



Commission européenne
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Transalpine Freight Traffic Flows:

Summary Report on CAFT-Surveys 2014/15

Alpine Arc from Ventimiglia to Wechsel

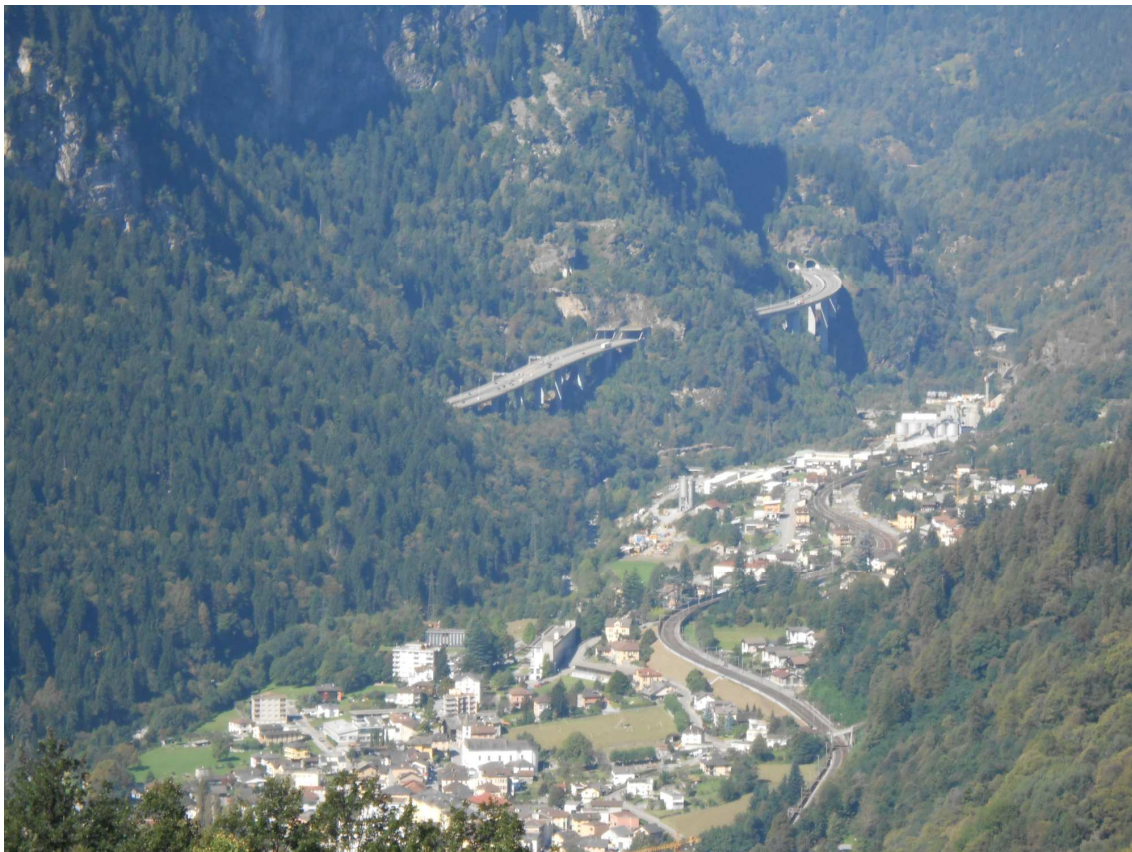


Photo: Sigmaplan

February 2018

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11.00	26.02.2018	kd

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1 Introduction

One of the most important data sources on transalpine freight traffic flows is the coordinated CAFT survey (for **Cross-Alpine Freight Transport**), which has been underway since 1994 in France, Switzerland and Austria. The last survey was completed in 2014 in Switzerland (publication 2015 in Berne ¹) and in 2015 in Austria (publication 2017 in Vienna ²). In France, there was no special survey in 2014, so Eurostat data were used. Results of this evaluation are available on the homepage of the Service of Observation and Statistics – General Commissariat for Sustainable Development³.

The CAFT survey covers the whole Alpine arc. This arc spans the *Alpes Maritimes* on the Mediterranean coast in the southwest, to the Alpine foothills at the border triangle between the Austrian regions of Styria, Lower Austria and Burgenland in the East. It covers all important Alpine crossings between Ventimiglia on the Franco-Italian border and Wechsel in Austria, corresponding to arc C in Alpinfo publications⁴ of the Swiss Federal Department of Environment, Transport, Energy and Communication (see the last issue for 2014).

Table 1 and figure 1 (overleaf) show the crossings studied.

Country	Crossing	Road	Rail	Arc A
France	Ventimiglia	X	X	
	Montgenèvre	X		
	Fréjus	X		X
	Mont Cenis		X	X
	Mont Blanc	X		X
Switzerland	Grand St-Bernard	X		X
	Simplon	X	X	X
	Gotthard	X	X	X
	San Bernardino	X		X
Austria	Reschen	X		X
	Brenner	X	X	X
	Tauern	X	X	
	Felbertauern	X		
	Schoberpass	X	X	
	Semmering	X	X	
	Wechsel	X	X	

Table 1: Relevant Alpine crossings of arc C

¹ <https://www.bav.admin.ch/bav/de/home/themen/alphabetische-themenliste/verlagerung/berichte-und-zahlen.html>

² https://www.bmvit.gv.at/verkehr/gesamtverkehr/statistik/agqv_15/index.html

³ <http://temis.documentation.developpement-durable.gouv.fr/docs/Temis/0083/Temis-0083860/22415.pdf>

⁴ <https://www.bav.admin.ch/dam/bav/de/dokumente/themen/verlagerung/alpinfo-2014.pdf.download.pdf/Alpinfo-2014-de.pdf>

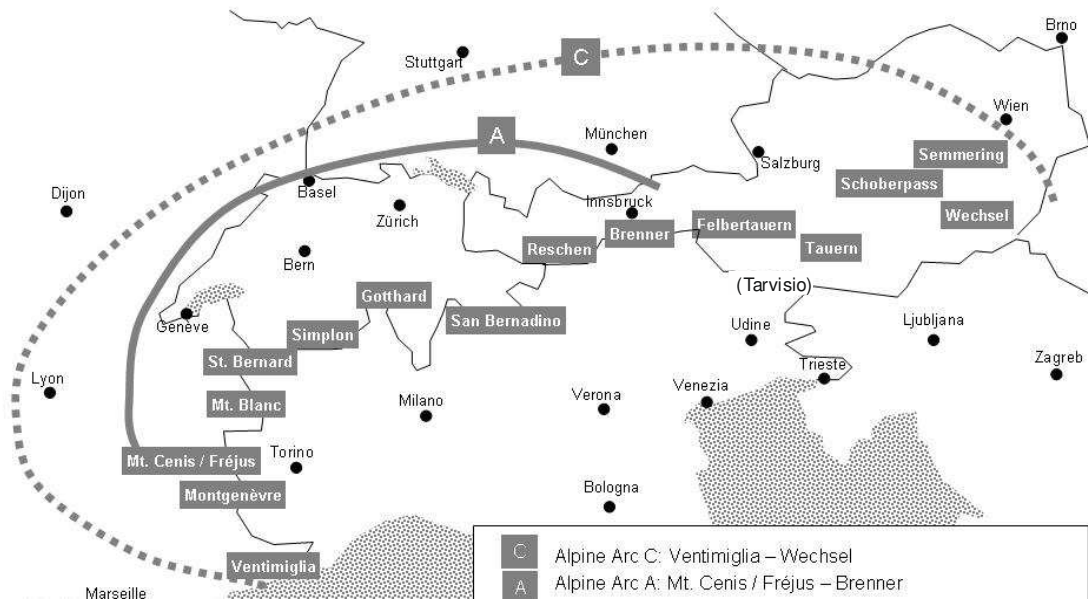


Figure 1: Alpine Arcs C and A

2 Specifics of the CAFT survey

The CAFT survey is the primary tool for the constant monitoring of transalpine freight traffic flows: the key indicators derived from the CAFT survey enable a uniquely detailed picture of the characteristics of transalpine freight transport. The most important indicator derived from the CAFT survey is the average loading weight of heavy goods vehicles (HGV), which is needed to deduce the transport volume from the number of vehicles counted on the various Alpine crossings.

The CAFT survey also collects information on:

- Characteristics of the vehicle (country of registration, type of vehicle, weight of the vehicle where possible, etc.)
- Type of freight transported (type of goods according to Eurostat categories, type of cargo where possible)
- Transport routes (origin and destination of transported goods, Alpine crossing used)
- Utilisation rates of rolling motorway and rail infrastructure, where possible

The first CAFT surveys were carried out in Switzerland in 1980/81. Between 1994 and 2009/10, CAFT surveys were carried out every five years in a coordinated manner using the same method in France, Switzerland and Austria. The characteristics of transport by road were gathered by interviewing the drivers of the HGV. This type of survey is quite expensive and the responsible authorities sought measures to limit the costs of the survey. In 2014/15, CAFT surveys were carried out differently in the three Alpine countries France, Switzerland and Austria.

To analyse transalpine freight transport by rail, data must be collected from rail infrastructure managers or rail freight operators. Due to the liberalisation of rail transport in Europe, various operators share the market and often are reluctant to publish detailed information on their transport operations which they regard as business secrets. Moreover, rail infrastructure managers often only have data on the rail network under their responsibility which mostly means inside national borders. Therefore they do not necessarily know what happens with the wagons after crossing the border, and information on origin and/or destination have to be gathered from other sources.

Not only the survey method, but also the survey period differs from country to country: The CAFT survey was conducted in 2009 in Switzerland and Austria, while France chose 2010 as its survey period. The most recent survey in Switzerland was conducted in 2014, while Austria did it in 2015. France produced a report based on 2014 road freight transport data from Eurostat and a transport model.

The most recent CAFT survey in France, Switzerland and Austria can be summarized as follows:

- **France:** no special survey was conducted. The analysis uses an evaluation of selected data from European transport statistics (Enquête transport routier de marchandises TRM), combined with data from automatic counting stations for HGV. The Alpine crossings are determined by using transport models. There is no rail data, and the reference period is 2014.
- **Switzerland:** the survey of road freight transport was conducted by interviews on the Alpine crossings. The results are combined with data from automatic counting stations for HGV. The rail data is from a database with details of the wagon's route. The survey period is 2014.

- **Austria:** a survey of road freight transport was conducted by interviews on the Alpine crossings with a small sample. These results are combined with data from automatic counting stations. The rail data was acquired from the infrastructure manager. The survey period is 2015 and first months of 2016. The evaluation period is 2015.

As the data sources used in the CAFT survey are not always the same as those used in the framework of the “Alpine Traffic Observatory”, set up under the EU-CH Land Transport Agreement of 1999, there are differences between the results presented by the CAFT survey and those reported by the Observatory.

In France, data for the CAFT report come from the European transport statistics. Data for the Observatory come from counting devices and empirical factors and are regularly delivered by the ministry. In Austria, the differences between the CAFT survey and the Observatory results are mostly caused by the surveys not being carried out over precisely the same sections of the routes.

Direct comparison of the different CAFT surveys with each other is complicated by portions of datasets with data gaps related to specific features (e.g. datasets without information about the vehicle type). The problem is that one cannot be sure whether these data gaps are randomly distributed. In order to avoid a misleading impression of accuracy, the report displays in such cases not the absolute but the relative figures or shares. Absolute values outlined in this report are results from the individual CAFT surveys and do not necessarily conform to the values of the “Alpine Traffic Observatory”.

3 Results of CAFT 2014 (2015)

3.1 Overview

As described above, the survey methods and survey periods of the three Alpine countries France, Switzerland and Austria are different. The results of the CAFT surveys consist, on the one hand, of quantities of vehicles and goods, which can be counted automatically or derived from counts with the help of key indicators from other sources. Other information, for instance about the type of goods transported through the Alps, cannot be collected by automatic counting devices but must be gathered by other means (e.g. survey interviews). As the quantities of vehicles and goods carried across the Alps are regularly counted and published in the framework of the Alpine Traffic Observatory, the corresponding aggregate statistics derived from CAFT surveys will only be summarized in this report (chapter 3.2 to 3.4).

The main focus of the report presents the unique and diversely resolved observations specific to CAFT, like the type of goods carried, the mode, the loading weight and the routes used across the Alps (chapters 3.5 to 3.10). Though the data do not all refer to the same period (2014 or 2015, depending on the country), they are evaluated and discussed together to present a comprehensive picture of transalpine freight flows (with the exception of rail transport between France and Italy, which was not included in this survey. As this part of transalpine freight transport has a share of less than 2%, the overall picture is not distorted noticeably).

3.2 Road traffic

Summed over all the countries in the CAFT surveys, a total of more than 10 million heavy goods vehicles (HGV) crossed the Alps. The transport volume carried by the vehicles over the Alps amounts to 140 million tonnes. Table 2 and figure 2 show the breakdown by Alpine crossing.

Period		Number of HGV (in 1000)	Transport volume (in mio tonnes)	Av. loading weight (in t/HGV)
2014	Ventimiglia	1'319	19.23	14.58
	Montgenèvre	56	0.96	17.15
	Fréjus	672	10.86	16.16
	Mont Blanc	548	6.76	12.33
	Total France	2'595	37.81	14.57
2014	Gd. St. Bernhard	46	0.57	12.46
	Simplon	77	0.83	10.71
	Gotthard	758	9.25	12.19
	San Bernardino	151	1.83	12.10
	Total Switzerland	1'033	12.47	12.08
2015	Reschen	108	1.20	11.08
	Brenner	2'383	36.00	15.11
	Felbertauern	53	0.68	12.69
	Tauern	1'116	13.74	12.31
	Schoberpass	1'453	17.61	12.12
	Semmering	535	5.61	10.48
	Wechsel	1'335	15.32	11.47
Total Austria	6'984	90.15	12.91	

Table 2: Number of HGV by crossing and country

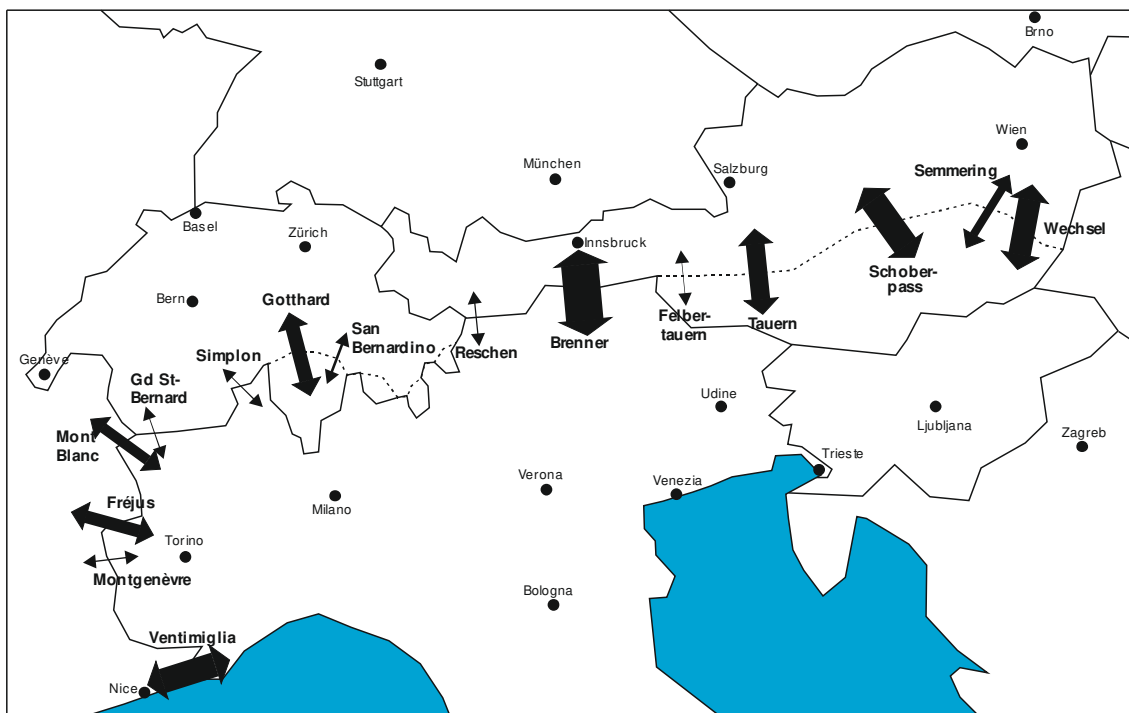


Figure 2: Transalpine HGV by crossing

Figure 2 shows the relative importance of Alpine crossings and the geographical distribution over the Alpine arc. The most important crossing in France is Ventimiglia with 51% of all HGV crossing the Alps between France and Italy. In Switzerland, Gotthard assumes 73% of the transalpine HGV's and Brenner, the most important Austrian crossing, takes over 34% of the HGV's crossing the Alps in Austria.

The average loading weight over all crossings normally ranges from 11 to 15 tonnes per HGV. Exceptions are Simplon and Semmering with 10.7 and 10.5 t/HGV, respectively. At 14.6 tonnes, the average loading weight on the French crossings is noticeably higher according to the CAFT survey of 2014. The assumption that higher vehicle loading weights may be encouraged by the lower relief of the Ventimiglia crossing is not supported by the data. In fact, the Montgenèvre, with an altitude above sea level of 1854 m, and thus not very attractive for heavy vehicles, shows the highest average load of all Alpine crossings. This indicates that the model assigning the trips to the individual crossings could not take into account the different characteristics of the crossings (road standards, elevation gains and absolute altitude) and their influence on the route choice of more or less heavy vehicles.

3.3 Rail traffic

The transport volume carried annually over the Alps on the seven rail corridors in Switzerland and Austria amounts to around 65 million tonnes, about two thirds as much as the volume transported on the road on the Swiss and Austrian crossings. In rail transport, a distinction is made between 3 different production modes: Wagon load (WL, individual wagons are combined to a train in a marshalling yard, transported together to a different yard, from where they are distributed to their final destination), unaccompanied combined transport (UCT, containers, swap bodies and semi-trailers are transported from one terminal to the other) and accompanied combined transport (ACT, whole HGV including tractor and driver are transported from one loading terminal to the other). In Switzerland, the production mode could not be determined for less than 1% of the total transport volume. Table 3 and figure 3 show the breakdown by the seven Alpine crossing, figure 4 shows the breakdown by Alpine crossing and production mode.

Period		Rail transport volume (kt)				
		Total	WL	UCT	ACT	unknown
2014	Simplon	10'519	1'830	6'921	1'712	56
	Gotthard	15'725	5'451	9'956	179	139
	Total Switzerland	26'244	7'281	16'877	1'891	195
2015	Brenner	13'805	2'948	7'253	3'605	-
	Tauern	11'516	6'264	5'087	165	-
	Schoberpass	4'363	3'505	375	483	-
	Semmering	11'743	9'823	1'921	-	-
	Wechsel	-	-	-	-	-
	Total Austria	41'428	22'540	14'636	4'253	-

Table 3: Rail transport volume by crossing and production mode

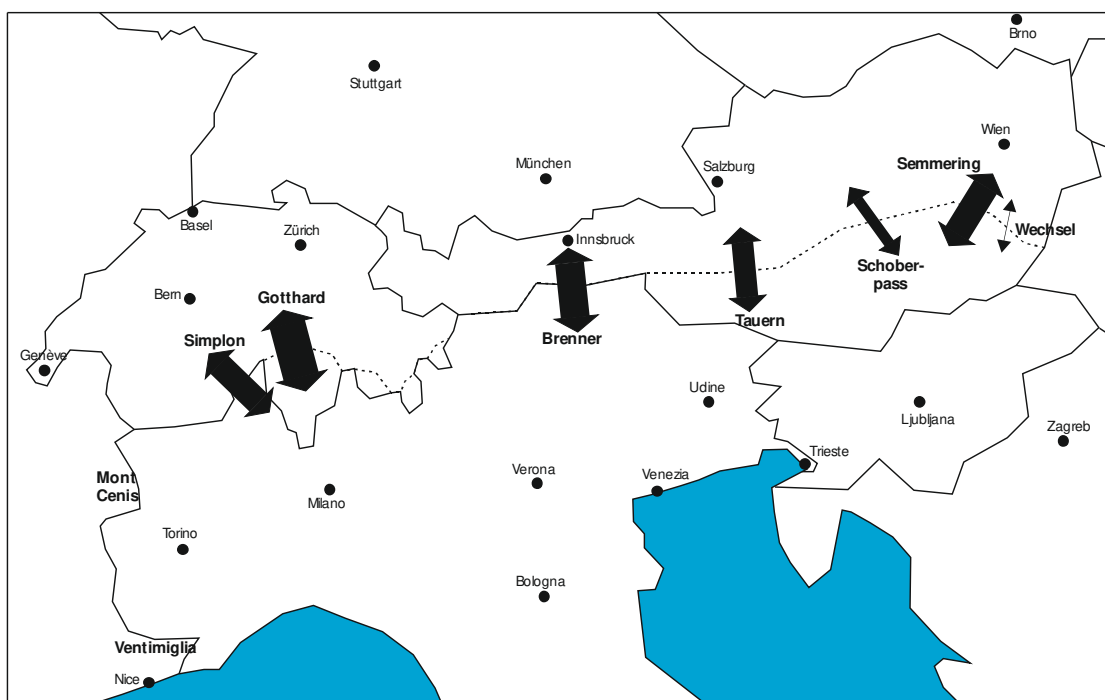


Figure 3: Transalpine rail transport volume by crossing (Switzerland and Austria)

In Switzerland the Simplon and the Gotthard corridor both take over considerable quantities (11 and 16 million tonnes) while in Austria Brenner, Semmering and Tauern each assume between 28% and 33% of Austrian transalpine rail transport.

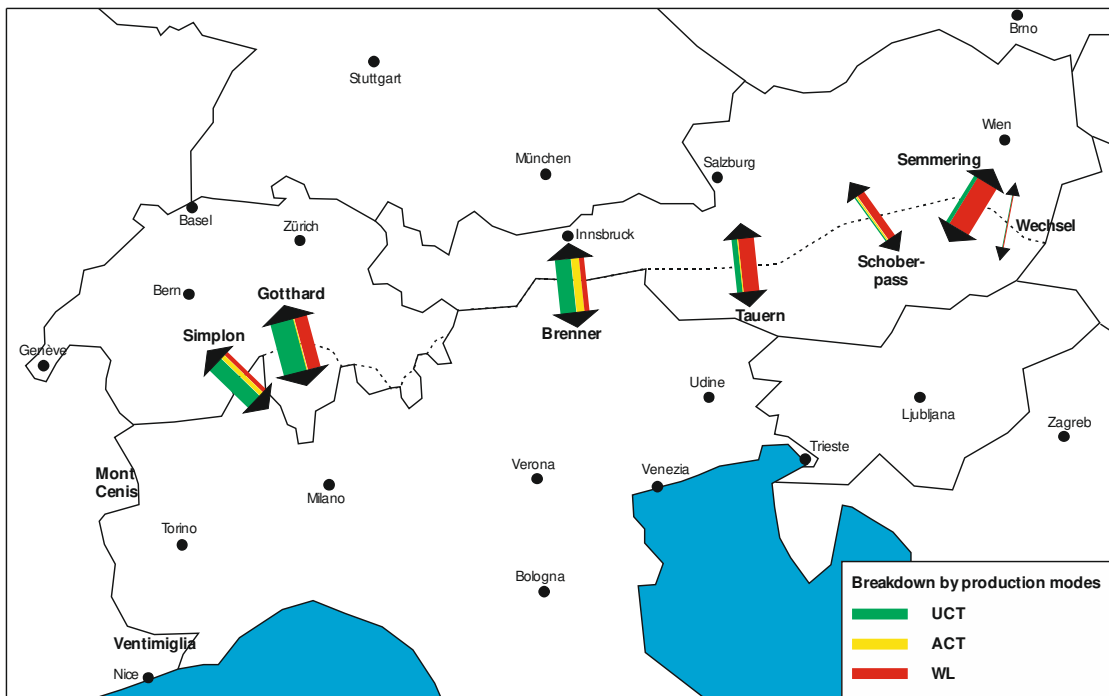


Figure 4: Transalpine rail transport volume by production mode and crossing (Switzerland and Austria)

Unaccompanied combined transport (UCT) concentrates on the crossings Gotthard, Simplon and Brenner (between 32% and 22% of the transalpine UCT through Switzerland and Austria). For wagon load (WL) the most important crossings are Semmering (33%), Tauern (21%) and Gotthard (18%). Noteworthy quantities in ACT (accompanied combined transport or "rolling motorway") are only observed on Brenner (59%) and Simplon (28%).

3.4 Modal share

The data only allow the modal share to be illustrated for Switzerland and Austria which differs strongly from one crossing to the other. Its breakdown by crossing and country is shown in table 4, with the resulting share by country illustrated in figure 5.

Period		Transport volume (in kt)		Modal share (%)	
		Road	Rail	Road	Rail
2014	Gd. St. Bernhard	567		100%	0%
	Simplon	828	10'519	7%	93%
	Gotthard	9'245	15'725	37%	63%
	San Bernardino	1'833		100%	0%
	Total Switzerland	12'473	26'244	32%	68%
2015	Reschen	1'198		100%	0%
	Brenner	35'997	13'805	72%	28%
	Felbertauern	678		100%	0%
	Tauern	13'739	11'516	54%	46%
	Schoberpass	17'611	4'363	80%	20%
	Semmering	5'606	11'743	32%	68%
	Wechsel	15'318		100%	0%
	Total Austria	90'147	41'428	69%	31%

Table 4: Modal share by crossing and country

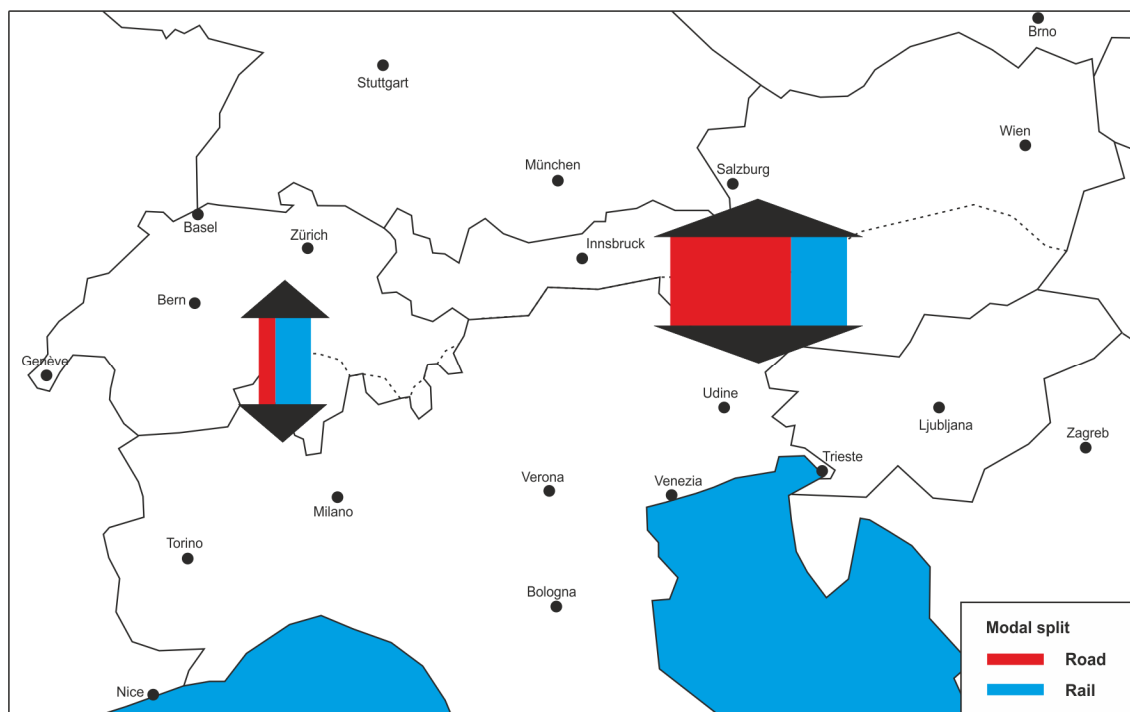


Figure 5: Transalpine modal share by country (Switzerland and Austria)

3.5 Type of vehicles

The CAFT survey supplies information on the type of vehicles. The following categories are differentiated: Lorries (without trailers), lorries with trailers, and articulated vehicles (semitrailer trucks). In France, more than one-third of the records include no information on the type of vehicle. Thus the evaluation for France is aggregated and not differentiated by crossing.

Alpine crossing / country	Share of ...		
	Lorries	Lorries with trailer	Articulated vehicles
Reschen	17.1%	6.1%	76.7%
Brenner	10.9%	7.7%	81.4%
Felbertauern	21.2%	16.3%	62.5%
Tauern	13.3%	14.0%	72.7%
Schoberpass	13.4%	15.9%	70.7%
Semmering	23.7%	15.4%	60.9%
Wechsel	19.2%	12.4%	68.4%
Austria	14.6%	12.0%	73.3%
Gd. St. Bernhard	10.4%	7.1%	82.6%
Simplon	9.6%	12.3%	78.1%
Gotthard	8.4%	19.9%	71.7%
San Bernardino	10.1%	17.6%	72.4%
Switzerland	8.8%	18.4%	72.7%
France	7.5%	6.4%	86.2%

Table 5: Type of vehicle by country and by crossing, respectively

Austria has the highest share of lorries, Switzerland the highest share of lorries with trailers, and France the highest share of articulated vehicles. In Austria, the share of lorries is especially high on smaller crossings and crossings with a high share of domestic traffic. In Switzerland, the same is true for lorries with trailers.

3.6 Type of traffic

The CAFT survey supplies information on the origin and destination of the transported goods, enabling the differentiation of the freight flows by type of transport: domestic transport, import, export and transit. As the main Alpine ridge runs on the border between France and Italy, there is no transalpine domestic transport on these crossings. In contrast, Switzerland and Austria are each divided by the Alps. As a result, domestic transport across the Alps is important within these two countries. And as the distance from one border to the other is relatively small for these two countries, the share of transit is much higher than in France. Table 6 shows the shares of the types of transport by country and mode.

Period	Country	Mode	Domestic	Import	Export	Transit
2014	France	Road	0%	35%	33%	32%
2014	Switzerland	Road	15%	18%	12%	55%
	Switzerland	Rail	7%	3%	3%	87%
2015	Austria	Road	19%	11%	13%	57%
	Austria	Rail	10%	18%	14%	58%

Table 6: Type of transport by country and mode

Since goods are normally shipped over longer distances by rail than by road, one should suppose that the transit share on rails is higher than that on the road. This is true for Switzerland where 87% of the transport volumes by rail occur in transit, while the transit share of road transport only amounts to 55%. In Austria this relationship is not observed: Here, the transit shares of rail and road are very close to one another: 58% and 57% respectively. The difference illustrates the success of the Swiss freight transfer policy which is laid down in the Swiss constitution. The reason that the overall share of domestic transport (rail and road) is higher in Austria (16%) than in Switzerland (10%) is the relative size of the southern and northern parts of both countries.

3.7 Direction of freight and vehicle flows

The CAFT survey supplies information on the direction of freight and HGV flows by crossing, by mode and by country (except for rail transport for France). Using these data it is possible to determine the balance of the direction of the freight and vehicle flows.

3.7.1 Freight flows

The transalpine freight flows are not balanced: a higher share of goods is transported (by road and rail together) from north to south (55%) than in the opposite direction (45%). Table 7 shows that the goods flows are more balanced in France than in Switzerland and in Austria.

Country	Direction	Transport volume (in 1000 tonnes)	Direction share
Austria	South	71'786	56%
Austria	North	55'516	44%
Switzerland	South	20'707	53%
Switzerland	North	18'010	47%
France	East	18'588	49%
France	West	19'152	51%
Total	South/East	111'082	55%
Total	North/West	92'677	45%

Table 7: Direction of goods flow by country (all modes)

3.7.2 Vehicle flows

As might be expected, the transalpine vehicle flow is almost balanced: normally all vehicles return to their starting point. Table 8 shows that Austrian crossings are used a little bit more often for the southward journey while for the northward journey French crossings are somewhat more popular.

Country	Direction	Number of HGV (in 1000)	Direction share
Austria	South	3'614	52%
Austria	North	3'370	48%
Switzerland	South	504	49%
Switzerland	North	529	51%
France	East	1'230	47%
France	West	1'361	53%
Total	South/East	5'348	50%
Total	North/West	5'259	50%

Table 8: Direction of vehicle flow by country

Due not only to the unbalanced goods flows, but also for technical reasons – special vehicles cannot be used for every type of transport or every type of goods – there is always a certain number of empty trips. The share of empty vehicles is not evenly distributed over the different Alpine crossings and journey directions. Table 9 shows the share of empty vehicles for the most important crossings (more than 4% of the total HGV) and the three countries.

Crossing or country	Share of transalpine HGV	Share of empty HGV by direction	
		South/East	North/West
Ventimiglia	12%	10%	3%
Fréjus	6%	6%	3%
Mont Blanc	5%	8%	22%
Gotthard	7%	15%	8%
Brenner	22%	6%	5%
Tauern	11%	9%	8%
Schoberpass	14%	12%	15%
Semmering	5%	23%	26%
Wechsel	13%	15%	17%
Total important crossings	95%	10%	10%
Austria	66%	11%	12%
Switzerland	10%	20%	8%
France	24%	9%	7%
Total	100%	11%	10%

Table 9: Share of empty vehicles by crossing and direction

The share of empty vehicles is more balanced by direction on the Austrian crossings. Meanwhile, in Switzerland as a whole, as well as over the important Swiss and French crossings, one direction is predominant for empty journeys. It cannot be excluded that the high share of empty trips at Mont Blanc is connected with the imperfection of the traffic model. In Austria the Semmering presents an above-average share of empty vehicles in both directions. This may partly be explained by the fact that the Semmering route is not a continuous motorway over the entire length, and on a 25 km long section there is a driving ban for vehicles over 7.5 tonnes (smaller vehicles are used more often in regional transport where the share of empty trips is higher).

3.8 Country of registration of HGV in transalpine traffic

Whereas twenty years ago transalpine transport used to be assumed mostly by carriers from the Alpine countries, today it is an international business. Vehicles registered in the countries bordering the main Alpine ridge are still the most important group. The overall share of vehicles registered in France, Switzerland, Austria and Italy is higher than 40%, but vehicles from countries of Central and Eastern Europe and from the Balkan countries are especially numerous on the Alpine crossings (their overall shares are 20% and 19% respectively; the share in Austria is 24% for each group).

Group of countries	Country Code	All Alpine crossings		Crossings FR		Crossings CH		Crossings AT	
		Number of HGV	Share	Number of HGV	Share	Number of HGV	Share	Number of HGV	Share
Countries directly adjacent to main Alpine ridge	AT	1'901'808	17.9%	13'594	0.5%	13'212	1.3%	1'875'002	26.8%
	CH	327'369	3.1%	3'497	0.1%	308'978	30.3%	14'894	0.2%
	FR	695'390	6.6%	683'062	26.3%	10'482	1.0%	1'846	0.0%
	IT	1'467'638	13.8%	745'454	28.7%	250'223	24.5%	471'962	6.8%
Other Northern or Western Europe countries	DE	622'657	5.9%	10'590	0.4%	81'753	8.0%	530'314	7.6%
	ES	455'127	4.3%	417'188	16.1%	2'112	0.2%	35'827	0.5%
	NL	143'182	1.4%	23'769	0.9%	36'671	3.6%	82'742	1.2%
	PT	54'920	0.5%	47'444	1.8%	1'871	0.2%	5'606	0.1%
	other	133'688	1.3%	34'131	1.3%	22'490	2.2%	77'067	1.1%
Central and Eastern Europe countries	CZ	473'325	4.5%	26'276	1.0%	23'146	2.3%	423'903	6.1%
	HU	421'881	4.0%	80'112	3.1%	19'812	1.9%	321'958	4.6%
	PL	795'293	7.5%	94'224	3.6%	62'167	6.1%	638'902	9.1%
	SK	419'626	4.0%	73'551	2.8%	45'995	4.5%	300'079	4.3%
Balkan countries	BA	79'321	0.7%	0	0.0%	1'233	0.1%	78'088	1.1%
	BG	199'010	1.9%	36'926	1.4%	16'837	1.7%	145'247	2.1%
	HR	340'330	3.2%	15'786	0.6%	1'784	0.2%	322'760	4.6%
	RO	495'236	4.7%	115'147	4.4%	63'378	6.2%	316'710	4.5%
	SI	791'516	7.5%	74'811	2.9%	9'407	0.9%	707'298	10.1%
other	75'189	0.7%	0	0.0%	4'503	0.4%	70'686	1.0%	
Former Soviet Union	EE	62'431	0.6%	25'617	1.0%	2'644	0.3%	34'171	0.5%
	LT	333'338	3.1%	58'429	2.3%	35'521	3.5%	239'388	3.4%
	LV	59'167	0.6%	15'309	0.6%	1'938	0.2%	41'921	0.6%
	other	44'862	0.4%	0	0.0%	1'100	0.1%	43'762	0.6%
Other countries		206'433	1.9%	0	0.0%	2'834	0.3%	203'599	2.9%

Table 10: Country of registration of HGV by country of Alpine crossing

For the Alpine crossings in Switzerland and Austria, there is a pattern that the proportion of foreign-registered vehicles is higher when the crossings are on the border to Italy than when they are inside the country.

Registration of vehicles	Alpine crossings Switzerland		Alpine crossings Austria	
	on the border	in the interior	on the border	in the interior
National territory	21%	31%	8%	37%
Foreign countries	79%	69%	92%	63%

Table 11: Country of registration of HGV according to location of Alpine crossing

When interpreting these figures it must be considered that the crossings on the border in Switzerland (Gd St-Bernard and Simplon) are much less important than those in the interior (Gotthard and San Bernardino) in terms of volume. This is not the case in Austria, where the most important Alpine crossing for road transport (Brenner) is situated on the border.

3.9 Relations

Information about the relations of freight traffic (origin - destination) is only available from the CAFT surveys. Therefore, this subject is presented in more detail in this report. Because there are no data on rail transport supplied in the framework of CAFT survey for France, the two rail crossings of Mont Cenis and Ventimiglia are not described.

3.9.1 Main relations per Alpine crossing

For the detailed presentation of freight flows the neighbouring countries were divided into smaller geographical units, and the other countries partly aggregated to bigger units. The corresponding definition of regions is shown in appendix 1. These so called "CAFT-regions" are involved to quite different degrees in freight transport across the Alps. In the following figures, the freight flows are shown for each crossing and mode separately (in the case of France, there are only results for the road crossings). CAFT-regions which contribute less than 1% to the origin or destination of a given freight flow over a crossing are not displayed.

Ventimiglia Road



Figure 6: Share of origin and destination regions of freight traffic on the road in Ventimiglia

Around 19 million tonnes of goods are carried by road across the border between France and Italy at Ventimiglia. On the west side of this crossing, more than half of the transport volume has its origin or destination in Spain and more than 40% in the adjacent CAFT-region of France (which consists of the French region Provence-Alpes-Côte d'Azur (PACA) and the former region of Languedoc-Roussillon, now part of Occitanie). On the east side, more than 80% has its origin or destination in Italy (mostly in Lombardia), but nearly 20% goes farther to other countries or comes from there.

Montgenèvre Road



Figure 7: Share of origin and destination regions of freight traffic on the road in Montgenèvre

The traffic model is less precise for crossings with smaller sample sizes. Thus the results for Montgenèvre must be interpreted with caution. Depending on the data source, between half a million and one million tonnes of goods are carried by road across the Montgenèvre. On the west side of the crossing, the majority of the transport volume has its origin or destination in France, with another important share coming from or going to Spain (the exact size of which being debatable though). On the east side, most of the traffic has its origin or destination in Italy (Piemonte being the most important region). In sum, Montgenèvre serves mostly local traffic between the adjacent regions; long-distance transport is a smaller share of traffic here than in Ventimiglia.

Fréjus Road



Figure 8: Share of origin and destination regions of freight traffic on the road at Fréjus tunnel

Around 11 million tonnes of goods are carried by road through the Fréjus tunnel. This road crossing is too far north for traffic to or from Spain, but on the west side, about 7% of the transport volume has its origin or destination in the United Kingdom or in Benelux countries. On the east side, the share of transport volume not going to or coming from Italy is very low. Fréjus serves mostly the exchange between France and Northern Italy, more than three quarters from or to Piemonte and Lombardia.

Mont Blanc Road



Figure 9: Share of origin and destination regions of freight traffic on the road at Mont Blanc tunnel

Almost 7 million tonnes of goods are carried through the Mont Blanc tunnel. The freight flows at this tunnel are roughly comparable to those of Fréjus, but on the west side of this crossing, the share of Switzerland as origin or destination is astonishingly high (almost 25%). This could be traffic between Western Switzerland and Piemonte/Lombardia during winter, when the Simplon is often closed due to bad road conditions.

Grand St-Bernard Road



Figure 10: Share of origin and destination regions of freight traffic on the road at Gd St-Bernard

The Grand St. Bernard is a minor Alpine road crossing with an annual volume of around half a million tonnes. On the north side of this crossing, more than half of the transport volume has its origin and destination in Switzerland while Benelux and several regions in Germany each show a share of between 15% and 20%. On the south side, practically all goods flows come from or go to Italy, mostly Piemonte and the Aosta valley.

Simplon Road



Figure 11: Share of origin and destination regions of freight traffic on the road at Simplon

Around 1 million tonnes of goods are carried by road across the Simplon pass. On the north side of this crossing, more than 80% of the transport volume has its origin or destination in Switzerland, the other important region is the Benelux countries. On the south side, freight flows not going to or coming from Italy are less than 5% of the total. Summing up, Simplon serves mostly the exchange between Switzerland and Northern Italy.

Simplon Rail



Figure 12: Share of origin and destination regions of freight traffic on rail at Simplon

Around 11 million tonnes of goods are carried through the Simplon rail tunnel. The split of the origin or destination regions north of this crossing differs quite a lot from that of the road: about half of the transport volume comes from or goes to the Benelux countries and about 30% from or to Germany. On the south side, the freight flows are more concentrated in fewer regions, essentially in northern Italy. Here, as well as on the Gotthard rail crossing (figure 14), and less pronounced on the Gotthard road crossing (figure 13), the freight flow almost follows the Rhine – Alpine corridor.

Gotthard Road



Figure 13: Share of origin and destination regions of freight traffic on the road at Gotthard

Around 9 million tonnes of goods are carried through the Gotthard road tunnel. On the north side of this crossing, the origin or destination regions are divided as follows: Switzerland (about 40%), Germany (more than 20%), Benelux (less than 20%), France and Great Britain (each a bit less than 10%). On the south side, more than 80% has its origin or destination in Italy and about 20% in the southern part of Switzerland (Ticino and Moesa).

Gotthard Rail



Figure 14: Share of origin and destination regions of freight traffic on rail at Gotthard

The Gotthard rail tunnel assumes almost 16 million tonnes of goods (*note: volumes here still refer to the "old" tunnel, not to the base tunnel*). Like on the Simplon crossing, the origin and destination regions for the rail mode on the north side are farther from the crossing than those for road transport: more than 40% of the transport volume comes from or goes to Germany, and more than 30% from or to the Benelux countries. On the south side, the freight flows are more concentrated on Lombardia (about two thirds). The share originating or terminating in the southern part of Switzerland is less than 15%.

San Bernardino Road



Figure 15: Share of origin and destination regions of freight traffic on the road at San Bernardino

Around 1.8 million tonnes are carried over the San Bernardino pass. At first glance, the freight flows look quite similar to those of the Gotthard road crossing, but on the north side, Benelux and Great Britain are much less represented, and Germany much more. On the south side of this crossing, the differences are much smaller (for example the share of Lombardia at San Bernardino is 50%, and at Gotthard 45%; the share of southern Switzerland is 22% here and 19% at the Gotthard). This can be explained by the fact that the southern access is the same for both crossings.

Reschen Road



Figure 16: Share of origin and destination regions of freight traffic on the road at Reschen

Around 1.2 million tonnes of goods are carried over the Reschen pass. The catchment area of this crossing is smaller than that of the more important ones: on the north, a bit more than 40% of the transport volume comes from or goes to Germany (mostly southern parts) and about 40% from or to western Austria (Tyrol and Vorarlberg). On the south side of this crossing, the origins and destinations of the freight flows are very much concentrated on the adjacent provinces of Italy (i.e. Alto Adige (Southern Tyrol) and Trento).

Brenner Road



Figure 17: Share of origin and destination regions of freight traffic on the road at Brenner

Around 36 million tonnes of goods are carried by road across the Brenner, which makes it by far the most important Alpine road crossing. Compared to Reschen, which serves mostly local traffic, the catchment area of Brenner is vast and it is more widely branched than Gotthard. In the north, nearly 60% of the transport volume has its origin or destination in Germany, but it is spread over more different regions. Scandinavia, Poland and Great Britain together account for more than 10% of the transport volume. In the south, less than 3% goes or comes to or from other countries than Italy.

Brenner Rail



Figure 18: Share of origin and destination regions of freight traffic on rail at Brenner

Almost 14 million tonnes of goods are carried by rail across the Brenner. Compared to the road, the origin or destination regions of the goods transported by rail are much more concentrated in the north as well as in the south, in contrast to the Swiss crossings, where the catchment area for rail is more expanded than that for trips by road.

Felbertauern Road



Figure 19: Share of origin and destination regions of freight traffic on the road at Felbertauern

Around 700,000 tonnes of goods are carried through the Felbertauern tunnel. As for other less important Alpine crossings, the catchment area of Felbertauern is smaller than for crossings with more traffic. In the north, Austria's share is close to 80% (Tyrol alone more than 40%). In the south the share of Austrian traffic is about the same, with East Tyrol alone accounting for about 70% of traffic generation.

Tauern Road



Figure 20: Share of origin and destination regions of freight traffic on the road at Tauern

Around 14 million tonnes of goods are carried by road across the Tauern. In the north, a bit less than half of the transport volume has its origin or destination in Germany, about a quarter in Austria. In the south, the share of the Balkans (Slovenia, Croatia and southern Balkans) exceeds that of Italy. The southern parts of Austria (Carinthia and Styria) have a share of about a quarter.

Tauern Rail



Figure 21: Share of origin and destination regions of freight traffic on rail at Tauern

Some 11 million tonnes of goods are carried by rail across the Tauern. As for the Brenner, the catchment area of the rail connection across the Tauern is smaller than that of the road link. The shares of the different countries do not vary greatly, but they are more concentrated on fewer regions.

Schoberpass Road



Figure 22: Share of origin and destination regions of freight traffic on the road at Schoberpass

More than 17 million tonnes of goods are carried by road across the Schoberpass. In the north, around 40% of the transport volume has its origin or destination in Austria, and about 30% in Germany. In the south, nearly two thirds of the transport volume comes from or goes to Austria (Carinthia and Styria), the rest is underway almost exclusively from or to the Balkans.

Schoberpass Rail



Figure 23: Share of origin and destination regions of freight traffic on rail at Schoberpass

Around 4.4 million tonnes of goods are carried by rail across the Schoberpass. In the north, more than half of the transport volume has its origin or destination in Germany (mostly in North Rhine-Westphalia which is one of the most important senders and receivers in transalpine rail transport and has good rail connections to southern Austria) and about 20% in Austria. In the south, more than 80% of the transport volume comes from or goes to Austria (Carinthia and Styria), the rest runs almost exclusively from or to the Balkans. The comparison with the road shows no extreme differences in the geographical distribution except for the concentration of rail freight flows in North Rhine-Westphalia.

Semmering Road



Figure 24: Share of origin and destination regions of freight traffic on the road at Semmering

Around 5.5 million tonnes of goods are carried by road across the Semmering. Figure 24 shows that the road crossing of Semmering mainly serves the purposes of Austrian domestic transport: In the north its proportion is three-quarters, in the south more than 90%. But relative to all Alpine crossings described above, traffic to and from the countries of the former “Eastern Bloc” (Poland, Czech Republic, former SU, Slovakia and Hungary) makes up a larger proportion of the volume (however in absolute terms, the Brenner road crossing has more traffic to or from these countries).

Semmering Rail



Figure 25: Share of origin and destination regions of freight traffic on rail at Semmering

Almost 12 million tonnes of goods are carried by rail across the Semmering. As for the road, the rail crossing of Semmering is also important for domestic transport in Austria, but to a lesser extent: In the north its proportion is near 40%, in the south about 50%. But in contrast to the road, the importance of the traffic to and from the countries of the former Eastern Bloc plays a much bigger role: its share north of the crossing is more than 60%. In the south, the share of Italy is only slightly larger than that of the Balkans. Here, as well as on the Wechsel road crossing (figure 26), and less pronounced on the Semmering road crossing (figure 24), the freight flow roughly aligns with the Baltic-Adriatic TEN-T core network corridor.

Wechsel Road



Figure 26: Share of origin and destination regions of freight traffic on the road at Wechsel

Around 15 million tonnes of goods are carried by road across the Wechsel. This crossing serves primarily the purposes of Austrian domestic transport: In the north half of all goods originate in or go to Austria; in the south more than one-third. As for the rail connection at Semmering, the traffic to and from the countries in Central and Eastern Europe is important: their share in the north is 50%. In the south, the share of Italy is substantially higher than that of the Balkans.

3.9.2 Use of different Alpine crossings for important transalpine relations

Goods transport via different Alpine crossings has been analysed for six quantitatively important relations between aggregated CAFT-regions (cf. appendix 1), subdivided by road and rail.

The following relations are analysed:

Northern Austria – southern Austria: transport volume 20 million tonnes

Southeast Germany - northeast Italy: transport volume 10 million tonnes

Austria - southeast Europe: transport volume 9 million tonnes

Southern and central France – northwest Italy: transport volume 8 million tonnes

Lombardia – Benelux: transport volume 7.5 million tonnes

Southern and central France – Lombardia: transport volume 7 million tonnes

Northern Austria – Southern Austria

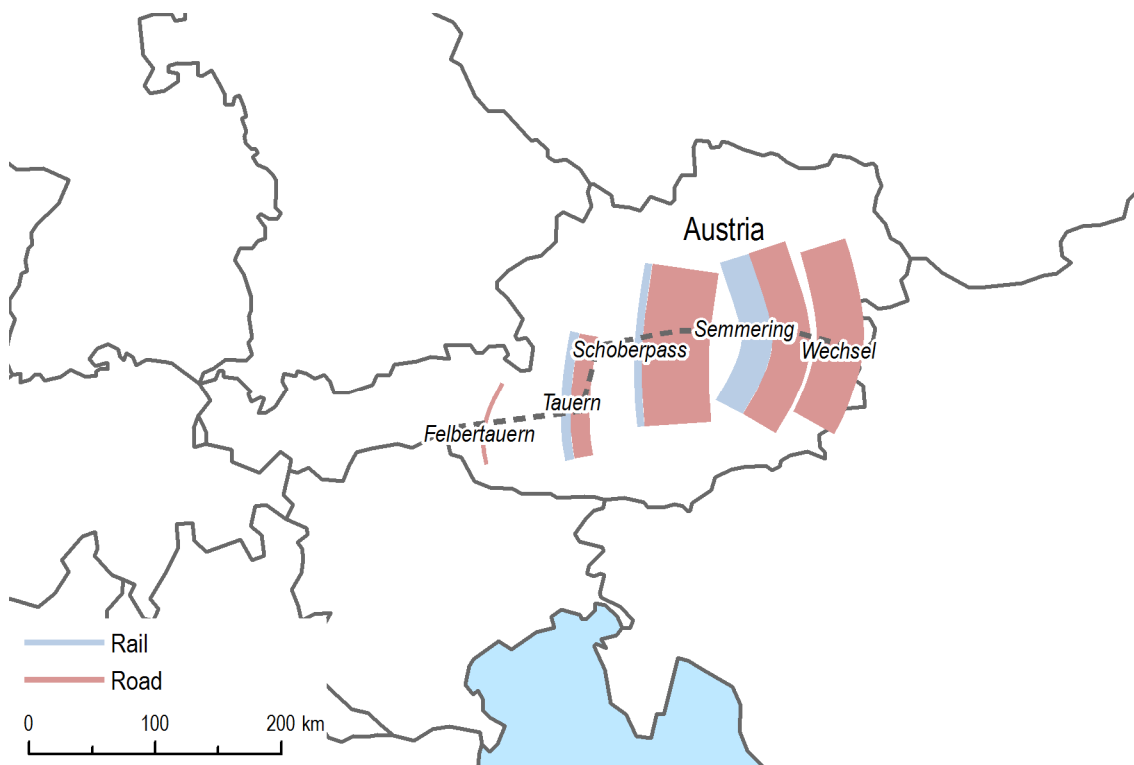


Figure 27: Alpine crossings used for transports between northern and southern Austria

The total transport volume between northern and southern Austria amounts to approximately 20 million tonnes. Austrian domestic transport accounts for more than 10% of the total transalpine transport volume. For this relation, all Austrian Alpine crossings on road and on rail are used except those situated on the border to Italy (Reschen and Brenner).

The distribution per crossing and mode is roughly the following: Felbertauern road 2%, Tauern rail 4%, Tauern road 8%, Schoberpass rail 3%, Schoberpass road 30%, Semmering rail 14%, Semmering road 17% and Wechsel road 21%.

Southeast Germany - Northeast Italy

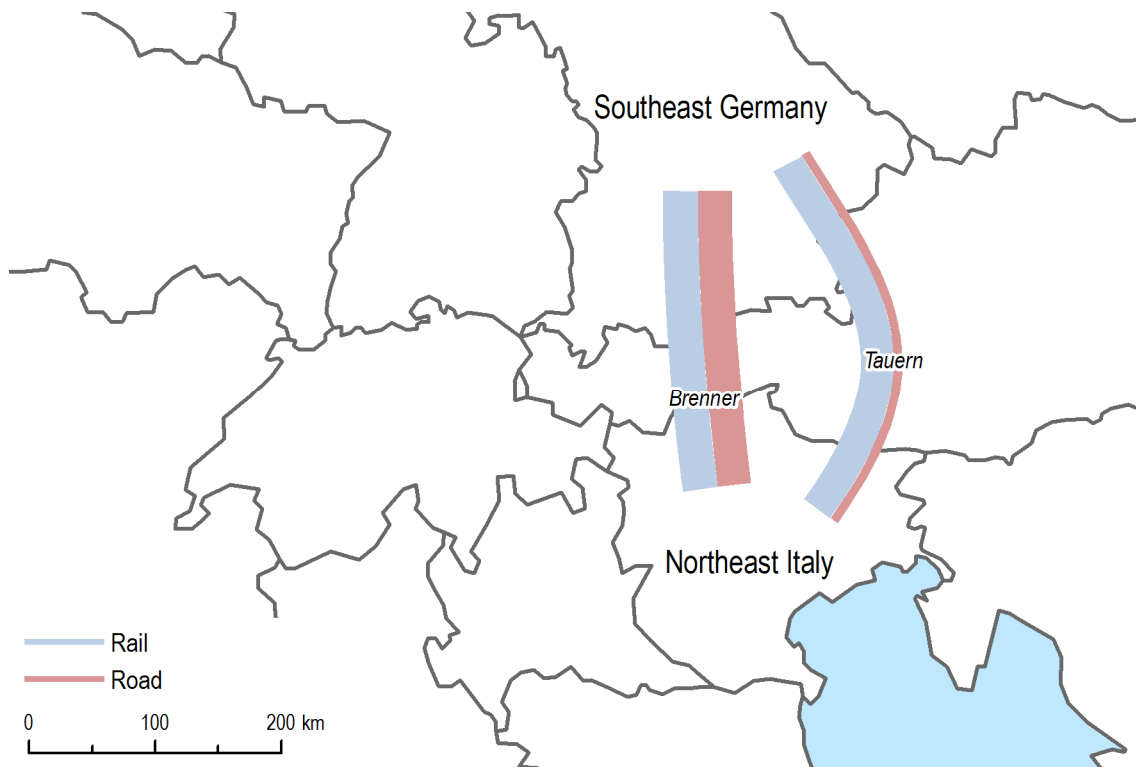


Figure 28: Alpine crossings used for transports between Southwest Germany and northeast Italy

The total transport volume between Southeast Germany and Northeast Italy amounts to approximately 10 million tonnes. This freight flow, 5% of the total transalpine transport volume, runs almost exclusively over the Austrian crossings of Brenner and Tauern. Rail is more important than road.

The distribution per crossing and mode is roughly the following: Brenner rail 31%, Brenner road 30%, Tauern rail 29% and Tauern road 8%.

Austria - Southeast Europe

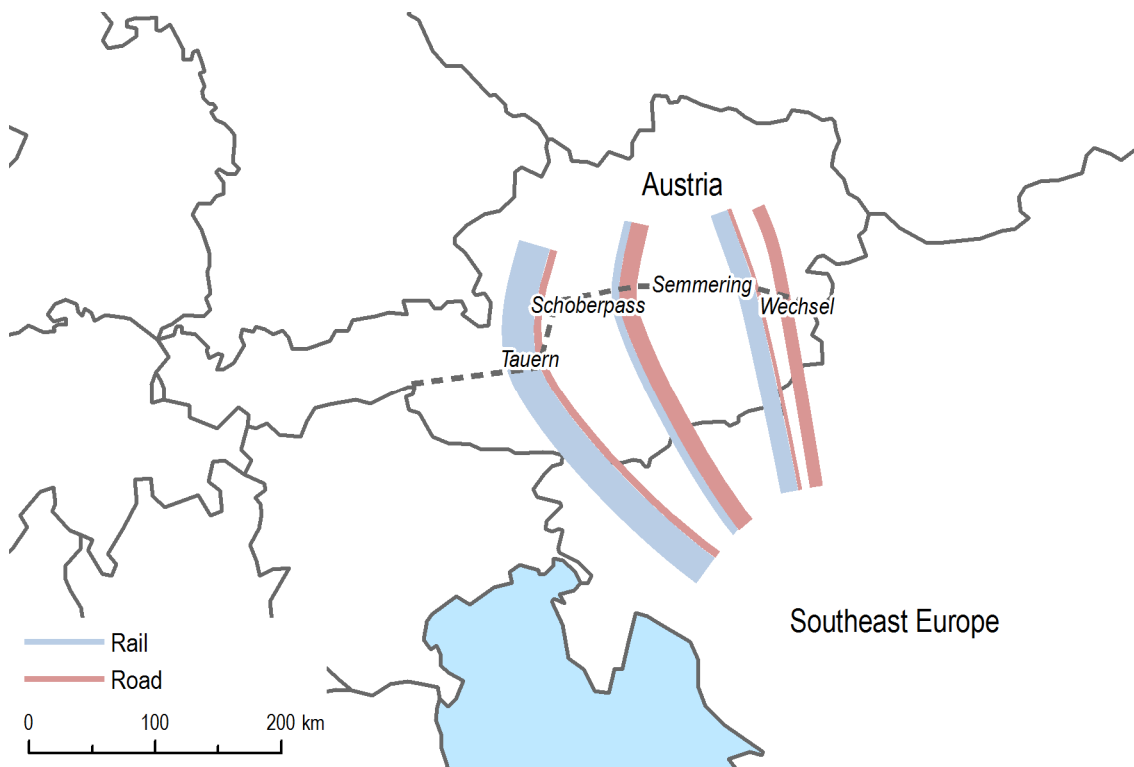


Figure 29: Alpine crossings used for transports between Austria and southeast Europe

The total transport volume between Austria and Southeast Europe amounts to approximately 9 million tonnes. This relation comprises all Austrian Alpine crossings by road and rail except Felbertauern (due to its small share) and those situated on the border to Italy (Reschen and Brenner). The relation is comparable to that between the northern and southern parts of Austria (in terms of the distribution of freight flows on several crossings), and accounts for 5% of the total transalpine transport volume.

The distribution per crossing and mode is roughly the following: Tauern rail 31%, Tauern road 8%, Schoberpass rail 7%, Schoberpass road 18%, Semmering rail 18%, Semmering road 4% and Wechsel road 14%.

Southern and central France – Northwest Italy

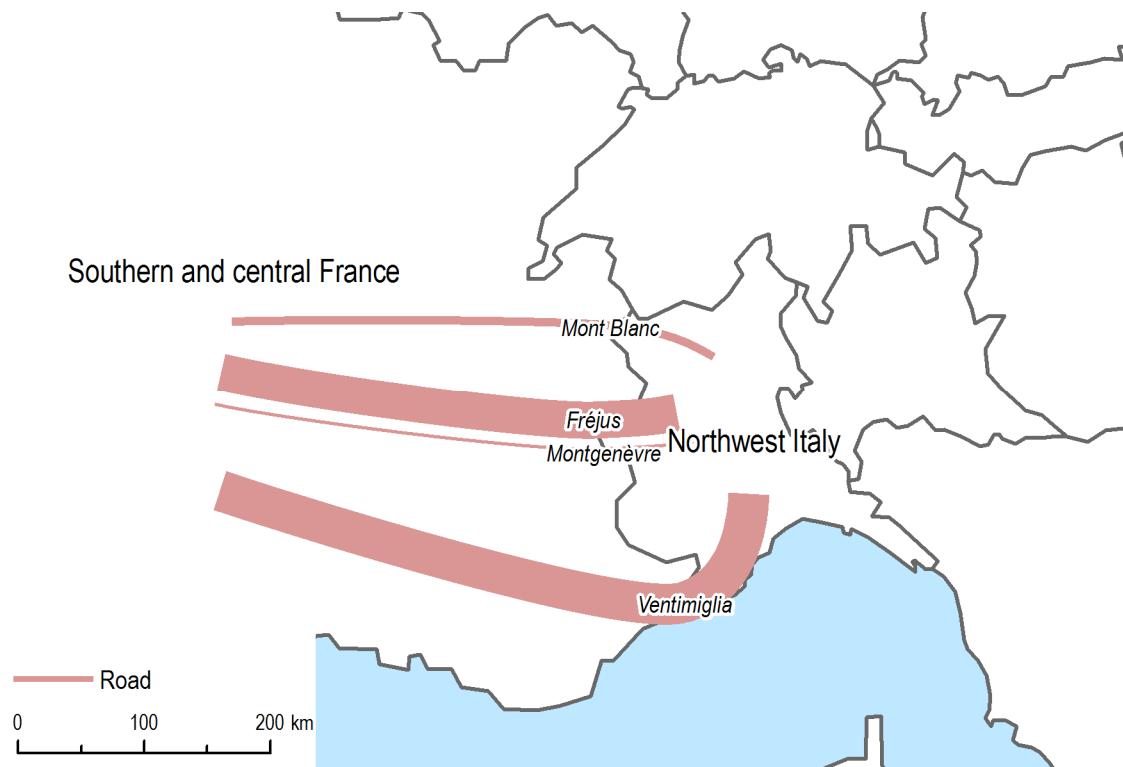


Figure 30: Alpine crossings used for transports between southern and central France and northwest Italy

The total road transport volume between Southern and central France and Northwest Italy amounts to approximately 8 million tonnes. All French – Italian Alpine road crossings are used for this relation, which accounts for 4% of the total transalpine transport volume (note that rail crossings are not analysed in the French CAFT report).

The distribution per crossing (only road transport) is roughly the following: Ventimiglia 45%, Montgenèvre 4%, Fréjus 41% and Mont Blanc 9%.

Lombardia – Benelux countries

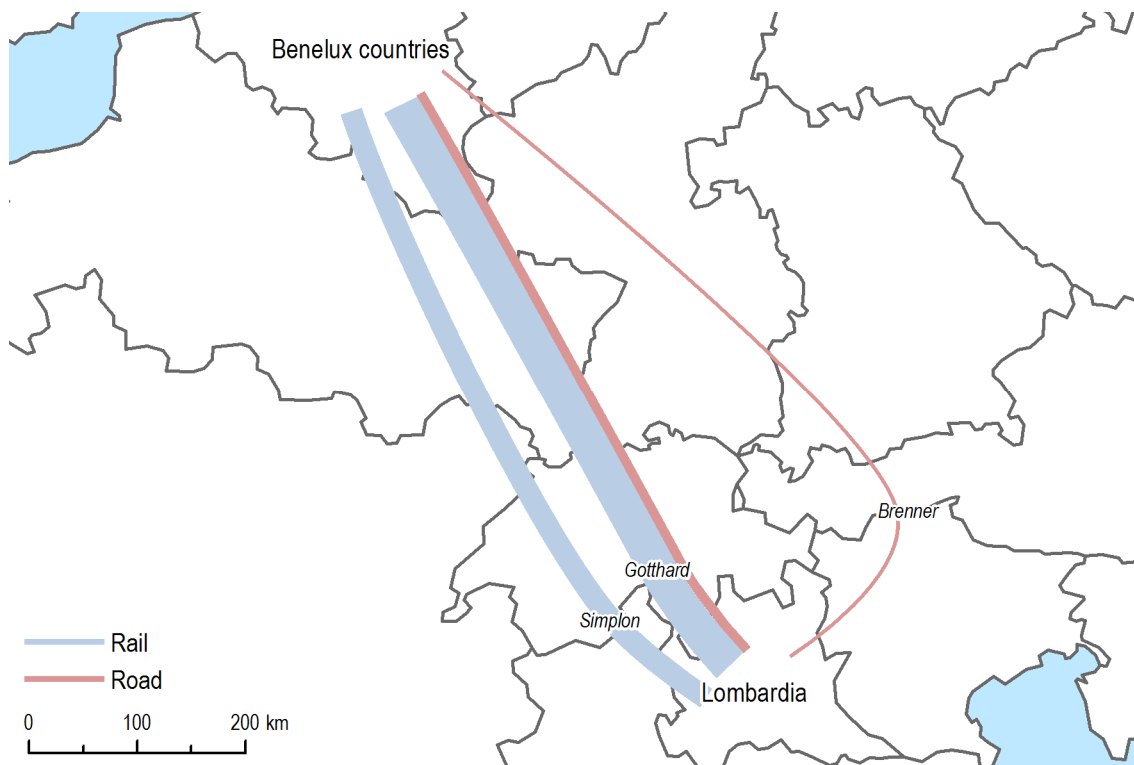


Figure 31: Alpine crossings used for transports between Lombardia and the Benelux countries

The total transport volume between Lombardia and the Benelux countries amounts to approximately 7.5 million tonnes. For this relation, which assumes 3.7% of the total transalpine transport volume, rail is much more important than the road. While rail transport uses the Gotthard and the Simplon line, road transport is concentrated mostly on Gotthard. The freight flow over the Brenner road crossing, which is less than half the volume of the flow at the Gotthard road crossing, might be deviation traffic, but this itinerary choice might also have other reasons, like partial loads from Bavaria or Austria to Lombardia or vice versa. The vast majority (nearly 95%) of the freight flow follows the Rhine-Alpine corridor.

The distribution per crossing and mode is roughly the following: Simplon rail 32%, Gotthard rail 53%, Gotthard road 14% and Brenner road 6% (about 0.4 million tonnes or 25'000 HGV).

Southern and central France – Lombardia

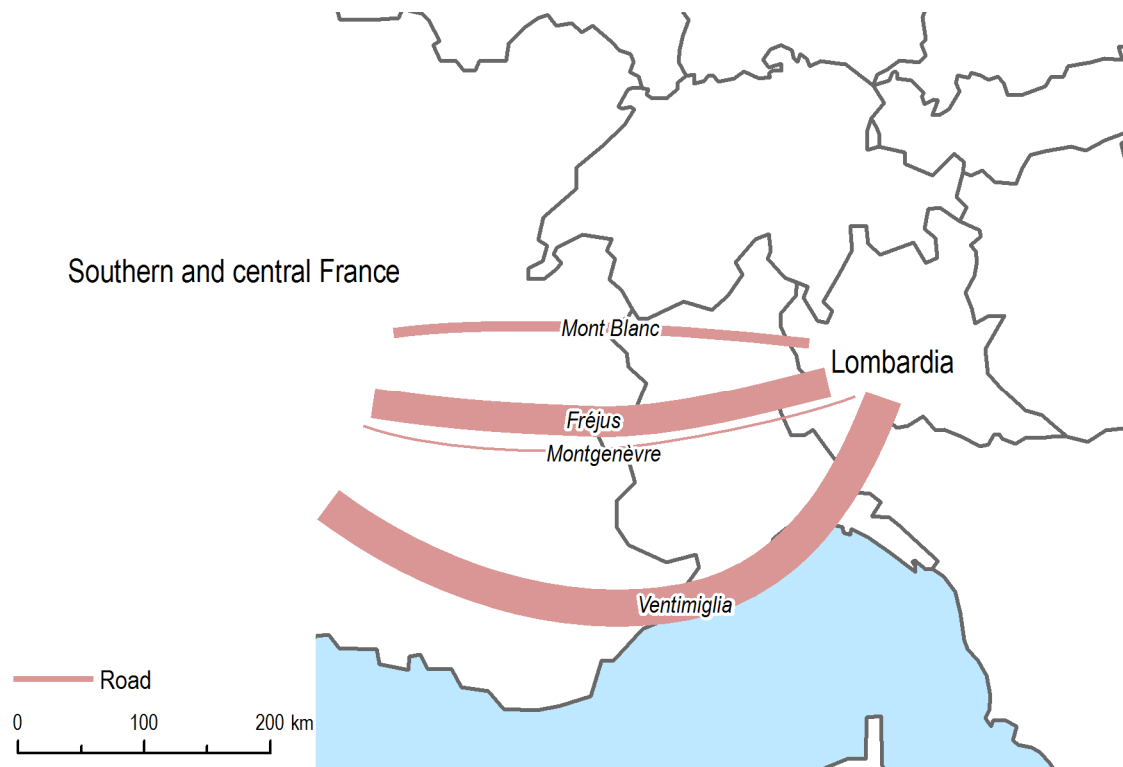


Figure 32: Alpine crossings used for transports between central and southern France and Lombardia

The total road transport volume between Southern and central France and Lombardia amounts to approximately 7 million tonnes. The distribution of the transport flows between central and southern France and Lombardia, 3.6% of the total transalpine transport volume, hardly differs from that between central and southern France and northwest Italy. Here, as well, rail crossings are not analysed. The distribution per crossing (only road transport) is roughly the following: Ventimiglia 46%, Montgenèvre 3%, Fréjus 37% and Mont Blanc 12%.

3.9.3 Modal share of important relations

In chapter 3.9.2, there are already a few remarks about the share of road or rail. This section analyses the modal split by country relations. On the two domestic relations between the northern and the southern parts of Switzerland and Austria, respectively, the modal share is quite different. While rail transport has a share of a bit more than 20% in Austria, this proportion amounts to 50% in Switzerland.

Other country relations have the following shares of rail transport:

- Benelux – Italy: 64%
- Germany – Italy: 44%
- Germany – southern Austria: 34%
- Northern Austria – Italy: 27%
- Northern Switzerland – Italy: 26%

The well-known trend: *“the longer the distance, the higher the share of rail”* is confirmed in transalpine transport.

3.10 Type of goods

3.10.1 Share of goods categories in transalpine transport

The CAFT survey also collects information on the type of goods carried across the Alps. There are some caveats: the information about the type of goods is less well-known by the drivers or operators. Goods in containers are very often only declared as “unknown goods in containers”.

The type of goods transported across the Alps is recorded in 20 groups according to standard goods classification for transport statistics (NST 2007). The full names of these groups of goods can be found in appendix 2, which also shows the aggregation into the 7 groups, which are used in the framework of CAFT. Table 12 gives an overview of the transport volumes of each goods category for 2014/15 and its share.

NST2007	Name	in mio tonnes	Share
01	Agricultural products	16.5	8.1%
02	Petroleum and natural gas	1.9	0.9%
03	Metal ores	9.8	4.8%
04	Food products	24.7	12.1%
05	Textiles	2.4	1.2%
06	Wood products	15.0	7.4%
07	Refined petroleum products	5.7	2.8%
08	Chemicals	13.5	6.6%
09	Mineral products	10.8	5.3%
10	Metal products	22.8	11.2%
11	Machinery and equipment	6.2	3.1%
12	Transport equipment	9.7	4.8%
13	Other manufactured goods	2.6	1.3%
14	Secondary raw materials and wastes	4.8	2.3%
15	Mail, parcels	1.2	0.6%
16	Transport equipment and material	2.8	1.4%
17	Household removal	0.5	0.2%
18	Grouped goods	11.6	5.7%
19	Unidentifiable goods	38.5	18.9%
20	Other goods	2.8	1.4%
	All goods	203.8	100.0%

Table 12: Type of goods transported across the Alps (NST2007)

Table 12 shows that the share of goods which are not specified (groups 18, 19 and 20) is more than one quarter of the total. More than one third of the rest of the transport volume is assigned to three categories. Six categories have a share of less than 2% each.

Aggregated into seven main groups (see appendix 2), the freight transported across the Alps is composed as illustrated in figure 33

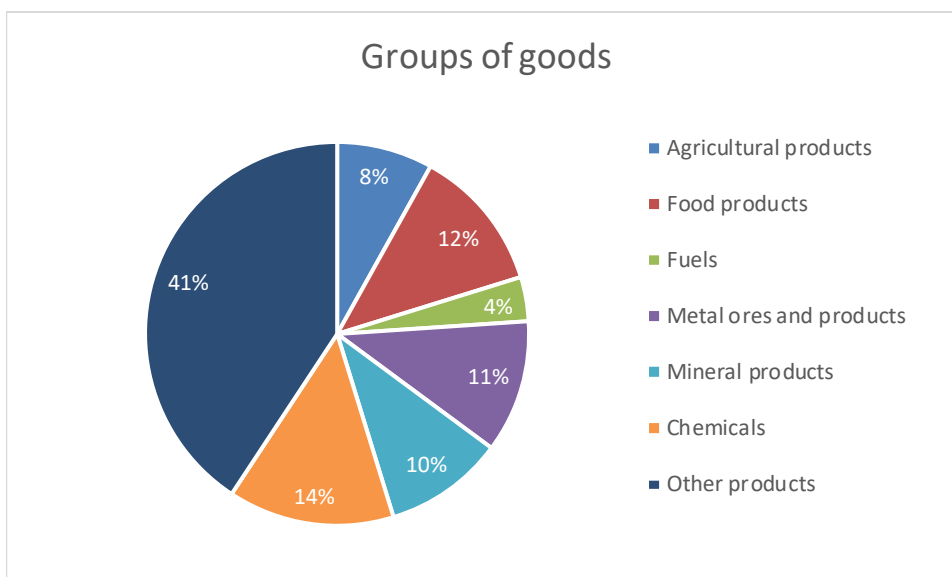


Figure 33: Groups of goods transported across the Alps

3.10.2 Modal share by goods categories

As rail data for the French crossings are not available in the framework of the CAFT survey, it is not possible to give total values of the modal share by goods categories for the entire Alpine arc. Instead, we have evaluated the modal share by aggregated goods categories for transalpine transport operations between Germany and Italy.

Designation of group of goods	Volume of goods (in mio tonnes)	Rail share
Food products	7.1	5%
Agricultural products	2.4	6%
Fuels	0.3	14%
Chemicals	6.6	23%
Metal ores and products	5.0	29%
Mineral products	2.9	38%
Other products	28.8	76%
All goods	53.2	50%

Table 13: Modal share for transports Germany – Italy by type of goods

As the biggest group of goods covers more than half of the total, it is not possible to determine which goods are the most «rail-oriented». One thing is clear and explains the high share of rail in this group: goods in containers, which can very often not be attributed to a specific goods category and thus are assigned to “other products”, very often use rail as their transport mode. On the other hand, it can be concluded that agricultural and food products are primarily “road-oriented”, most probably because they are time-sensitive or need cooling or refrigerating on their journey.

4 Development since last CAFT survey

In Switzerland and Austria, the last CAFT survey before those of 2014 and 2015, respectively, took place in 2009. The French publication mentioned in footnote 3 on page 1 compares the results of 2014 with those of the “Transit survey” of 2010 which is already based on the data of Eurostat. In this section, however, we compare the French results of 2014 with those of the French CAFT survey of 2009 (which differ to some extent from those of the Transit survey of 2010). The methodological change in France between 2009 and 2010 makes comparisons more difficult though. With all this in mind, in this chapter the results from 2014 and 2015 are compared with the data from 2009.

2009 was a special year: After a long period of more or less constant growth the economic crisis in Europe led to a drastic decrease of GDP and to an even more drastic decrease in transalpine transport activity. When comparing the growth rates of Austria with those of France and Switzerland, the general increase in transport volume by +2% between 2014 and 2015 must be considered.

4.1 Road traffic

Table 14 gives the percentage change by crossing for the key figures already used in chapter 3.2 (number of HGV, transport volume and average load).

Period		number of HGV (in 1000)	transport volume (in mio tonnes)	Av. loading weight (in t/HGV)
2009/2014	Ventimiglia *)	6%	9%	3%
	Montgenèvre *)	4%	69%	62%
	Fréjus *)	-1%	5%	6%
	Mont Blanc *)	0%	-19%	-20%
	Total France *)	3%	3%	0%
2009/2014	Gd. St. Bernhard	0%	11%	11%
	Simplon	13%	12%	-1%
	Gotthard	-16%	-10%	7%
	San Bernardino	-9%	-3%	6%
	Total Switzerland	-12%	-7%	7%
2009/2015	Reschen	11%	3%	-7%
	Brenner	35%	38%	2%
	Felbertauern	-13%	-1%	14%
	Tauern	20%	8%	-10%
	Schoberpass	18%	23%	5%
	Semmering	24%	18%	-5%
	Wechsel	32%	47%	11%
	Total Austria	26%	29%	2%

Table 14: Percentage change of transalpine road transport between CAFT surveys

*) in France, the changes between 2009 and 2014 reflect a comparison between CAFT 2009 data and Transit 2014 data (no specific CAFT survey was carried out in 2014) and are influenced by a methodological change.

Regarding the figures per country, the number of HGV and the transport volume have developed almost at the same rate in France and in Austria which means virtually no change in the average loading weight of the vehicles. Only in Switzerland can a moderate increase in the load factor be observed. The case of the load factor in France has already been discussed in chapter 3.2. Whether the relatively high growth rates on the important crossings Brenner, Wechsel and Semmering are due to the relatively low size of the sample or whether they have specific reasons related to the generation and routing of transalpine goods transport is not clear at this stage.

The above-average growth of the easternmost crossings in Austria can be explained by the intensified exchange of goods after the EU's eastern enlargement in 2007. However, the highest growth rate is registered on the Brenner, which accounts for almost 40% of the whole transport volume carried across the Austrian Alps by road in 2015.

4.2 Rail traffic

Table 15 shows the percentage change by crossing and production mode. The quantitatively insignificant category "unknown production mode" in Switzerland (see chapter 3.3) is not considered.

Period		Rail transport volume (kt)			
		Total	WL	UCT	ACT
2009/2014	Simplon	14%	-29%	37%	8%
	Gotthard	35%	43%	31%	4%
	Total Switzerland	26%	14%	33%	8%
2009/2015	Brenner	5%	22%	26%	-27%
	Tauern	94%	31%	659%	-65%
	Schoberpass	3%	3%	-8%	12%
	Semmering	26%	20%	74%	0%
	Total Austria	27%	20%	84%	-27%

Table 15: Percentage change of transalpine rail transport between CAFT surveys

Despite the differing reference period, the growth rate of rail transport volumes is practically at the same level in Switzerland and in Austria. However, here the development by crossing is also quite different. In Switzerland, the higher increase at the Gotthard (compared to the Simplon) follows a much more pronounced drop from 2008 to 2009 (Gotthard -25%, Simplon -7%). Although other factors influenced the divergent development of the two crossings, the relative distribution of transport volume across the two crossings came back to the value it had attained before the economic crisis: the share of Gotthard was 60% in 2014 and 61% in 2008.

In Austria, the growth of rail transport can be attributed to the Semmering and above all to the Tauern crossing: On the Tauern crossing, the transport volume has virtually doubled due to the increased capacity of the infrastructure. Thus the shares of the three most important Alpine rail crossings in Austria have moved closer together: Brenner 33%, Semmering and Tauern 28% each.

Regarding the production modes, the reduction of the ACT services in Austria have caused a noticeable decrease, while ACT has moderately grown in Switzerland. The overall highest growth

rates are registered in UCT transport, while they are below average in wagon load transport, confirming the stated long-term trend.

4.3 Modal share

Table 16 shows the change in transport volume in Switzerland and Austria and the resulting modal shares.

Period	Country	Transport volume (in kt)		Modal share (%)	
		Road	Rail	Road	Rail
2009	Switzerland	13'364	20'840	39%	61%
2014	Switzerland	12'473	26'244	32%	68%
2009	Austria	70'122	32'617	68%	32%
2015	Austria	90'147	41'428	69%	31%

Table 16: Transport volumes and modal shares in Switzerland and Austria

As mentioned in chapter 3.5, the Swiss freight transfer policy laid down in the Swiss constitution and the subsequent laws seem to have been successful. The modal share of rail has increased in Switzerland by 7 percentage points between 2009 and 2014 while there is practically no change of this key indicator in Austria.

4.4 Type of traffic

Table 17 compares the shares of the types of transport by country and mode across the last two CAFT survey years (2014 or 2015 versus 2009). On the Alpine road crossings between France and Italy, the growth in transport volumes was exclusively due to increased import and export volumes (mostly transport between France and Italy). In Switzerland, the development on the road is comparable to that in France, but transport volumes have slightly decreased. On rail, by contrast, transport volumes have increased noticeably in Switzerland while the shares of the types of traffic have not changed. In Austria, the shares on the road have not changed since 2009, while on rail, the transit share has increased and the share of domestic transport has decreased. This can be explained by the general decline of rail transport over short distances (fewer stations with consignments of goods).

Country	Mode		Domestic	Import	Export	Transit
France	Road	Share 2009	0%	33%	30%	37%
		Share 2014	0%	35%	33%	32%
Switzerland	Road	Share 2009	16%	14%	8%	62%
		Share 2014	15%	18%	12%	55%
Switzerland	Rail	Share 2009	8%	3%	3%	86%
		Share 2014	7%	3%	3%	87%
Austria	Road	Share 2009	19%	12%	12%	56%
		Share 2015	19%	11%	13%	57%
Austria	Rail	Share 2009	17%	16%	16%	51%
		Share 2015	10%	18%	14%	58%

Table 17: Transport volumes and modal shares in Switzerland and Austria

4.5 Type of goods and relations

For statistical reasons it is not possible to provide a meaningful comparison of these variables between the two CAFT surveys. As there are virtually no significant and meaningful differences, we refrain from reproducing them in this report.

5 Survey methodology

5.1 Switzerland

The survey methods used for road transport differ fundamentally from those used for rail transport. For freight traffic by road, the following data sources were used:

- Data from heavy vehicle fee (HVF) control stations and border crossings
- Interviews at the Alpine crossings

Since HVF-data have reached a high quality level and detection gaps can be filled with specially developed algorithms, the quantitative analysis was based on this data. On all surveyed Alpine crossings the Federal Customs Administration operates HVF control stations or recording devices at the border crossings, which distinguish vehicles by type of vehicle (lorry, lorry with trailer, articulated vehicle) and country of registration and hence provide the total amount of heavy goods vehicles.

Detailed characteristics were determined in interviews which were extrapolated to annual values. The surveys were carried out by a specially trained group of interviewers. At Gotthard, two interviewers were occupied on 35 days for each direction (140 interviewer-days), at San Bernardino one interviewer per direction on 20 days (40 interviewer-days). At Simplon and at the border crossing in Gondo, both directions were covered by one interviewer, respectively, whereas the interviews at the Gr. St. Bernhard tunnel were conducted by 2 people, one at each portal of the tunnel. The selection of the survey days were random, but they were evenly spread on weekdays and seasons. The following relative samples could be reached:

Alpine Crossing	Number of Interviews	vehicles per year	Sample
Gr.St. Bernhard	818	45'626	1.8 %
Simplon	866	68'471	1.1 %
Gotthard	13'549	758'336	1.8 %
San Bernardino	2'698	151'475	1.8 %

In total, 1.75% of vehicles were sampled in the CAFT2014 survey in Switzerland (175 out of 10'000 HGV).

Data supplied by the Swiss Federal Railways (SBB) could be used for the analysis of rail transport. The set of data contains transport data from all transport companies licensed in Switzerland using the standard gauge rail infrastructure of SBB, BLS and SOB. The dataset represents a complete inventory of unaccompanied combined traffic and wagonload traffic using cross-alpine and approaching tracks. With included terms of quantity, types of goods and their origin and destination stations or terminals the dataset describes complete railway traffic flows.

Accompanied combined transport: RAlpin AG operates two services: between Freiburg (Germany) and Novara (Italy) via Simplon and between Basel and Lugano (both Switzerland) via Gotthard. They collect data concerning all transported trucks and goods volumes. This dataset represents the complete year 2014. It lacks information about pre- and postcarriage and about the types of goods. The information was collected by a survey based on samples at the ACT terminals. The drivers were asked about the country of registration of the vehicle and origin, destination and type of transported goods. The overall 18 days of survey were evenly distributed throughout the year.

The SBB dataset, as in all standardised transport statistics, does not contain detailed information about the type of goods in unaccompanied combined transport. The aim of the supplementary survey was to get information about the types of goods in a common classification (NST-2007). Using datasets provided by the biggest multimodal transport operators in the Swiss market, approximately 35% of the UCT transport volumes in 2014 could be identified.

5.2 Austria

For freight traffic by road, the following data were used:

- toll data provided by ASFINAG (operating company of Austrian motorways and express roads): number of HGV by vehicle category (vehicles of more than 3.5 tonnes and 2, 3 or 4 and more axles and EURO classes (Brenner, Tauern, Schoberpass, Semmering, Wechsel)
- count data from automatic counting devices (differentiated according to their length) provided by the regional government of Tyrol and complemented by manual counting by the interviewers (Reschen, Felbertauern)
- Interviews at all Alpine crossings

The number of HGV per Alpine crossing divided by type of vehicle (lorry, lorry with trailer, articulated vehicle) and country of registration is calculated from ASFINAG data and data from counting devices/manual counts. They represent the target values for the projection.

The methodology for the interviews at the Alpine crossings is similar to that of Switzerland. Specially trained persons collect detailed characteristics from the drivers of HGV (vehicle characteristics, type, quantity, origin and destination of the load, etc.). There is a freight traffic ban on weekends from Saturday 15.00 until Sunday 22.00. However there are many exceptions (for food products, for example). Therefore, interviews have also been carried out to a small extent on Saturdays and, on Brenner and Reschen, also on Sundays. The number of days of survey ranged from 9 to 50 days per crossing. The following relative samples could be reached:

Alpine Crossing	Number of Interviews	vehicles per year	Sample
Reschen	820	167'000	0.5 %
Brenner	6'261	2'213'000	0.3 %
Felbertauern	398	53'000	0.7 %
Tauern	1'513	1'107'000	0.1 %
Schoberpass	1'682	1'422'000	0.1 %
Semmering	2'147	535'000	0.4 %
Wechsel	2'401	1'335'000	0.2 %

In total, 0.22% of vehicles were sampled in the CAFT2015 survey in Austria (22 interviews per 10'000 HGV).

For the analysis of rail transport, data supplied by Rail Cargo Austria (RCA) could be used. The set contains transport data from all transport companies licensed to use the rail infrastructure in Austria. The dataset contains a complete inventory of unaccompanied combined traffic and wagonload traffic using cross-alpine tracks. With included variables describing quantity, types of goods and their origin and destination stations or terminals the dataset describes complete railway traffic flows.

Accompanied combined transport service was offered on five different relations through Austria (Wörgl – Brenner, Wörgl – Trento, Wels – Maribor, Regensburg – Trento and Salzburg – Trieste). This type of traffic has been surveyed by interviews in the terminals. Interviews were done on 11 days distributed over the year. In total, 6'439 interviews could be evaluated, which corresponds to a sample of 3.1%.

5.3 France

Until 2009, France had been supplying CAFT with the results of the so called "Transit" survey, which sampled all the transit traffic in France. Within this framework, interviews were conducted on a sample of truck drivers crossing the main points along the Alpine and Pyrenean borders. In 2010, due to budgetary constraints, organisational reasons, difficulties in securing the cooperation of the police forces, and a desire to reduce the response burden, it was decided not to renew the "Transit" survey.

Instead, road freight data collected under Regulation (EU) No. 70/2012 (European road freight transport survey) has been used. As this survey does not contain any information about the chosen itinerary, a matrix of probabilities for using the main Alpine crossings had to be applied to the freight flow data from the European road freight transport survey to assign it to the individual crossings. This matrix of probabilities had been established on the basis of comparisons of the results of the "Transit" survey 2010 and of the European road freight transport survey for 2010.

The two methods for 2010 have shown comparable results.

The 2014 analysis only uses data from the European road freight transport survey. The advantages of this method are the lower cost (the data is available without a supplementary survey), representative time sampling over the whole year, and replicability over time at marginal costs. The disadvantages are the problem of the representativity of the survey respondents (response rate 9%) and the small number of records: about 7'800 HGV trips gathered by internet questionnaires represent 2.7 million counted HGV journeys, a relative sample size of 0.3% overall. This proportion can vary strongly by Alpine crossing or by other attribute subsets (like country of registration, type of vehicles, etc.). Therefore the data quality, and thus the results, may not necessarily be better than those in Austria, where the relative sample size is lower, but the sample quality is controlled for every subset.

For further information on the French model applied in 2014, see:

http://jms.insee.fr/files/documents/2015/S07_2_ACTE_V1_CARON_JMS2015.PDF

Data on transalpine rail transport are not included in the French report.

5.4 Comparability

As the three datasets of France, Switzerland and Austria have the same structure, evaluations over the whole Alpine arc, as they are presented in chapter 3 of the present report, are feasible as long as they concern only road transport. But the different survey period must be taken into account. For rail transport, information on the French crossings is missing, but as they represent only 5% of the overall transalpine rail transport volume, this disadvantage is bearable.

One more important point is the different representativity level of the three datasets. This can be shown by the comparison of the 95% confidence interval for the same attribute by country, the transport volume on the road divided by transit, import and export:

- France:
 - transit transport volume = 11.92 +/- 0.37 million tonnes (+/- 3.1%)
 - import transport volume = 13.37 +/- 0.38 million tonnes (+/- 2.9%)
 - export transport volume = 12.51 +/- 0.38 million tonnes (+/- 3.0%)
- Switzerland:
 - transit transport volume = 6.83 +/- 0.09 million tonnes (+/- 1.4%)
 - import transport volume = 2.30 +/- 0.07 million tonnes (+/- 3.1%)
 - export transport volume = 1.51 +/- 0.06 million tonnes (+/- 4.0%)
- Austria:
 - transit transport volume = 49.0 +/- 0.72 million tonnes (+/- 1.5%)
 - import transport volume = 9.53 +/- 0.46 million tonnes (+/- 4.8%)
 - export transport volume = 11.5 +/- 0.49 million tonnes (+/- 4.3%)

The results show that the standard deviation grows rapidly with decreasing values of the indicator and with decreasing samples. It is evident that the combination of results with diverging confidence intervals can create problems in particular when the evaluation is more specific (e.g. one of 20 goods categories or one of hundreds of possible transport relations instead of a simple “yes-or-no-question”). Thus it is desirable that the results of the different surveys reach a more comparable representativity level, for example by more comparable and larger samples (see below).

5.5 Recommendations for future CAFT survey

The difficulties in sketching a comprehensive picture over the whole Alpine arc are caused by three factors:

- The different survey methodology: for road transport the conclusions are based on an evaluation of registry data in France, while interviews are used in Austria and Switzerland; for rail transport, there is no survey in France and registry data is evaluated in Austria and Switzerland.
- The different relative sample size for the road transport survey in the three countries (about 0.3% in France, between 0.1% and 0.7% in Austria, and between 1.1% and 1.8% in Switzerland)
- The different reference periods (2014 in France and Switzerland, 2015 in Austria)

The first step to improve the comprehensive information on transalpine traffic and transport in the future consists of reducing the differences mentioned above:

- At the least, the gap in the survey data of rail transport between France and Italy should be closed. As the data situation in France is very difficult, this part could be taken over by Italy. In doing that, while also surveying the rail freight flow between Italy and Slovenia (at Villa Opicina), Italy could obtain a comprehensive picture of all rail freight flows crossing its borders. Data for rail freight flows from and to Switzerland and Austria are available in the framework of the observatory and are surveyed by the national CAFT surveys.

- It would be desirable to increase the proportion sampled in France and Austria to a range between 0.5% to 1.0%.
- The survey should cover the same time period in all countries (next Swiss CAFT is planned for 2019).

From an overall perspective it would be desirable if Austria could raise the sample size on the crossings over the main Alpine ridge (e.g. by concentrating the next CAFT survey on these crossings).

For the future use of European transport data, which are collected on a regular basis anyway, the traffic model for the allocation of the known vehicle trips (O/D-relations) to the respective Alpine crossings which France used in 2014 may need to be improved somewhat. A better consideration of characteristics of the road crossings, which are important for the route choice of HGV trips (e.g. tolls, travel time, elevation differences, "HGV-friendly" roads etc.) may be helpful.

Appendix

Appendix 1: CAFT regions and aggregations

Appendix 2: Goods list according to NST2007 and aggregations

Appendix 1: CAFT-regions and aggregations

Name	NUTS code	Aggregation	Country
Northern Switzerland		Northern Switzerland	CH
Southern Switzerland		Southern Switzerland	CH
Freiburg	DE13	Southwest Germany	DE
Tübingen	DE14	Southwest Germany	DE
Stuttgart	DE11	Southwest Germany	DE
Karlsruhe/Rheinessen-Pfalz	DE12, DEB3	Southwest Germany	DE
Hessen, Saarland, Koblenz, Trier	DE7, DEC, DEB1, DEB2	Southwest Germany	DE
Southern Bavaria	DE21, DE27, DE22	Southeast Germany	DE
Northern Bavaria	DE23, DE24, DE25, DE26	Southeast Germany	DE
Nordrhein-Westfalen	DEA	Northern Germany	DE
Thüringen, Sachsen	DED, DEG	Northern Germany	DE
Northeast Germany	DE3, DE4, DE8, DEE	Northern Germany	DE
Northwest Germany	DE5, DE6, DE9, DEF	Northern Germany	DE
Vorarlberg	AT34	Austria	AT
Tirol	AT33	Austria	AT
Southern Austria	AT2	Austria	AT
Northeast Austria	AT1, AT31, AT32	Austria	AT
Rhône-Alpes	FR71	Southern and central France	FR
Franche-Comté	FR43	Southern and central France	FR
Bourgogne	FR26	Southern and central France	FR
Mediterranean region	FR8	Southern and central France	FR
Southwest France	FR53, FR61, FR62	Southern and central France	FR
Southwest France and center	FR24, FR51, FR52, FR63, FR72	Southern and central France	FR
Paris and North France	FR1, FR22, FR23, FR25, FR30	Northern France	FR
Champagne-Ardennes	FR21	Northern France	FR
Alsace/Lorraine	FR41, FR42	Northern France	FR
Lombardia	ITC4	Lombardia	IT
Liguria	ITC3	Northwest Italy	IT
Piemonte/Aosta	ITC1, ITC2	Northwest Italy	IT
Northeast Italy	ITH1, ITH2, ITH3, ITH4	Northeast Italy	IT
Emilia-Romagna/Toscana	ITH5, ITI1	Other regions of Italy	IT
Central Italy	ITI2, ITI3, ITI4, ITF1, ITF2	Other regions of Italy	IT
Southern Italy and islands	ITG, ITF3, ITF4, ITF5, ITF6	Other regions of Italy	IT
Poland	PL	Northeast Europe	
Czech Republic	CZ	Northeast Europe	
Slovakia	SK	Northeast Europe	
Hungary	HU	Southeast Europe	
Benelux countries	BE, NL, LU	Benelux countries	
British Isles	UK, IE	British Isles	
Skandinavia	SE, DK, FI, NO	Scandinavia	
Iberia	ES, PT	Iberia	
Slovenia/Croatia	SI, HR	Southeast Europe	
Southern Balkans	AL, BA, BG, KO, ME, MK, RO, RS	Southeast Europe	
Former Soviet Union	BY, EE, KZ, LT, LV, MD, RU, UA	Former Soviet Union	

Appendix 2: Goods list according to NST2007 and aggregations

NST2007	Designation	Aggregated group	Name
01	Products of agriculture, hunting, and forestry; fish and other fishing products	1	Agricultural products
02	Coal and lignite; crude petroleum and natural gas	3	Fuels
03	Metal ores and other mining and quarrying products; peat; uranium and thorium	5	Mineral products
04	Food products, beverages and tobacco	2	Food products
05	Textiles and textile products; leather and leather products	7	Other products
06	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials; pulp, paper and paper products; printed matter and recorded media	6	Chemicals
07	Coke and refined petroleum products	3	Fuels
08	Chemicals, chemical products, and man-made fibers; rubber and plastic products; nuclear fuel	6	Chemicals
09	Other non metallic mineral products	5	Mineral products
10	Basic metals; fabricated metal products, except machinery and equipment	4	Metal ores and products
11	Machinery and equipment n.e.c.; office machinery and computers; electrical machinery and apparatus n.e.c.; radio, television and communication equipment and apparatus; medical, precision and optical instruments; watches and clocks	7	Other products
12	Transport equipment	7	Other products
13	Furniture; other manufactured goods n.e.c.	7	Other products
14	Secondary raw materials; municipal wastes and other wastes	7	Other products
15	Mail, parcels	7	Other products
16	Equipment and material utilized in the transport of goods	7	Other products
17	Goods moved in the course of household and office removals; baggage and articles accompanying travellers; motor vehicles being moved for repair; other non market goods n.e.c.	7	Other products
18	Grouped goods: a mixture of types of goods which are transported together	7	Other products
19	Unidentifiable goods: goods which for any reason cannot be identified and therefore cannot be assigned to groups 01-16	7	Other products
20	Other goods n.e.c.	7	Other products