problem is that the data are available only for one variable at a time, i.e. either for spatial cells or business groups or vehicle size (*3*).

„Motor Vehicle Traffic in Germany“ (KiD 2002)
The aim of the national survey “Motor Vehicle Traffic in Germany” (KiD 2002) was to create information on commercial traffic. The Central Vehicle Register of the Federal Bureau of Motor Vehicles was used as sampling source. It is based on the concept of domestic registration. The register provides almost ideal conditions for the selection of a representative sample, since it is updated daily. Otherwise the register fulfills all methodological demands on the theory of sampling and statistical methods, because each element of the parent population is included and clearly identifiable. In addition the register contains features of the vehicle owner, which influences vehicle usage, and they can be used for the stratification.

A comprehensive analysis of commercial traffic has to consider all types of vehicles and all kind of owners, because private vehicles are used for commercial purposes, too. KiD 2002 has a structure of one main (commercial owner of passenger cars as well as trucks up to 3.5 t PL of private and commercial owner) and three additional surveys (I: private and commercial owner of trucks above 3.5 t PL and tractors / prime movers, II: motor cycles and passenger cars of private owner, III: others).

The parent population is the total number of all vehicle days from which a random sample was drawn. Coincidentally chosen persons (private and commercial owner, different types of vehicles) from different settlement areas have been asked about their vehicle usage on a reference day. The survey was a mail out / mail back survey with a vehicle travel diary.

Overall approximately 77.000 valid samples were collected. The findings represent the Federal Republic of Germany and can generate information for every day, type of vehicle, settlement area or other feature.

3 ESTIMATION OF COMMERCIAL ROAD TRAFFIC

The following chapter contains the description of the estimation method, the presentation of the findings for the model area such as Berlin and some thoughts about possibilities and limits of the approach and the used data.

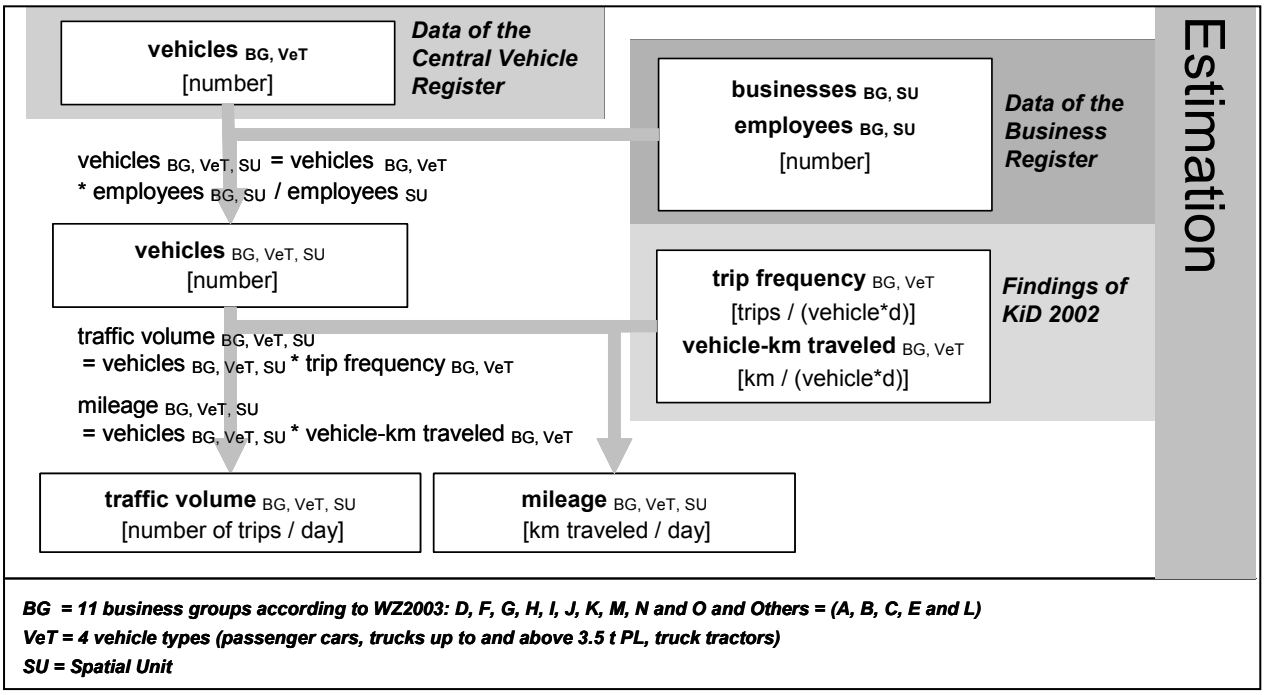
3.1 Estimation method for the spatial concentration of commercial road traffic

The approach to estimate the commercial road traffic combines the data from the Business Register, the number of registered motor vehicles and the behavioral findings of the survey „Motor Vehicle Traffic in Germany“ (KiD 2002). This is done in three steps:

- Spatial distribution of businesses and employees by business groups: Therefore the data of the Business Register generated by the Statistical Offices are connected with geographical data sets of the model area and displayed as GIS-maps.
- Allocation of the motor vehicles according to vehicle types and business groups within the model area: All commercial vehicles (distinguished into four groups: passenger cars, trucks up to and above 3.5 t PL, truck tractors) per business group, are distributed to the spatial units (traffic analysis zone, postcode, boroughs) proportionally to the distribution of employees working in the business group and spatial unit.
- Estimation of the traffic volume and of mileage according to type of vehicle and business group: the results of the previous steps regarding the spatial distribution of motor vehicles per business group are combined with the behavioral data from KiD 2002 (average number of trips and vehicle-km traveled per day).

The following figure shows a flow-diagram of the estimation procedure.

Figure 2: Estimation procedure



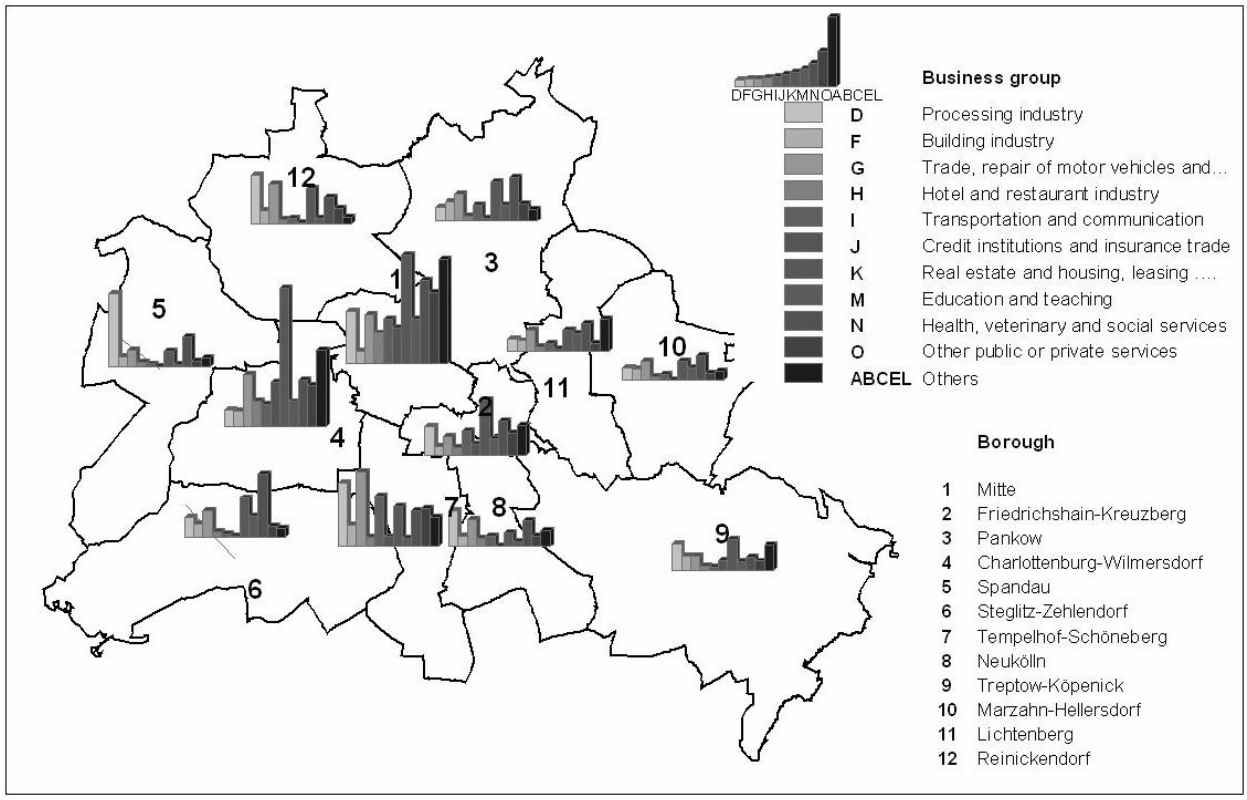
3.1.1 Spatial distribution of businesses

The data of the Statistical Offices include the number of businesses within the related federal state as well as the amount of employees per business group corresponding to spatial units. This is used for the estimation.

Suitable spatial units (traffic analysis zones, postcode or boroughs) have to be chosen for the model area. Therefore, the need for exact results (data spatially disaggregated as far as possible) and data protection issues have to be balanced. Berlin is organized in 12 boroughs and 92 districts. The businesses and employees were evaluated in districts as smallest available spatial unit. For a better readability the maps are based on boroughs.

The information of the Business Register can be displayed in a geographical information system (in this case ArcGIS) by connecting them to the spatial data set. This generates a first impression of the spatial distribution of employees by business group (s. Figure 3).

Figure 3: Distribution of employees by business group and district



The figure shows significant differences between the number of employees per borough and business group: in some boroughs, the processing industry (D) prevails, in other boroughs services (K, O) have a bigger part of the employees.

3.1.2 Allocation of the vehicle population

The allocation of vehicles to districts is oriented towards the allocation of the employees (3.1.1). The share of employees in each business group and spatial cell is used as indicator for the spatial distribution of the commercial vehicles per type and business group (figure 4). This is necessary because the vehicle population is only available as a grand total of the vehicle types (cars, trucks, etc.) and business group for the federal states (here Berlin).

Table 1 shows the allocation of motor vehicles per type to different business groups for Berlin. Besides the spatial allocation, the described approach requires the segmentation of trucks into two categories: The relationship of small trucks up to 3.5 t PL (93 %) and large trucks with more than 3.5 t PL (7 %), which is valid for the state, is transferred to all business groups.

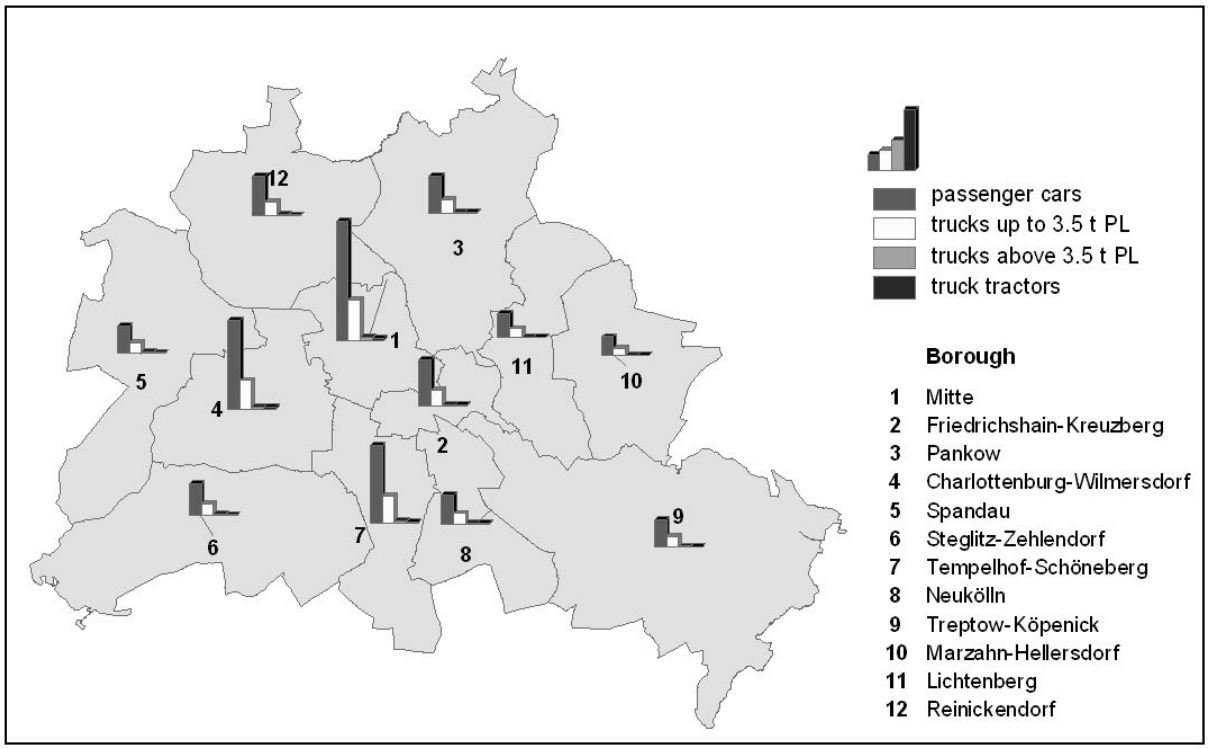
Table 1: Vehicle population by business group in Berlin, January 1st, 2004 [estimation by authors according to (*3*)]

	Business group	Passenger cars	Trucks < 3.5 t PL	Trucks ≥ 3.5 t PL	Truck tractors
ABCE	Agriculture and forestry, fishing and fish farming, mining, stone quarrying and earth extraction, energy and water supply	1,612	1,373	111	6
D	Processing industry	10,949	4,042	327	24
F	Building industry	5,706	5,540	449	51
G	Trade, repair of motor vehicles and goods	16,578	3,018	244	228
H	Hotel and restaurant industry	862	210	17	0
I	Transportation and communication	3,064	1,712	139	488
J	Credit institutions and insurance trade	1,692	45	4	0
K	Real estate and housing, leasing of mobile goods, commercial services primarily for businesses	16,097	3,763	305	787
L	Public authorities, defense, social insurance	4,449	1,256	102	2
M	Education and teaching	62	13	1	0
N	Health, veterinary and social services	2,842	327	27	3
O	Other public or private services	41,848	15,734	1,274	451
	Commercial owners	***105,761***	***37,035***	***2,998***	***2,040***
P	Private owner	1,097,299	37,737	3,055	364
Q	Exterritorial organizations and corporations	839	59	5	0
	Unknown	22,400	1,502	122	22
	Total	**1,226,299**	**76,333**	**6,180**	**2,426**

Most of the commercial vehicles are registered in the business group O ”Other public and private services”. A central finding of KiD 2002 is important to mention: There is a difference between the allocation to business groups according to the Central Vehicle Register and the personal statements of the owners. This applies especially to the passenger cars. According to the data of the KBA 42 % of the commercial vehicles are registered in the business group O. However, only 6 % of the owners stated, that their vehicle was mainly used for this purpose (*7*, p. 213) in the survey.

The following diagram illustrates the generated spatial allocation of the commercial vehicles (January 1st, 2004) for Berlin.

Figure 4: Allocation of the commercial vehicles to the boroughs according to the type of vehicle [illustration by authors, based on (*3*) and Figure 3]



The figure shows a concentration of vehicles in three central boroughs (1 Mitte, 4 Charlottenburg-Wilmersdorf, 7 Tempelhof-Schöneberg). This is similar to the allocation of the employees (see Figure 3).

3.1.3 Estimation of the traffic volume and the vehicle-km traveled (VKT)

The third step is based on the findings of the national survey "Motor Vehicle Traffic in Germany" (KiD 2002). The number of vehicles in the districts are multiplied by the behavioral data (average number of trips and the vehicle-km traveled per day according to vehicle type and business group, see table 2). The values in table 2 are based on the Central Vehicle Register and not based on the responses of the vehicle owner in the survey (refer to explanatory notes on the variances accompanying table 1). This is done to ensure data consistency.

For some business groups there are only aggregated data because of statistical reasons: A too detailed evaluation of KiD 2002, e.g. per day of week, vehicle types and different types of settlement areas (e.g. central cities in agglomeration areas versus rural areas) does not provide information which are statistically reliable due to the small sample sizes in some subgroups (*7*).

Table 2: Trips and road performance per vehicle and day (weekday) [own analysis according to (*7*)]

values per vehicle and day (Mo-Fr)		Passenger cars		Truck < 3.5 t PL		Truck ≥ 3.5 t PL		Truck tractors	
Business group		trips / day	km / day	trips / day	km / day	trips / day	km / day	trips / day	km / day
Processing industry	D	3.11	95.1	4.05	67.3	*4.91*	*143.3*	*2.43*	*382.4*
Building industry	F	2.27	78.7	2.68	47.1	3.61	92.9	6.62	265.3
Trade, repair of motor vehicles and goods	G	2.68	73.0	5.60	72.3	5.19	138.3	3.35	276.1
Hotel and restaurant industry	H	2.81	65.0	5.76	46.3	*4.91*	*143.3*	*2.43*	*382.4*
Credit institutions and insurance trade	J								
Education and teaching	M								
Health, veterinary and social services	N								
Transportation and communication	I	3.32	83.4	9.95	88.0	3.40	315.4	3.91	431.9
Real Estate and housing, leasing of mobile goods, commercial services primarily for businesses	K	2.92	65.8	3.19	59.3	*4.91*	*143.3*	*2.43*	*382.4*
Other public or private services	O	2.99	76.7	4.75	60.7	*4.91*	*143.3*	*2.43*	*382.4*
Other business groups	(ABCE+L)	3.10	83.4	4.34	46.6	*4.91*	*143.3*	*2.43*	*382.4*
Total	**A-Q**	**2.94**	**78.2**	**4.31**	**58.6**	**4.47**	**175.5**	**3.34**	**389.5**

Passenger cars: these values are valid for commercial owners in the central cities of the agglomeration areas
Trucks > 3.5 t PL: these values are valid for commercial and private owners in central cities of agglomeration areas
Trucks ≤ 3.5 t PL: these values are valid for commercial and private owners in Germany
Truck tractors: these values are valid for commercial and private owners in Germany
Italicized values subsume several business groups [1 km = 0,6211 mi]

The average vehicle-km traveled per day varies depending on business group and vehicle type: The road performance of trucks up to 3.5 t PL is less than 59 km per day (37 mi/day), whereas passenger vehicles (78 km/day ~ 48 mi/day) and trucks with more than 3.5 t PL (176 km/day ~ 109 mi/day) have a much higher road performance.

In step 3 the number of vehicles is multiplied by the average number of trips and the vehicle-km traveled to estimate the traffic volume and the VKT per districts.

Chapter 3.2 contains the basic findings of the estimation of commercial traffic in Berlin.

3.2 Findings concerning the spatial concentration of commercial road traffic

Several assumptions and generalizations had to be made due to the combination of various data sources (a more detailed discussion of the data limits will follow in section 3.3). So, the results have to be interpreted under the following constraints:

- The year 2004 corresponds with the latest published statistics on the vehicle population (January 1st, 2004).
- Applied classifications are based on a system of business groups and the data sources (business group statistics WZ 2003, the vehicle population according to KBA and WZ 2003 and KiD 2002 corresponding to WZ 93).
- The conclusions are drawn for a sectoral classification of 11 business groups, which were derived from original 16 main groups.
- The generated values represent domestic traffic; the approach generates data about commercial vehicles which are registered in the model area.
- The results apply for commercial vehicles (passenger cars, trucks up to 3.5 t PL, trucks above 3.5 t PL and truck tractors) only. Commercial traffic with vehicles of private owners (approx. 1/3 of all trips) is not included. Otherwise the estimation contains some private trips which are done with commercial vehicles: i.e. approx. 1/3 of all trips with commercial vehicles have a private purpose (*7*).
- The results apply for workdays only (Monday-Friday, unless a holiday).

A total traffic volume of approx. 495 thousand trips per workday (tolerance: 396 to 594 thousand trips) and a VKT of approx. 11.5 Mio. kilometers (7.14 Mio. miles) per workday can be proved for commercial vehicles in Berlin. The following table shows, that passenger cars and truck tractors – in comparison to trucks – produce disproportionately high vehicle-kilometers.

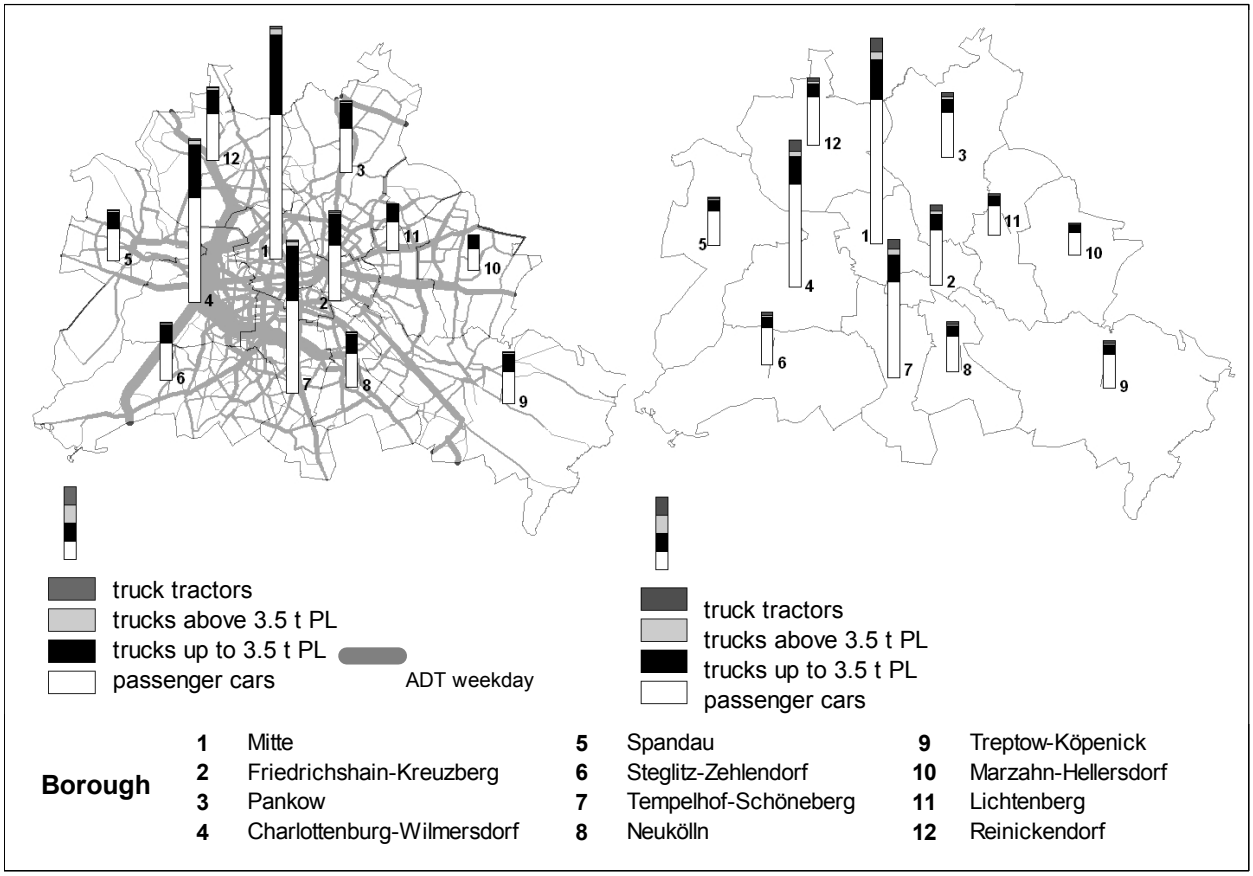
Table 3: Traffic volume and VKT by commercial vehicles registered in Berlin (2004) [estimation by authors, based on the Business Register, (*3*) and (*7*)]

	Traffic volume	**VKT**
Passenger cars	62 %	70 %
Trucks up to 3.5 t payload	34 %	19 %
Trucks above 3.5 t payload	3 %	4 %
Truck tractors	1 %	7 %

Figure 5a displays the spatial concentration of the daily commercial road traffic as a sum of all trips by vehicle type and business group by boroughs. To assess the quality of the findings, a map of the average daily traffic in 2002 (workday, DTV_w, all vehicles) is included. Figure 5 b shows the generated allocation of the VKT. Nearly 50 % of the daily traffic arises within the inner city boroughs.

Figure 5: Generated findings, 2004 [estimation by authors, based on the Business Register, (*3*) and (*7*)]

a) Traffic volume of commercial vehicles per workday b) VKT of commercial vehicles per workday



Trips undertaken with passenger cars and trucks up to 3.5 t PL are approx. 50 % shorter than 10 km (6 mi) and approx. 70 % shorter than 20 km (12 mi) (*7*). It can be assumed that a major share of the observed trips is carried out within the urban area of Berlin. Only 8 % of all trips with commercial passenger cars and 46 % of trips with trucks up to 3.5 t PL serve transport of goods (*7*). The rest is to be attributed to business passenger traffic or private purposes.

3.3 Opportunities and limits of the approach

Some limitations of the approach have to be named.

The main problem is that no complete reproduction of urban commercial traffic can be achieved:

- Only commercial vehicles are taken into account. Private vehicles used for commercial purposes were not considered, since no official information on their distribution within the area of investigation exist.
- Moreover trips of the long-distance freight trucking (terminating and transit traffic) as well as trips into the model area, with vehicles which are registered outside the model area, are not displayed.
- Due to the fact that KiD 2002 only offers information on the type of destination (other businesses, construction site, customer household etc.), no clear assumptions regarding the spatial distribution of the destinations can be developed and in consequence no O-D-matrices can be generated.

The following constraints result from KiD 2002 itself:

- The characteristic values lie within a 95 %-confidence interval of +/- 20 % (68 %-confidence interval of +/- 10 %). At least these tolerances have to be taken into account for the described findings.
- The location of the commercial vehicle matches the address of its owner in 70 to 80 % only (*7*, p. 215ff). Therefore, vehicles are considered, which are not stationed within the model area, nor is the opposite case.
- The statements of the vehicle owner regarding the main use of their vehicles differ considerably from the business groups in the Central Vehicle Register. The values were used according to the last one.

The key-advantages of the described procedure are:

- The described method is a straight-forward approach to generate valid data for commercial traffic by four vehicle types (passenger cars, truck up to and above 3.5 t PL and truck tractors), when issues of data compatibility are solved.
- The application of the Business Register has proven to be of value. Up to 2000 there had been no official statistics about businesses, their locations and employees in Germany.
- The estimation approach produces more holistic results than pure traffic counts at census points. There is the problem to differ the trucks (primarily defined according to the number of axes and kind of tires). Both methods, however, should be combined.
- The procedure generates more information on commercial traffic, because it includes trips performed with LCV's and business passenger trips. It goes beyond the usual available data that focus on freight trucking.

Because not all data were available on the same detailed spatial and sectoral classification, further assumptions had to be made:

- The orientation towards employees with welfare contribution implies that appointees, self-employed and freelancer, as well as helping family members are not accounted for. Resulting distortions cannot be estimated.
- An alternative method could be the use of detailed data of the Federal Bureau of Motor Vehicles. For this, a special analysis (connected to costs) of the Central Vehicle Register according to vehicle types and regional spatial division (postcode) would be required. But, vehicles are often registered at the company headquarter and not at their location of use (the actual business location). Due to the fact that a relationship between the number of employees of a business and the number of vehicles was proven (*10*), a combination of the vehicle population to the business locations seems more logically. The employees use the commercial vehicles irrespective of the tax advantages of the company headquarter.
- The calculations account for domestic vehicles, although some of them may be used in other areas. Vehicles that are stationed and used within the model area but registered elsewhere are not included. The reasons lay within the official statistics. If this leads to over- or underestimation, cannot be determined. It is not known if there is a tendency to a higher or lower registration than stationing vehicles in Berlin.
- For the traffic estimation, available travel demand values for different business groups according to official statistics were coupled with data on the commercial fleet of the same apportionment. The question which specifications (Central Vehicle Register vs. owner's specifications through survey) provide more realistic results has to be left: Is a classification during the registration process of vehicles more reliable than the classification gained from surveys or not?

Regarding the number of vehicles and trips per day, a region's traffic is stronger influenced by the traffic of the domestic businesses and their employees and less by the terminating traffic. Such questions can only be answered with an estimation of all kinds of traffic. Nevertheless, the overlap of private passenger transport, regional commercial traffic and long-distance freight trucking leads to bottlenecks in the infrastructure.

4 CONCLUSIONS

Altogether, the method has proven to be suitable and practical to estimate the regional commercial traffic by combining different regional and national data sources. The generated benchmarks of commercial traffic with trucks lie within comparable dimensions from existing estimations on road freight traffic. Moreover, the findings are not only limited to freight traffic. They emphasize the importance of smaller trucks, vans and passenger cars. The spatial concentration of commercial traffic in Berlin was confirmed by a comparison with the average daily traffic on the road network.

The introduced method is a straight-forward way to produce a spatial overview of the main sources of commercial traffic and to estimate the traffic that will be generated from newly developed commercial areas. It however, does not substitute commercial traffic demand models and regional surveys.

Regarding the data, the following conclusions can be drawn:

- For the first time in Germany, a valid knowledge about commercial traffic on a national level is provided with MiD 2002, KiD 2002 and in combination with the road performance survey.
- The conclusions can be drawn that business passenger traffic is of greater importance than (long-distance) freight trucking, particularly in terms of traffic volume. Moreover, business passenger traffic represents the sector with the greatest development potential (if one takes into account vehicle population and employee development or the development of the offered and necessary services).
- Business passenger traffic is almost unnoticed not only by researches but also by municipal transport planners (the same is valid for the USA, if you see the current call for paper of the 85th TRB Annual Meeting to "freight survey methods" or publications addressing commercial vehicles (*11, 12*)).

Further research needs could be identified in respect to the following issues:

- preliminary decisions, such as location decisions of businesses, and their effect on regional traffic,
- internal business decisions about logistics processes and their effects on traffic generation,
- the traffic potential of businesses, e.g. by customers, craftsman or deliveries and
- mode choice, especially in the segment of business passenger traffic.

KiD 2002 solves a lot of national questions in Germany for the first time. Related to the questions and problems of the cities and regions not all open questions are answered (e.g. about destination choice). The applied method for the estimation of spatial and sectoral concentration of commercial traffic is very straight-forward and in some ways quite simplified. It can be used in order to demonstrate the significance of commercial traffic as a result of local commercial activities and raise the awareness of the importance to include all segments of commercial traffic into public transport policies. Municipalities need to conduct surveys and to maintain regional data, including freight and business passenger traffic in order to generate complete and valid data for a reliable planning framework. Furthermore traffic demand models are necessary for the regional commercial traffic to be able to evaluate commercial traffic related measures. The generated data can also be an input for traffic demand modeling. A corresponding development has taken place within the last years (e.g. VENUS, IVV Aachen; a trip chain model, TU Braunschweig, which is similar to the “commercial vehicle movement model” of Calgary (*12*) ; WISEVA, TU Dresden and PTV etc.). However, these new options still need stronger integration into practical planning processes.

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