Who owns Light Commercial Vehicles? An empirical analysis for Switzerland

Raphaël Ancel

Nicole A. Mathys

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Raphaël Ancel
Federal Office for Spatial Development (ARE)
raphael.ancel@are.admin.ch

Nicole A. Mathys
Federal Office for Spatial Development (ARE)
nicole.mathys@are.admin.ch

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Abstract

The number of Light Commercial Vehicles (LCV) in Switzerland increases faster than any other type of vehicle. Despite a growing interest from public authorities, we still know relatively little regarding their actual use. In this study, we matched the national vehicle register with the national business register in order to identify the General Classification of Economic Activities (NOGA 2008) of the companies owning LCVs. As register matching is handled very restrictively, this is the first time that such results are published for Switzerland. The paper presents the methodology used for matching (there is no common unique identifier) and provides results aggregated at the level of NOGA sections. The resulting distribution of vehicles across sectors significantly differs from previous survey-based findings. This distribution is then converted in vehicle-kilometers by factoring in the average daily distances traveled by each branch. Our findings are crucial to better understand the road traffic generated by economic activity. They are also a key input for the Swiss LCV traffic model and hence for traffic forecasts.

Keywords

Light Commercial Vehicles; LCV; traffic model; economic activity

Suggested Citation

1 Introduction

Light commercial vehicles (LCVs) are defined in the European Union and in Switzerland by their gross weight, which must not exceed 3.5 tonnes, and by their targeted usage: the carriage of goods. Their usage goes however beyond the carriage of goods: a survey conducted in 2013 among LCV owners in Switzerland found that 53% of LCVs were used for service trips (Federal Statistical Office, 2015a). LCVs have gained the attention of public authorities because of their central role in city logistics and their increasing number on the roads: the annual number of LCV registrations in Switzerland has increased by 82% between 1999 and 2019 (Federal Statistical Office, 2022) and the latest forecasts of the Swiss government (Federal Office for Spatial Development, 2021) projects a 58% increase of LCV vehicle kilometers between 2017 and 2050.

To this date, two data sources provide estimates for Switzerland of the usage of LCVs across economic sectors: the LCV survey conducted in 2013 by the Swiss Federal Statistical Office (Federal Statistical Office, 2015b) and a more recent research project with a smaller scale (Ruesch *et al.*, 2023). The main limitations of the LCV survey of 2013 are that (i) it is already old, (ii) the matching of business-owned LCVs with branches often failed and (iii) the business-owned LCVs whose General Classification of Economic Activities (NOGA) section could not be identified cannot be distinguished from LCVs owned by households. The survey of Ruesch *et al.* (2023) also has its limitations: only 7'000 vehicle owners were contacted, and the response rate was quite low (26 %). These differences in survey design result in large differences in the results. The purpose of this paper is to provide a more recent, comprehensive and precise estimate of the distribution of LCVs between households and NOGA sections. This is achieved by matching the national vehicle register with the national business and enterprise register, without the need of any sampling. Such a matching is highly relevant for modeling and projections since the probability that a vehicle is active and the average daily distance when a vehicle is active differ significantly between NOGA sections (e.g. from about 50 km to about 170 km for average daily distances).

Section 2 provides a brief overview of the data available, Section 3 describes the methodology, Section 4 presents the results in terms of vehicle fleet and vehicle-kilometers, and Section 5 concludes.

2 Data

2.1 LCV survey

The Swiss Federal Statistical Office (FSO) conducts every now and then a survey among LCV owners. The last editions took place in 1993, 1998, 2013, 2023. As the results for 2023 are not yet available, we rely here on the 2013 edition. The survey was conducted with two types of questionnaires. Questionnaires of type 1 only contained a few questions about the mileage and the main use of the vehicle during a reference day. Questionnaires of type 2 contained the same questions as those of type 1, but also questions about the individual trips and shipments transported during that day (postal codes of origin and destination, weight, type of good, mileage of the vehicle at origin and destination). These additional questions however were only asked for vehicles that carried at least 50 kg of goods during the reference day. Overall, according to the survey report (Federal Statistical Office, 2015b):[1]

- Questionnaires of type 1 were sent to the owners of 40'000 LCVs. The response rate was 76%.
- Questionnaires of type 2 were sent to the owners of 28'000 LCVs. The response rate was 71%, but the part with questions about individual trips and shipments was only completed for 3'874 LCVs.

Questionnaires of type 2 impose a higher burden for the respondents, in particular for those who report their individual trips. This means that the response rate is likely to decrease with the number of individual trips made on the reference day. To avoid a selection bias, the FSO only uses the questionnaires of type 1 to compute the veh-km statistics.

The FSO published various analyses of the LCV Survey 2013, including a table (Federal Statistical Office, 2015c) providing the veh-km and the ton-km for each section of the General Classification of Economic Activities (NOGA 2008). Although the FSO did not publish any figures about the number of vehicles per economic section, we can estimated them using the detailed data of the survey (types 1 and 2).

[1] These were the planned numbers. Light variations in the implementation.

2.2 National vehicle register

The Swiss national vehicle register (Federal Roads Office, 2022) contains all vehicles registered in Switzerland. We relied here on a non-standard dataset, containing only the vehicles owned by juridical persons, but including additional attributes about the vehicle owner: name of the company, name of the division (often empty), address of the company and address of the establishment, where the vehicle is most often located. It also contains standard attributes about the vehicle itself, such as the vehicle type.

2.3 Business and Enterprise Register

Table 1: List of the retained sections and divisions of the NOGA 2008 classification (source: `https://www.kubb-tool.bfs.admin.ch/en`)

A	agriculture, forestry and fishing
B	mining and quarrying
C	manufacturing
D	electricity, gas, steam and air-conditioning supply
E	water supply; sewerage, waste management and remediation activities
F	construction
G	wholesale and retail trade; repair of motor vehicles and motorcycles
H (49-52)	transportation and storage, except postal and courier activities
H (53)	postal and courier activities
I	accommodation and food service activities
J	information and communication
K	financial and insurance activities
L	real estate activities
M	professional, scientific and technical activities
N	administrative and support service activities
O	public administration and defence; compulsory social security
P	education
Q	human health and social work activities
R	arts, entertainment and recreation
S	other service activities
T	activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U	activities of extraterritorial organisations and bodies

The Business and Enterprise Register (BER) "contains all enterprises and businesses in private and public law which are domiciled and exercise an economic activity in Switzerland"

(Federal Statistical Office, 2024). The BER contains in particular the name and address of the entreprise or business, as well as the 6-digit Type code of the NOGA 2008 classification. In this study, we are only interested in the first level of this classification (sections), except for the section H (Transportation and storage), in which we isolated the postal and courier activities (2^{nd} level NOGA code (division): 53), which are of particular interest in the field of city logistics. The retained NOGA sections and divisions are listed in Table 1.

3 Matching Methodology

In order to identify the number of vehicles registered within each branch, we link the non-standard dataset of the national vehicle register containing the name and address of the companies owning LCVs (see Section 2.2) with the national business register. The objective is to add a "NOGA 2008" attribute from Table 1 to each vehicle. The results are reported in Table 2.

The matching is done based on the establishments' name, their address (a string consisting of a street name and a number) and their postal code. As these fields are not always consistent between the two registers, we test a variety of matching criteria. We start with the strictest (exact same name, address and postal code) and then progressively relax the various constraints (e.g. (a) exact same name and postal code, but no constraint on the address or (b) same address and postal code, but some small differences between the two names are allowed). When several establishments of the national business register fulfill the matching criterion for the same vehicle, we distinguish two cases : if all the establishments fulfilling the matching criterion correspond to the same NOGA attribute (section or division, see Table 1), we consider the matching as unambiguous and assign this common NOGA code to the vehicle. If the establishments belong to different branches, we do not assign any NOGA code to the vehicle.

Once a vehicle is assigned to a branch, this assignment is considered definitive and no additional matching criterion is applied. Note also that in some cases, the vehicle register contains two addresses and postal codes: one for the enterprise and one for the establishment where the vehicle is located. In such cases, we first try to match the vehicle owner based on the establishment's coordinates and if it fails, we retry with the enterprise's coordinates.

Table 2: Number of assigned vehicles per matching criterion

Matching criterion	Assigned vehicles	Share[%]
1) Same name, address and postal code	166'921	52.1
2) Same name and postal code	40'179	12.6
3) Same name	14'282	4.5
4) Same address and postal code and:		
a) Name_BER$_x$ = Name_IVZ	16'845	5.3
b) name_BER = name_IVZ	6'155	1.9
c) name_BER$_x$ = name_IVZ	1'471	0.5
d) L(Name_BER, Name_IVZ) = 1	2'683	0.8
e) L(Name_BER$_x$, Name_IVZ) = 1	2'167	0.7
f) Two words in common	11'840	3.7
Same postal code and:		
a) Name_BER$_x$ = Name_IVZ	6'350	2.0
b) name_BER = name_IVZ	2'171	0.7
c) name_BER$_x$ = name_IVZ	673	0.2
d) L(Name_BER, Name_IVZ) = 1	1'038	0.3
e) L(Name_BER$_x$, Name_IVZ) = 1	930	0.3
f) Two words in common	5'691	1.8
Manual assignment	15'396	4.8
Unassigned	25'307	7.9
Total	320'099	100

Notes:
- State of vehicle register: December 16$^{\text{th}}$, 2022.
- State of establishment register: April 18$^{\text{th}}$, 2023.
- see text for the description of the matching criterion.

The criteria and the number of vehicles they permitted to assign to a branch are listed in Table 2, in the order they were applied. Name_BER and Name_IVZ denote the name in the business and establishment register (BER) and vehicle register (IVZ, from the german *Informationssystems Verkehrszulassung*), Name_BER$_x$ denotes a short version of Name_BER where we only keep the first x characters (x is set equal to the number of characters in Name_IVZ, which is limited to a maximum of 30) and name_BER, name_IVZ, and name_BER$_x$ denote lowercase versions of these names. $L(a, b)$ denotes the Levenshtein distance between the words a and b, i.e. the minimum number of single-character edits (insertions, deletions or substitutions) required to change a into b. Allowing a match when the Levenshtein distance is equal to 1 means that we allow one character to be edited. "Two words in common" means that Name_BER and Name_IVZ should have at least two words in common to be matched.

After application of all the matching criteria considered, about 87.3 % of vehicles could

be assigned to a branch. This proportion is further increased by “manual assignment” when the name of the vehicle owner contains some specific words: for instance the word "transport" was assigned to the branch H (49-52). Some particularly large vehicle owners were assigned to a branch manually (for instance the Swiss army and the Swiss post).

At the end, only 7.9 % of business-owned LCVs were left unmatched. In order to entirely distribute the fleet between the considered NOGA sections and divisions, the unmatched vehicles were randomly assigned a NOGA code, with a probability proportional to the number of LCVs already assigned to this code.

4 Results

4.1 Fleet decomposition by owner type and branch

The estimated distribution of LCVs by owner type and branch is summarized in Table 3. For comparison purposes, the last column reports the branch distribution of the LCV Survey 2013 (private vehicles are not reported for the LCV survey 2013 because they cannot be distinguished from business-owned LCVs whose NOGA code could not be identified). To facilitate the comparison, the second to last column is also restricted to business-owned LCVs.

Our estimated distribution is overall relatively similar to the one estimated on the basis of the detailed data of the LCV Survey 2013. For individual NOGA sections however, the differences can be sizeable: the proportion of the business LCV fleet registered in the NOGA section G (trade) drops from 16.2 % to 11.9 %, that of the section C (manufacturing) from 15.8 % to 12.4 %, while the one registered in the NOGA division 53 (postal and courier activities) is multiplied by 2.8, surging from 0.9 % to 2.5%. This large increase might be related to the growth of online shopping. Section N (administrative and support service activities) also exhibits a large increase, from 7.4 % to 9.9 %. Section F (construction) remains the one with the most LCVs. Its share among business-owned LCVs increases from 38.2 % (2013) to 41.1 % (2022). Some care is required when interpreting these differences: while they might indicate an actual evolution over time, some differences might also be due to the methodology.

Table 3: Estimated distribution of LCVs by owner type and NOGA code (state: June 2022), based on our own mapping and based on the detailed data of the LCV Survey (FSO, 2013)

Owner type	NOGA08	Vehicles (2022)	LCV [%] (2022)	LCV [%] business only (2022)	LCV [%] business only (FSO, 2013)
Business	A	3'767	0.9	1.2	2.1
	B	626	0.1	0.2	0.2
	C	38'999	9.2	12.4	15.8
	D	4'696	1.1	1.5	2.0
	E	2'836	0.7	0.9	1.1
	F	128'807	30.4	41.1	38.2
	G	37'452	8.9	11.9	16.2
	H (49-52)	15'857	3.7	5.1	4.1
	H (53)	7'811	1.8	2.5	0.9
	I	2'358	0.6	0.8	1.2
	J	2'328	0.6	0.7	0.6
	K	2'992	0.7	1.0	1.3
	L	2'794	0.7	0.9	0.8
	M	10'776	2.5	3.4	3.0
	N	30'977	7.3	9.9	7.4
	O	12'765	3.0	4.1	2.3
	P	1'161	0.3	0.4	0.3
	Q	2'877	0.7	0.9	1.2
	R	1'275	0.3	0.4	0.5
	S	2'489	0.6	0.8	0.9
	Total	313'642	74.1	100.0	100.0
Private	-	109'444	25.9		
Total	-	423'086	100.0		

4.2 Vehicle-kilometers by owner type and branch

Table 4 provides an estimate of the distribution of veh-km by owner type and branch. It was obtained by multiplying the number of vehicles estimated in the previous section for 2022 by the probability that the vehicle is active on a given day (including week-ends and holidays) and by the average distance traveled on active days. Both the probability that the vehicle is active and the average distance when active were computed using answers to the questionnaires of type 1 of the LCV Survey 2013 (Federal Statistical Office, 2015a), consistently with the estimations of the Federal Statistical Office. Note that the behavioral parameters for privately owned LCV might not be representative, because private vehicles cannot be distinguished from business-owned LCVs with unknown NOGA code.

Table 4: Estimated distribution of LCV-kilometers by owner type and NOGA code (state vehicles: June 2022), based on the average behavior per branch observed in the LCV Survey type 1 (FSO, 2013).

Owner type	NOGA08	Active proportion [%]	Daily distance when active [km]	Veh-km/year [in millions]	Veh-km [%]
	A	52	62.3	44	0.8
Business	B	64	51.8	8	0.1
	C	42	91.3	552	9.8
	D	44	52.1	39	0.7
	E	46	78.9	38	0.7
	F	48	65.2	1'474	26.2
	G	45	117.7	717	12.7
	H (49-52)	51	154.6	460	8.2
	H (53)	58	171.2	281	5.0
	I	40	58.5	20	0.4
	J	37	88.7	28	0.5
	K	51	89.7	50	0.9
	L	38	66.8	26	0.5
	M	41	95.5	154	2.7
	N	47	74.0	391	6.9
	O	50	51.1	120	2.1
	P	37	64.1	10	0.2
	Q	49	55.9	29	0.5
	R	41	88.5	17	0.3
	S	46	80.3	34	0.6
Private		40	71.7	1'135	20.2
Total				5'626	100.0

As the average daily distance and probability to be active come from the Federal Statistical Office (2015a), the comparison with the LCV Survey in terms of veh-km would only reflect the differences in fleet composition analyzed in Section 4.1. For lack of space, we do not include such a comparison. Ruesch *et al.* (2023) also provided a distribution of veh-km for business-owned LCVs, but only for selected NOGA sections: F (52 %), N (11 %), H (9 %), I (7 %), G (5 %), C (4 %), other sections (12 %). Although the most important section remains the same (F: construction), there are strong differences (e.g. for the section I). We believe that this is due to the non-representative sample (the response rate was 26 %) in Ruesch *et al.* (2023).

5 Conclusions

Register matching allowed us to identify the NOGA section for 92 % of business-owned LCVs for the year 2022. The resulting fleet decomposition is rather similar to the one observed in the ten year older LCV survey 2013, except for a few branches, whose proportion in the LCV fleet increased dramatically (e.g. parcel and courier services) or decreased (e.g. trade). We also provided an estimation of the distribution of veh-km across branches by assuming the same daily distance traveled per branch as in 2013. These findings flow into in the newly established LCV model for Switzerland.

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