Behavioural aspects of transportation mode choice in the "Énergie" S.P.P.S. survey

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Report 93/05 February 18, 1994

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Keywords: Transportation research, modal choice, behavioural analysis.

Behavioural aspects of transportation mode choice in the "Énergie" S.P.P.S. survey *

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Abstract

This paper analyzes the impact of behavioural variables on transportation mode choice in Belgium. The analysis is mainly based on the "Énergie" survey from the Belgian Prime Minister's Office, but also compares the obtained results with the conclusions of two independently conducted surveys in the cities of Brussels and Charleroi. The effect of length and duration of the trip, user's age and motorization level is considered.

1 Introduction

The purpose of this study is to analyze the modal choice decisions of transportation users in Belgium. This analysis is based on three different surveys related to different geographical areas of the country. The first two concern the cities of Brussels [4] and Charleroi [3] and have been conducted by the STRATEC consultant company during 1990-1991. The last one dates from 1986 and covers the whole of Belgium and is obtained from the Energy program of the S.P.P.S.[1]. More precisely, we are interested to investigate the effect on modal choice of several factors, including length and duration of the trip, user's age and motorization level.

The analysis presented here is part of the MUMTRIPS project, which is realized in the context of the "Transport and Mobility" impulse program managed by the Belgian Prime Minister's Services, Science Policy Office. This project is intented on the modelization of traffic into the city, with emphasis on the multi-modal trips.

The paper is organized as follows. After presentation of the surveys and discussion of their characteristics in Section 2, we present, in Section 3, some comparisons between results obtained for Brussels and Charleroi from the STRATEC and S.P.P.S. surveys. We then show, in Section 4, the influence of the above mentioned behavioural variables on modal choice, mostly for the country considered as a whole. Local differences are also exhibited for the two studied cities. Finally, some results about multi-modal trips are discussed in Section 5 and some conclusions are outlined in Section 6.

*Cette étude a été réalisée dans le cadre du contrat TR/B7/11 du programme d'impulsion "Transport et Mobilité" des S.P.P.S.

[1]Services de Programmation de la Politique Scientifique, *Belgian Prime Minister's Services, Science Policy Office*

2 The surveys

2.1 The S.P.P.S. survey

In the beginning of the 1980's, the S.P.P.S. was concerned with the national impact of the oil crisis and organized a country wide study on the use of energy. A component of this study was to analyze the behaviour of citizens in their use of transportation systems. A specific survey on this aspect was conducted from March 1986 to February 1987. It included, amongst other information, a rather detailed diary questionnaire, in which each member[2] of each surveyed household was asked to describe all his or her activities during three complete days. The results of this survey therefore contain a wealth of information about the behaviour of transportation users, which the authors were interested to extract and study. However, the survey was left unexploited for a long time and the details of the surveying procedures are difficult to reconstruct. This has an effect of the validity of the conclusions which can be drawn from this data set, as will be discussed below.

The data corresponding to the survey was transferred to us in May 1992 in a very "raw" form and many corrections and coherency checks had to be performed before it could be used at all. This work was conducted by M. Vause and is reported in [5].

A further difficulty arose because informations about the underlying sampling technique was missing. We only know that the distribution of the surveyed households is proportional to the population of each statistical district of the INS census. A "seed" household was randomly chosen in each surveyed district and the other were chosen after a formal random walk process.

We therefore attempted to weight the results according to the representativity, within the Belgian population, of the different classes of households surveyed. To obtain the desired weights, we used additional informations from the INS[3]. From the 1981 census [1], we derived the distribution of the population per municipality, sex and age class. This data was then correlated to the populations in 1986 (survey's year) which are known per municipality and sex only [2]: as we know from the country wide yearly ages pyramids that the distribution between the different age classes doesn't vary much from 1981 to 1986 (less than 1%), the distribution of the population per age class in 1986 can reasonably be obtained by linear approximation.

A final problem is that the sample doesn't cover all the Belgian municipalities. Moreover, some arrondissements (from the Luxembourg province) are not represented. We thus introduced a second correction to reweight the surveyed municipalities within population of each province.

Our discussion below is based only on data after these corrections.

2.2 The STRATEC surveys

Besides the S.P.P.S. survey, we also had access to two other surveys conducted by STRATEC on Brussels, the capital (with its periphery) and Charleroi. For these surveys, families were questioned about their displacement habits (for more details, see [4] and [3]). The data collection took place from October 1989 to April 1990 for Charleroi and from December 1990 to March

[2] older than 15 years

[3] Institut National de Statistique

1991 for Brussels. Results extracted from this data have been described by STRATEC in [4] and [3].

The STRATEC surveys differ in methodology from the S.P.P.S. one in that STRATEC interviewed all family members older than 4 years while the S.P.P.S. only covers people older than 15 years, at least as far as displacements are concerned. As a consequence, we had to drop the data corresponding to people between 5 and 15 from the STRATEC surveys, which explains why comparisons can not be directly made using the tables presented in [4] and [3]. Of course, this truncation has an effect on displacement patterns: a substantial proportion of trips between home and school are now neglected.

2.3 The studied cities

The cities of Brussels and Charleroi are studied in both the S.P.P.S. and STRATEC surveys. It is important to realize some differences between them that might affect and/or explain some of the results presented below.

Brussels is the capital city[4] of Belgium and the centre of European and NATO administrations. It is a city bursting with activity, faced with the congestion problems that are common to many major cities in the world. The detailed list of municipalities covered by both surveys is given in Annex A.

On the other hand, Charleroi is a medium size city[5] in the old industrial area of South Belgium, which has been strongly affected by the recession in the domain of mining and steel works. The city's economical situation has nevertheless improved between the two surveys. The study area covers not only the city itself but also some of its periphery. The list of surveyed municipalities is detailed in Annex A.

3 Evolution of behaviour between 1986 and 1991 in Brussels and Charleroi

We now compare results obtained from the S.P.P.S. and STRATEC surveys for their common geographical area, that is the cities of Brussels and Charleroi. The database from the first survey contains 416 households (872 individuals) and 5266 records concerning trips for Brussels. Charleroi is represented by 334 households (647 individuals) and 2480 records concern displacements. We do not study the periphery of Brussels, since the database only contains information for 50 households (111 individuals), which is probably not significant. The STRATEC surveys contain 6445 interviews for Brussels and 9580 for Charleroi.

Since the data collections were realized during different years (1986 for the S.P.P.S. and 1990 or 1991 for STRATEC), we would like to study the evolution in time of various behavioural variables related to displacement habits of the population.

[4] About 1000000 residents.

[5] About 450000 residents.

3.1 Mobility rates

We first study the mobility rate, which we define as the average number of "mechanized" trips per person and per day. We also distinguish the mobility rate during the morning peak hours (from 7 to 9am). Table 1 presents the results of this comparison.

	Complete day		Morning peak	
	Brussels	Charleroi	Brussels	Charleroi
1986	1.29	0.61	0.24	0.11
1990-91	1.31	1.21	0.29	0.25

Table 1: Mobility rates for Brussels and Charleroi

From this table, we can see that the mobility rate in Brussels seems to be stable between 1986 and 1991. We do not know if this trend can also be observed for walking displacements, because we only have an estimate of 0.74 walking trip per day and per person in Brussels in 1986, but miss the corresponding data in 1991. We however know that the amount of people walking (in Brussels) has increased between 1986 and 1991 from 14% to 39%, which seems to indicate a modal shift in favor of walking.

We now examine two elements which might explain, at least in part, that the daily mobility seems to have not increase between the two surveys. The first concerns the repartition per citizenship of the surveyed people. It indeed seems that the S.P.P.S.'s survey only included Belgians[6]. However, the mobility seems to vary significantly according to citizenship. Table 2[7] reports mobility rates for the active population according to this criterion.

Nationality	Mobility rate
Belgian	1.99
European, American	1.74
Turk, African, Asian	1.43
Unknown nationality	0.37
Average for foreigners	1.62

Table 2: Mobility rates for active people in Brussels (1991)

The mobility rate is thus smaller for non-Belgian citizens, and this could explain the higher rate obtained from the S.P.P.S. data. Observe that the numbers in the first column of Table 1 should be compared to the average of those presented in Table 2, which only cover the more mobile active population.

[6] Unfortunately, this is only an informed guess, as the data on the used sample is missing.

[7] We thank S. Gayda (STRATEC) for providing us these results.

Another element of explanation for the non-increase in daily mobility can be found into the difference of stratifications in professional classes for the two samples. Table 3 shows the distribution of the surveyed population into seven classes.

Class	S.P.P.S.	STRATEC
retired	25%	26%
student	10%	8%
jobless	14%	18%
blue collar	8%	12%
employee	26%	25%
self-employed	7%	8%
unknown	7%	3%

Table 3: Distribution of population into professional classes (Brussels)

The S.P.P.S. sample contains less retired people, who typically walk more but use motorized transportation less. It also contains less unemployed persons whose mobility is also smaller. Furthermore, the proportion of employees is higher in this survey than in the STRATEC one, compared with that of blue collars, self-employed. This could also explain why we don't find a higher mobility rate in the newest survey (STRATEC).

The situation is quite different for Charleroi, as can be observed from the mobility rates given in Table 1: the mobility indeed seems to increase drastically during the studied period. Again, the percentages of different professional classes in the two samples may also explain this trend. Table 4 shows the relevant distribution where the "jobless" class contains unemployed and retired people and housewives. These results show that the sample from S.P.P.S. contains a higher proportion of less mobile people (retired, unemployed, blue collars). Furthermore, the total proportion of active people sums up to 27%, compared with the corresponding 38% in the STRATEC survey.

Class	S.P.P.S.	STRATEC
student	8%	9%
"jobless"	64%	52%
blue collar	16%	11%
employee	8%	20%
self-employed	3%	7%

Table 4: Distribution of population into professional classes (Charleroi)

We now examine the proportion of the population that record trips in their daily activities. The evolution of this proportion is indicated for the two studied cities in Table 5.

	1986	1990-91
Brussels	84.3%	84.4%
Charleroi	73.0%	68.8%

Table 5: Percentages of people recording trips

We note a stability in the number of mobile people in Brussels, which can be correlated with the stability in mobility for this city. On the other hand, the number of mobile people in Charleroi decreases while the mobility increases. This implies that the number of trips performed by each of these mobile people is higher in Charleroi in 1990 than in 1986. This effect can be explained by the increase, for this latter city of the relative importance of more mobile professional classes (employed and self-employed) while we observe the opposite phenomenon in Brussels (see Tables 3 and 4).

3.2 Modal choice

We now examine the evolution in the modal choice between 1986 and 1990. Five modes have been considered: pedestrian, public transport, car, car as a passenger and "other modes" which covers bicycle, motorbike, lightweight motor cycle, etc.

Of course, surveyed people do sometimes use more than one transportation mode. In order to clarify this possibly complex situation, we have settled on a classification based on a hierarchy and the type and frequency of each mode. More precisely, we classify in the "pedestrian" category all people who only report pedestrian trips at the exclusion of any other mode. The remaining individuals are classified in the "public transport" category provided public transport trips are reported. The "car" category is used otherwise in all cases where the car mode is reported and the "car as passenger" in all cases where this mode is reported. The remaining individuals are then classified in the "other mode" category.

The resulting distribution of individuals is shown for both studied cities in Table 6.

	pedestrian	public transport	car	car as passenger	other
Brussels	14.4%	35.3%	40.1%	8.8%	1.4%
Charleroi	45.9%	12.4%	22.5%	14.0%	5.2%

Table 6: Distribution of mode choice over surveyed individuals in Brussels and Charleroi (1986)

We immediately note the differences between the two cities. Brussels is characterized by the predominance of the car mode, followed by public transport[8]. In Charleroi, almost half of the trips are made pedestrian.

[8] This very high use of public transport may be explained by the better offer for this mode in Brussels: underground railway, trams and buses.

The classification used by STRATEC in [4] and [3] is similar to ours (see p. 20 of the first reference), although somewhat less detailed, the only distinguished classes being pedestrian trips, public and private transport. The corresponding results are reported in Table 7.

	pedestrian	public transport	private transport
Brussels	39.3%	22.4%	38.3%
Charleroi	28.0%	13.4%	58.6%

Table 7: Distribution of mode choice over surveyed individuals in Brussels (1991) and Charleroi (1990)

One notices at once the strong evolution of pedestrian trips in Brussels and of the use of private transportation in Charleroi. Once again, the variations in the distribution of professional classes might, at least partly, explain these differences. However, the magnitude of these effects is somewhat surprising, and might be caused by hidden discrepancies in the samples. Caution should therefore be exercised in drawing general conclusions on the temporal evolution of modal choices in these cities.

3.3 Trip purposes

We finally analyze the evolution in mechanized trip purposes for Charleroi and Brussels. For this analysis, each trip is characterized by its origin and destination, which we have classified in one of the categories "at home", "work", "school" and "other". In Figures 1, 2, 3 and 4, the origin is shown on the y-axis and the destination on the x-axis. The reader will find the detailed results from which these figures are extracted in annex B (see Tables 18, 19, 20 and 21).

When comparing Figure 1 and 2, one observes a small increase in the number of trips whose destination is work (from 21 to 26%) or school (from 2 to 4%), while the "other" purpose decreases (from 31 to 26%). The same comment applies if one now considers origins instead of destinations. The coherence between the percentages for the origins and for the destinations is also remarkable.

For Charleroi, figures 3 and 4 show that the situation is similar: increase in trips to work (from 16 to 23%) and decrease for "other" purposes (from 32 to 27%) but stability for trips to school. We note again the parallelism between the percentages for origins and for destinations.

3.4 The case of the employees in Brussels

As we have seen, the two studied samples (S.P.P.S. and STRATEC) differ, in Brussels, in the relative distribution of social classes (see Table 3). In order to refine our analysis, we now compare results for the largest of these classes: the employees (27% of the population in the S.P.P.S. survey, 22% in the STRATEC data). A total of 274 records for this category of the population is available in the S.P.P.S. survey and 1716 in the STRATEC database. Again, we compute mobility rates, percentages of mobile people, modal choices and purposes of trips, restricting our attention to the employees only.

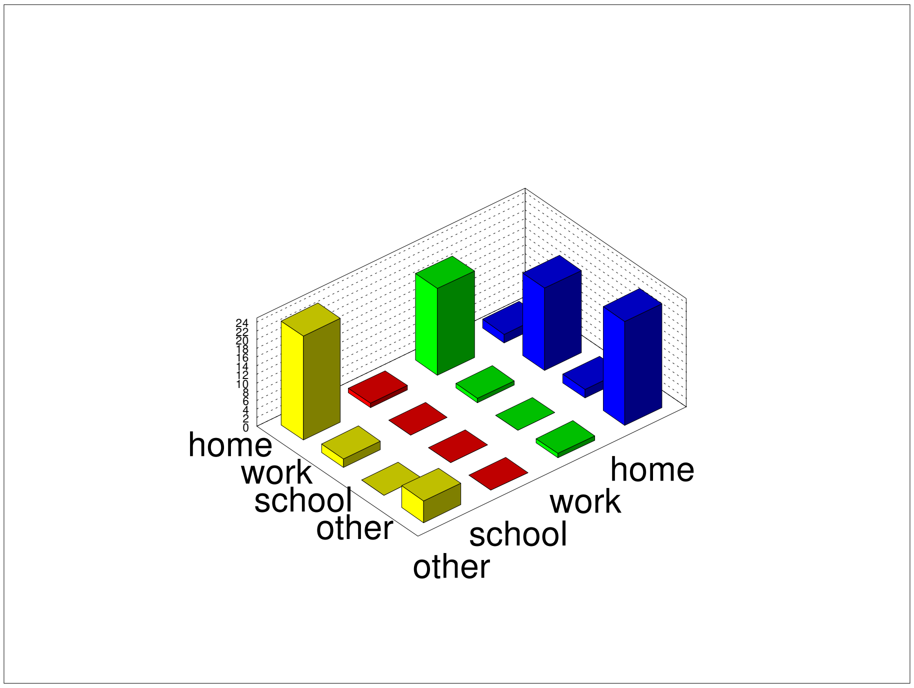

Figure 1: Purposes of journeys in Brussels (1986)

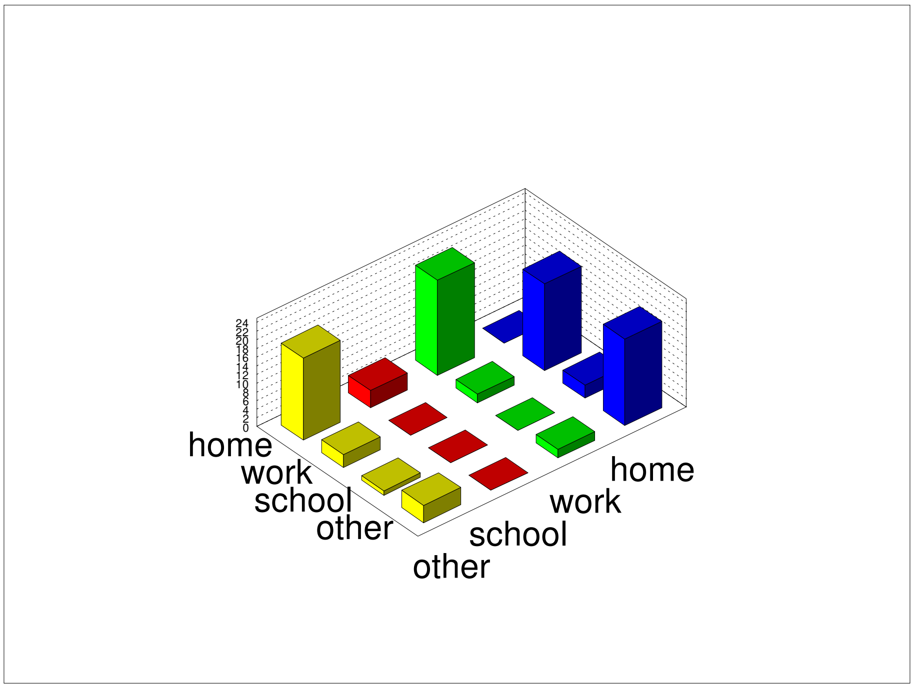

Figure 2: Purposes of journeys in Brussels (1991)

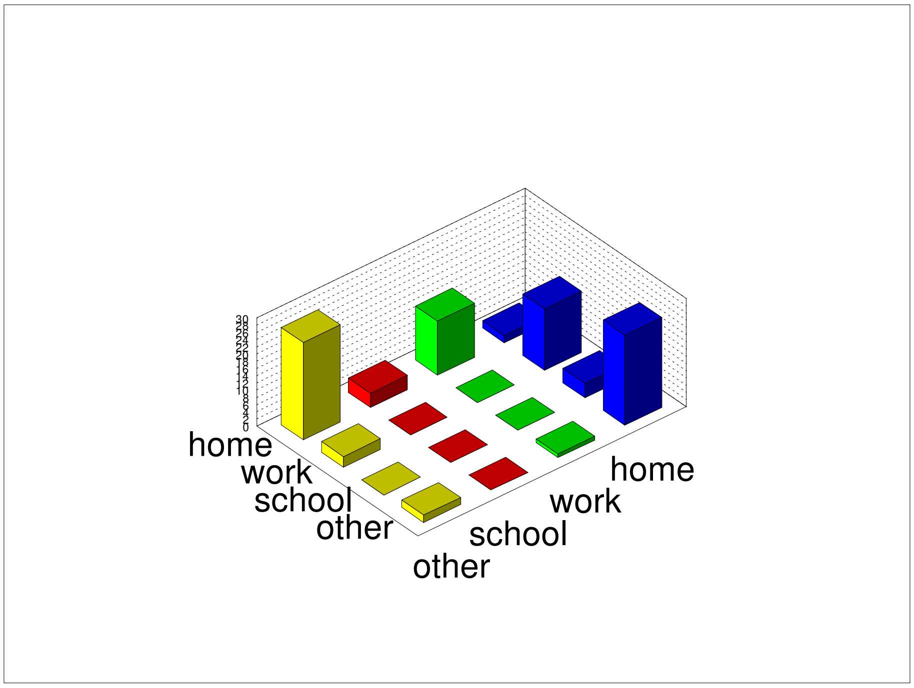

Figure 3: Purposes of journeys in Charleroi in 1986

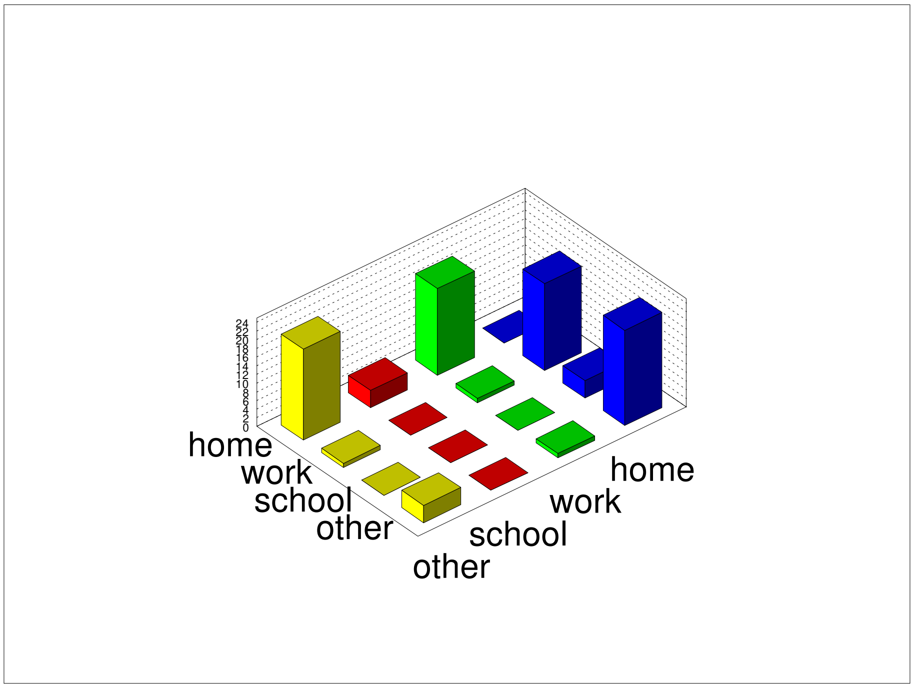

Figure 4: Purposes of journeys in Charleroi in 1990

3.4.1 Mobility rates

The comparison of mobility rates is undertaken in the same way as in section 3.1. The corresponding results are presented in Table 8.

	Complete day	Morning peak
1986	2.20	0.59
1991	2.00	0.63

Table 8: Mobility rates for the employees in Brussels

We observe, in Table 8, a decreasing mean mobility but a small increase in the peak hours mobility. This is correlated with the results concerning the percentages of employees recording trips in their daily activities. These numbers can be found in Table 9.

1986	1991
92.7%	91.5%

Table 9: Percentages of employees recording trips (in Brussels)

The results from Table 9 also shows a small decrease in the number of mobile employees. This may partly explain the smaller mobility rate. However, these mobility rates only concern "mechanized" trips, which implies that these results should also be correlated to the modal choice, as is shown in the next subsection.

3.4.2 Modal choice

Using again the hierarchy already described in Section 3.2, we now examine the evolution of the employees' modal choice between 1986 and 1991. The corresponding results are reported in Table 10.

	pedestrian	public transport	private transport
S.P.P.S. (1986)	6.9%	33.8%	59.2%[9]
STRATEC (1991)	16.9%	25.2%	57.9%

Table 10: Distribution of mode choice over surveyed employees (in Brussels)

Although the share of private transport seems stable between the two surveys, one notices the shift from public transport to the "pedestrian" category. This may be a further explanation of the decreasing mobility rate observed from Table 8 for "mechanized" trips.

[9]This percentage is divided as follows: 52.4% for driving a car, 5.3% for being passenger in a car and 1.5% for the other vehicles (motorbikes, ...).

3.4.3 Trip purposes

Our last specialized analysis concern the evolution of the purposes of the employees' mechanized trips in Brussels. As above, the categories chosen for trips origin and destination are "at home", "work", "school" and "other". The reader will find the distribution of recorded trips into these categories for the S.P.P.S. and STRATEC surveys in Figures 5 and 6, respectively . Once more, the detailed percentages illustrated in these figures can be found in Annex B (see Tables 22 and 23).

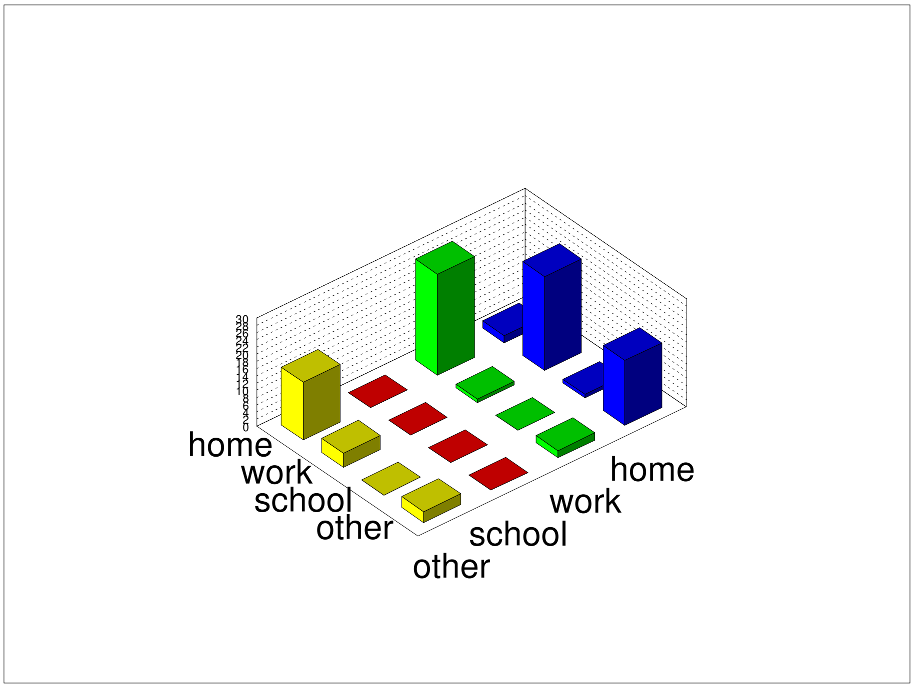

Figure 5: Purposes of journeys for employees in Brussels (1986)

We observe in these figures that the part of the "work" purpose increases from 1986 to 1991 (from 30% to 39%) while "other" decreases in the same proportion (from 23% to 16%). The trips to school remain marginal in both cases, as expected for this category of the population.

From the more detailed analysis of the behaviour of this population's section, it appears that the variations in mobility between 1986 and 1991 in Brussels is the composite effect of complex interacting phenomena.

4 Transportation behaviour in Belgium in 1986

In the previous section, we examined the evolution of mobility and some behavioural parameters between 1986 and 1991 for the cities of Brussels and Charleroi. We now focus our attention on the differences between these cities and Belgium considered as a whole. The basis of our analysis is the S.P.P.S. survey of 1986. As above, we successively consider mobility and modal choice.

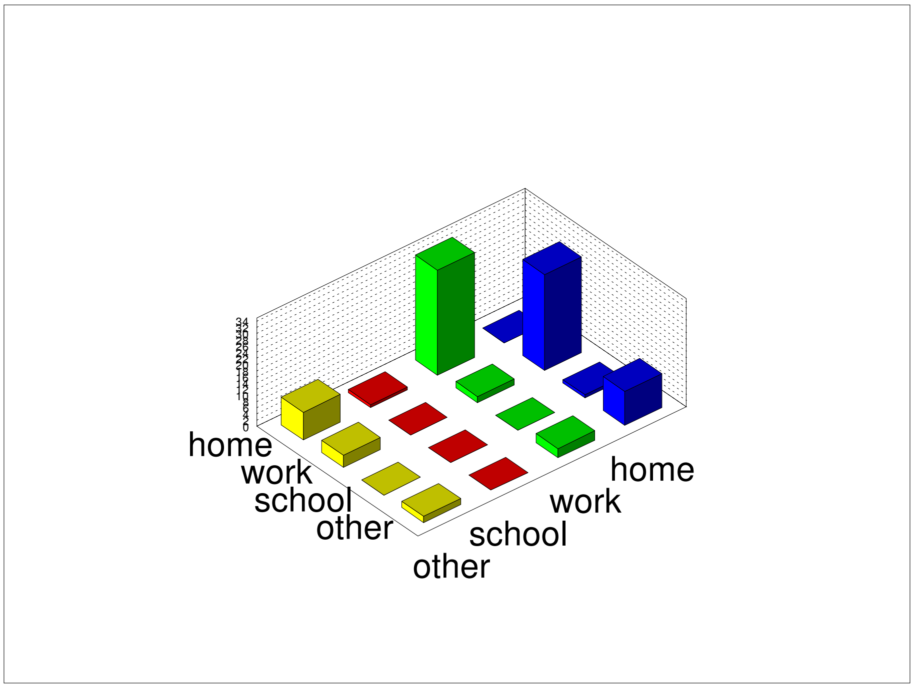

Figure 6: Purposes of journeys for employees in Brussels (1991)

4.1 Mobility

We first compare the mobility rates in the cities of Brussels and Charleroi with that of the whole country. Because the S.P.P.S. survey is more detailed than STRATEC's, we also report an estimate of the pedestrian mobility rate. The corresponding results are presented in table 11.

	Complete day		Morning peak	
	mechanized	pedestrian	mechanized	pedestrian
Belgium	1.39	0.60	0.25	0.07
Brussels	1.29	0.71	0.24	0.06
Charleroi	0.61	0.59	0.10	0.07

Table 11: Mobility rates

The first conclusion to be drawn from this table is that the mobility in Brussels and in Belgium as a whole does not seem to be very different (at least according to this survey). We note a slight advantage in mechanized trips for the country compared with Brussels, nearly exactly compensated by a corresponding shift towards pedestrian trips for this city. This could result from the fact that distances and transportation problems encourage people to walk more in Brussels, as is confirmed in Table 25.

The second conclusion is, again, that mobility in Charleroi is small compared with both Brussels and the country. Two reasons might explain this trend.

- We already noted above the differences in the distribution of professional classes between Charleroi and Brussels.
- The motorization level of the households is lower in Charleroi (52%) than in Brussels (74%) and Belgium (77%), see Table 15.

Of course, these factors are not independent.

We also note that the fraction of trips that take place during the morning peak period (7 to 9 am) is very comparable for the three cases:± 18% of mechanized trips and ± 10% of pedestrian trips.

We now examine the mobility rate as a function of the number of mobile people. The percentages of such people in the population are given in table 12.

Belgium	87.4%
Brussels	84.3%
Charleroi	73.0%

Table 12: Percentages of mobile people

A larger fraction of mobile people seem to be related to a greater mobility rate. However we do not observe a strict parallelism between these two parameters.

4.2 Modal choice

4.2.1 General aspects

We now turn again to the study of modal choice. As before, we can exploit the more detailed nature of the S.P.P.S. survey and refine our categories concerning public transport users. We first distinguish travellers using public transport as their unique mode of transportation for one trip, and travellers whose trips are multi-modal. The first of these categories can be further divided into a class of travellers using public transport as their only mode of transportation for the survey period and those who also use their car, as driver or passenger. We present the related results in Table 13, where the public transport category is hierarchized as we just described.

We first note the predominance of private transportation in all cases, except for Charleroi where the pedestrian mode is dominant. Brussels is characterized by a proportionally larger use of public transports, which seems to be balanced by the smaller proportion of “other” mode. The multimodal trips amount to nearly a sixth of the total number of trips involving public transport. We also see that almost half of the public transport users also use another mode, but this last conclusion should be tempered by the fact that only people older than 15 were surveyed.

The remaining of this section is devoted to a more detailed analysis of some factors that influence the behaviour of transportations users in their mode choice. We restrict our investigation to four parameters that are directly available from the survey: the length of the trip, its duration,

	pedestrian	public transport			car	car as passenger	other
		multimodal	single mode				
			without car use	with car use			
Belgium	18%	3%	7%	9%	38%	14%	11%
Brussels	14%	7%	10%	18%	40%	9%	1%
Charleroi	46%	1%	7%	4%	22%	14%	5%

Table 13: Modal choices across the studied population

the trip maker's age and the number of vehicles owned by the household. We realize that this choice is limitative to some extent, but nevertheless leads to interesting conclusions.

4.2.2 Influence of trip length

We start by considering the impact of trip length on modal choice. Figures 7, 8 and 9 show, for Belgium, Brussels and Charleroi, the distribution of mode choices (in percentage of all recorded trips) as a function of trip length. The lengths have been classified into six categories: less than 2 km, between 3 and 5 km, from 6 to 10 km, from 11 to 20 km, from 21 to 50 km and over 50 km. The detailed percentages from which these figures have been created can be found in Annex B (Tables 24, 25 and 26).

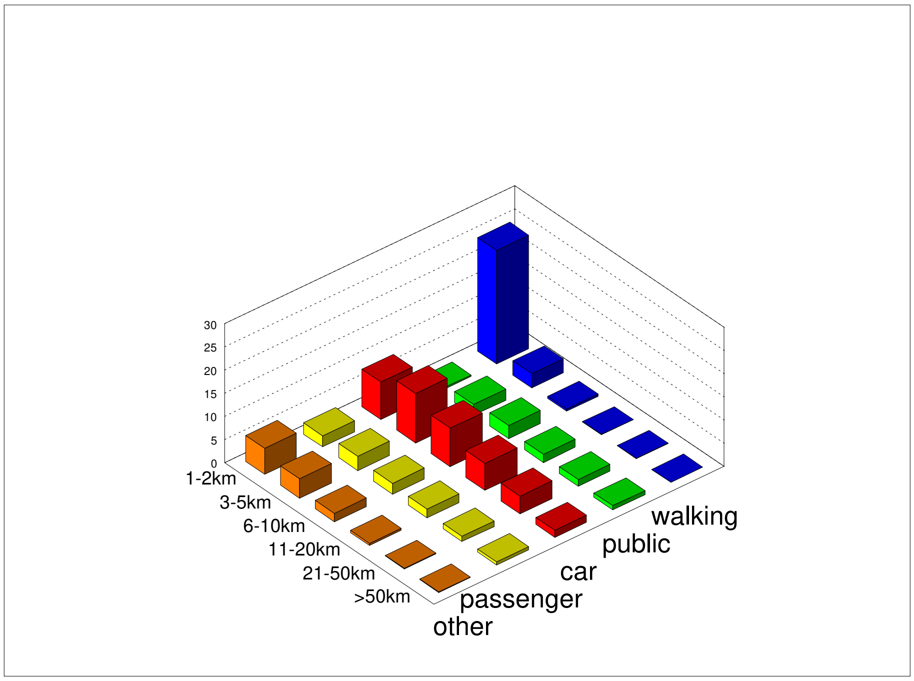

Figure 7: Modal choices with respect to trip length in Belgium

We find in Figure 7 that almost all pedestrian trips are shorter than 5 km and that a large majority (87%) is even under 2 km. These trips represent more than a half of the short trips of less than 2 km. Public transports are mostly chosen for displacements in the range from 3 to 20 km. They represent about 20% of the trips longer than 10 km and 27% of trips longer than 50 km. The multimodal trips seem to be mostly associated with longer distances. This is confirmed by the analysis of the detailed results, where we see that more than 30% of the long trips (over 20 km) using public transport use more than one mode. The "car" is always dominant, except for very short (1-2 km) trips where it is superseded by walking. Its relative importance grows with distance, except for trips over 50 km. We observe the same trend for the choice of car as passenger. On the other hand, the "other" mode relative importance decreases with distance. This mode, which covers bicycles and motorbikes, seems to be favored for short distances (more precisely between 3 and 5 km where it is the second most frequent after the car).

We also notice that 41% of all recorded trips are no longer than 2 km. This indicates that many people live near the destinations of their most usual trips (work, school, shopping, ...). This remark is further supported by the fact that 80% of all trips are under 10 km and 90% under 20 km. Finally, the most common type of trips is a short walk (25% of all trips) followed by car used between 3 and 5 km (11%) , all other trip types being below 10%.

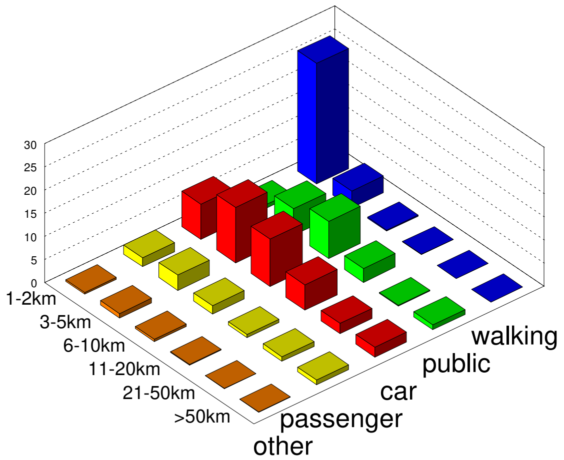

Figure 8: Modal choices with respect to trip length in Brussels

If we now turn to Brussels's situation (Figure 8), we see a stronger contribution of pedestrian trips for short distances. We also note a larger share for public transport, but an analysis of the detailed results shows that the corresponding trips are proportionally less multimodal. The car mode is clearly dominant, especially for trips between 11 and 50 km, while the "other" mode is marginal.

As expected, we find a larger proportion of relatively short trips (84% under 10 km, 93% under 20 km). Finally, the most common trips (26%) are walks of less than 3 km, followed by car trips between 3 and 5 km (12%).

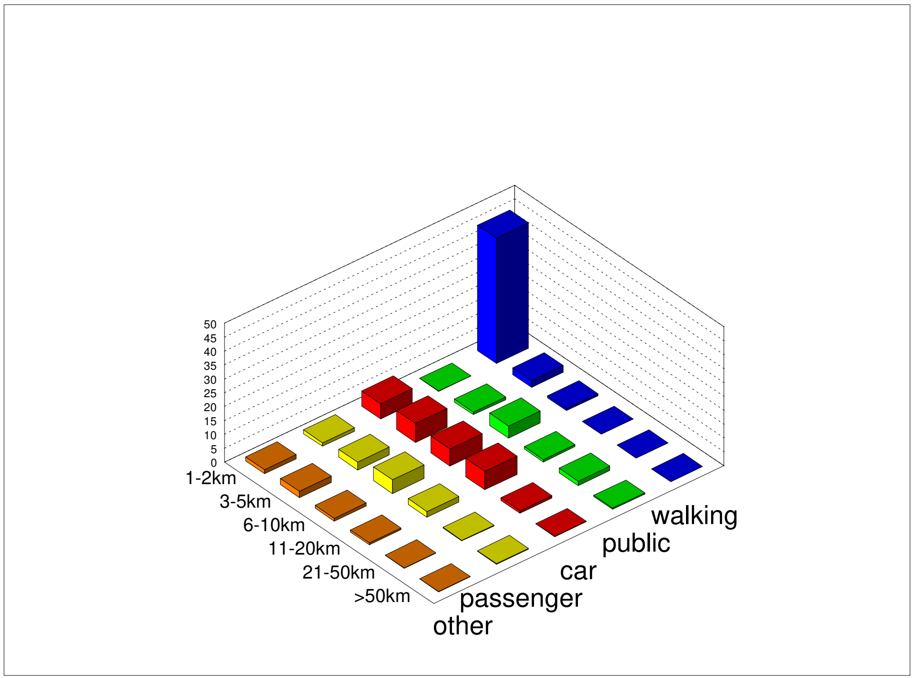

Figure 9: Modal choices with respect to trip length in Charleroi

In Charleroi (see Figure 9), we note a predominance of pedestrian trips (48%), especially short ones (94% of pedestrian trips). As for Belgium and Brussels, these short walking trips are most common. Furthermore, over 50% of all recorded trips are shorter than 3 km. The share of the car mode choice is relatively small (below 50%), except for trips between 11 and 20 km where it reaches 66%. Public transport is remarkably often chosen, especially for trips over 6 km. Multimodal trips only appear for distances over 20 km, but represents more than 70% of all such trips involving public transport. We finally note the importance of "passenger" mode (35%) for longer journeys (more than 50 km).

4.2.3 Influence of trip duration

The same analysis can be undertaken to measure the impact of trip duration on modal choice. To this aim, we consider six trip categories (according to their duration): less than 5 minutes, between 6 and 9 minutes, between 10 and 14 minutes, between 15 and 29 minutes, between 30 and 59 minutes, an hour or more. The distribution of trip modes vs duration is presented in Figures 10, 11 and 12. Again, the detailed results on which these figures are based can be found in Tables 27, 28 and 29 of Annex B.

We examine the case of Belgium first (Figure 10). We observe that the largest proportion of

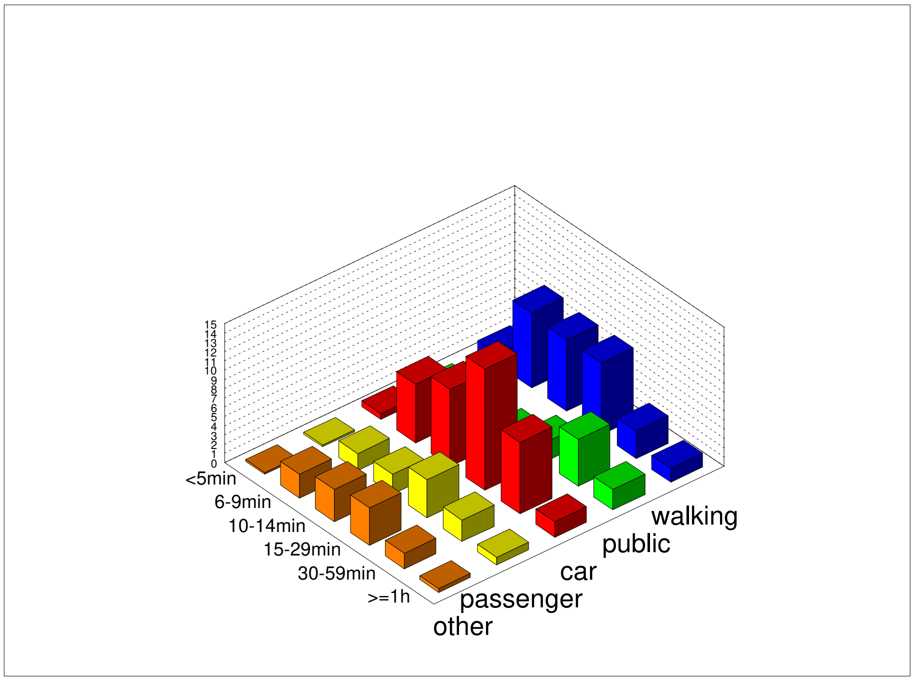

Figure 10: Modal choices with respect to the trip duration in Belgium

the trips (31%) takes between a quarter and half an hour. A large majority of trips (93%) lasts between 6 and 59 minutes. For the very short trips (less than 5 minutes), walking is the most frequently chosen mode (54%) but the car is also significantly often used (28%). For slightly longer trips (between 6 and 9 minutes), walking remains the most important mode but the use of the car increases. If we now consider even longer trips (from 10 to 14 minutes), this increase is enough for the car to be chosen more often that walking. Remarkably, public transport only appear significantly for trips exceeding half an hour and this mode increases in relative importance compared with car with trip duration: it indeed dominates for trips over an hour. In this category, multimodal trips are not marginal: they represent 25% of the recorded trips.

We note that although pedestrian trips are often less than 2 km (see table 24), their distribution is more diffuse for their duration. Finally, the most common kind of trip is driving a car between 15 and 29 minutes (13%)[10].

The situation in Brussels (see Figure 11) is quite comparable with that in Belgium as a whole, but we observe a shift from very short trips (less than 5 min.) to slightly longer ones (between 30 min. and one hour). We also note the predominance of walking (over or near 50%) for trips shorter than 15 minutes and of public transport (±40%) for trips over 30 minutes. Finally, multimodal trips are somewhat less frequent than in the case of Belgium.

The trips in Charleroi appear to be proportionally longer, as can be seen in Figure 12: 47% of all trips take between 15 and 29 minutes. This could be partly explained by the higher proportion

[10] All other kinds have a percentage less than 10%

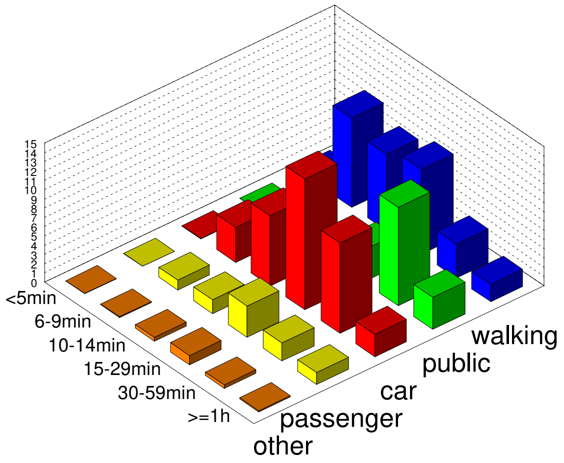

Figure 11: Modal choices with respect to the trip duration in Brussels

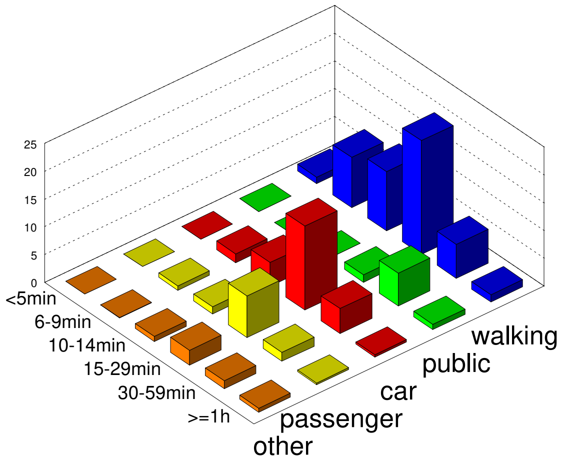

Figure 12: Modal choices with respect to the trip duration in Charleroi

of pedestrian trips, whose duration is more important for given origins and destinations. We note the surprising result that walking is most often chosen for the few trips of more than an hour! If the trip duration exceeds half an hour, public transport is also often used.

4.2.4 Influence of the user's age

The following factor that we wish to analyze is the age of the transportation user. Once again, we have chosen to consider six categories for this factor: under 20, between 20 and 30, between 31 to 40, between 41 and 50, between 51 to 60 and over 60 years. The repartition of the populations of the three studied areas into these categories is given in Table 14.

	Belgium	Brussels	Charleroi
under 20	8.5%	7.5%	8.0%
between 20 and 30	20.0%	18.5%	19.5%
between 31 and 40	17.0%	15.5%	15.5%
between 41 and 50	15.0%	14.0%	13.5%
between 51 and 60	15.5%	16.0%	17.0%
over 60	23.0%	28.0%	25.5%

Table 14: Distribution of the populations into age classes

The impact of age on modal choice is presented, for our three case studies, in Figures 13, 14 and 15. Detailed results can be found in Tables 30, 31 and 32 of Annex B.

In Belgium, a quarter of the trips are made by people between 20 and 30 years. We also observe that people between 20 and 40 years accomplish 46% of all the trips, although they represent only 37% of the population. The oldest part of the population (the 23% over 60 years) only generates 14% of all trips.

The pedestrian trips always represent more than 20% of the trips in each age class but are spectacularly often chosen by the people over 60 years (for more than an half their trips), for whom they are the most common kind of displacement. The youngest (under 20 years) are the most important public transport users (20% of their trips), while the share of the other age classes is around 10%. In public transport trips, multimodal ones are particularly significant in the 31-40 years class where they reach a 28% share. On the other hand, car is the most common transportation mode for people between 20 and 60 years. We also note that the passenger mode does not seem affected by the age factor (its share is rather stable around 10%). Finally, the "other" mode is the most chosen for people under 20 years (35% of their trips).

The situation in Brussels also shows that the 20-40 year classes are quite mobile (34% of the population generating 44% of the trips) and that people over 60 years are more sedentary (28% of the population for only 17% of the trips).

Once again, the pedestrian trips represent the most common kind of trips for people over 60 years (53% of their trips) but, in Brussels, they also are mostly chosen by teenagers (36% of

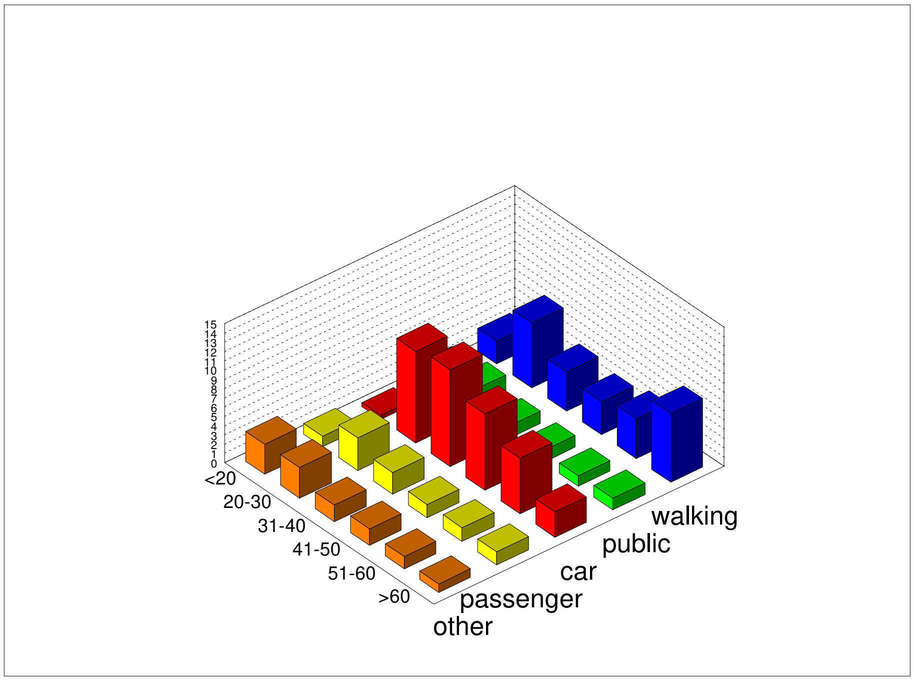

Figure 13: Modal choices with respect to the trip makers age in Belgium

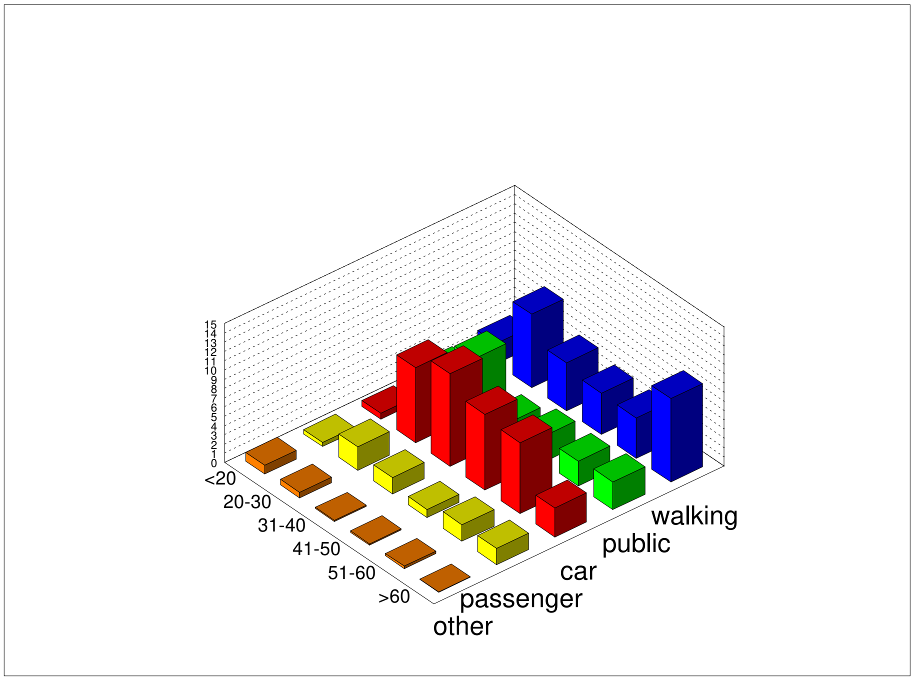

Figure 14: Modal choices with respect to the trip makers age in Brussels

their trips). The public transport has a quite good clientèle of people under 30 years (its part reaches 30% of the trips for people under 20 years and 24% for people between 20 and 30 years). In these public transport trips, the part of the multimodal journeys is quite important (36%) for people between 30 and 40 years. The car is the most common mode for people between 20 and 60 years and even represents more than an half of the trips for people between 30 and 50 years. The passenger mode's part is quite stable around 10% except for the 41-50 year class where it decreases to 5%. The "other" mode is only relevant for people under 20 years (16% of their trips).

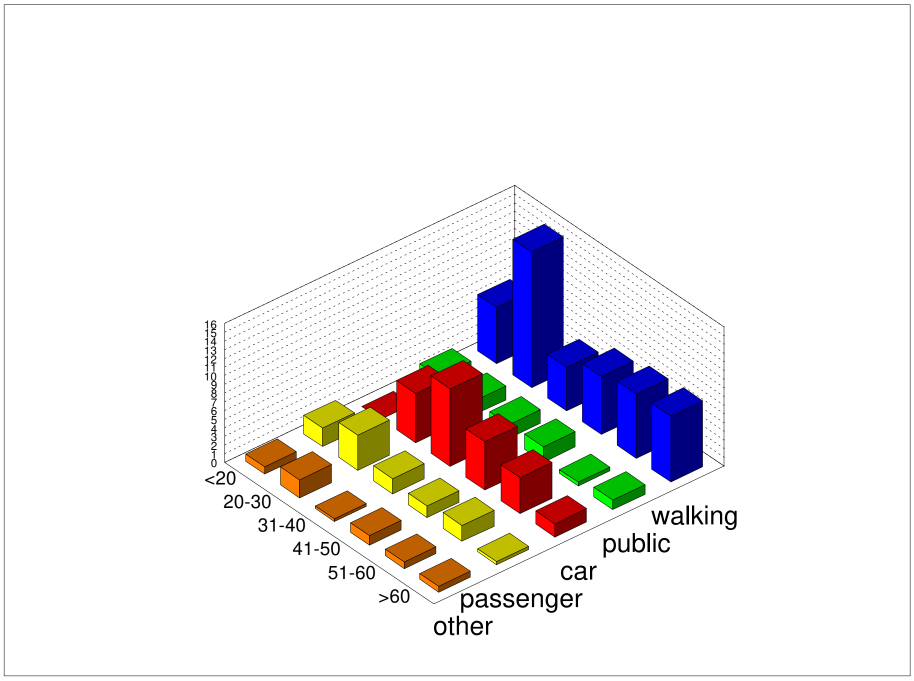

Figure 15: Modal choices with respect to the trip makers age in Charleroi

All classes of young people (under 40 years) are rather mobile in Charleroi. The people under 20 years represent 8% of the population but generate 11% of the trips; the 19.5% of the population between 20 and 30 years accomplish 29% of all trips and the 15.5% between 31 and 40 years, 18% of all trips. We also note that people over 60 years, which represent 25.5% of the population, only report 11% of the recorded trips. Walking is the most common mode in each class except for people between 31 and 40 years. Its relative part is even over 50% for people under 30 and over 50 years. The public transport share never exceeds 15%, with the best score for people under 20 years. We note the importance of multimodal trips involving public transport for people under 40 years[11]. The car is only predominant in the 31-40 years class (51% of all trips) and represents the second chosen mode for the other classes, except for people under 20 years where it is marginal. The car passenger mode is the second most important for the youngest people (19% of the trips for people under 20 years). The "other" mode share is quite stable around 7%, except for the

[11] But this kind of displacements is marginal for older people.

31-40 years class (only 2%).

4.2.5 Influence of car ownership

Finally, we analyze the influence of car ownership on modal choice. The number of cars owned by the surveyed households is shown in Table 15.

Owned cars	Belgium	Brussels	Charleroi
0	23.3%	25.5%	48.1%
1	59.0%	50.7%	47.1%
2	15.4%	20.9%	4.8%
3	2.0%	2.6%	0.0%
4	0.2%	0.3%	0.0%

Table 15: Percentages of the different number of owned cars

We can see in this table that more than 75% of Belgian households own at least a car, with a majority (59%) of households owning only one. In Brussels, there are a little more unmotorized people but the share of households with more than one car is more important (23.8%). The situation in Charleroi is quite different: almost half of the surveyed households don't own a car and none has more than two cars. This should be put in relation with the low score of car driving in the modal choice and the importance of walking in this city.

The influence of car ownership on modal choice is illustrated, for Belgium, Brussels and Charleroi, in Figures 16, 17 and 18. The detailed results are available in Tables 33, 34 and 35 of Annex B.

For Belgium as a whole, unmotorized people are a little under-represented in the trips (21% of the trips for 23.3% of the people) but the members of households owning two cars are relatively more mobile (18% of the trips for 15.4% of the population).

The members of unmotorized households use most often walking (55%), followed by public transport (18%) and "other" mode (also 18%). The use of car expectedly grows with ownership (from 43% when one car is owned to 63% when four are owned). We also note the second rank of pedestrian trips for all households owning at least one car. The share of public transport decreases with the number of owned cars but, with the proportion of multimodal trips only decreasing significantly for households owning three cars. The higher percentage of multimodal trips recorded for households owning four cars is probably an artifact due to the very small sample of such households. Finally, we notice that the most common kind of displacement is that using a car in an household owning a single car (25% of all recorded trips).

We now turn to the case of Brussels. we first note that, in this city, people from households with one car are slightly under-represented in the number of recorded trips, while individuals from families with two cars are slightly over-represented.

The pedestrian trips are dominant for people from unmotorized households (52% of their

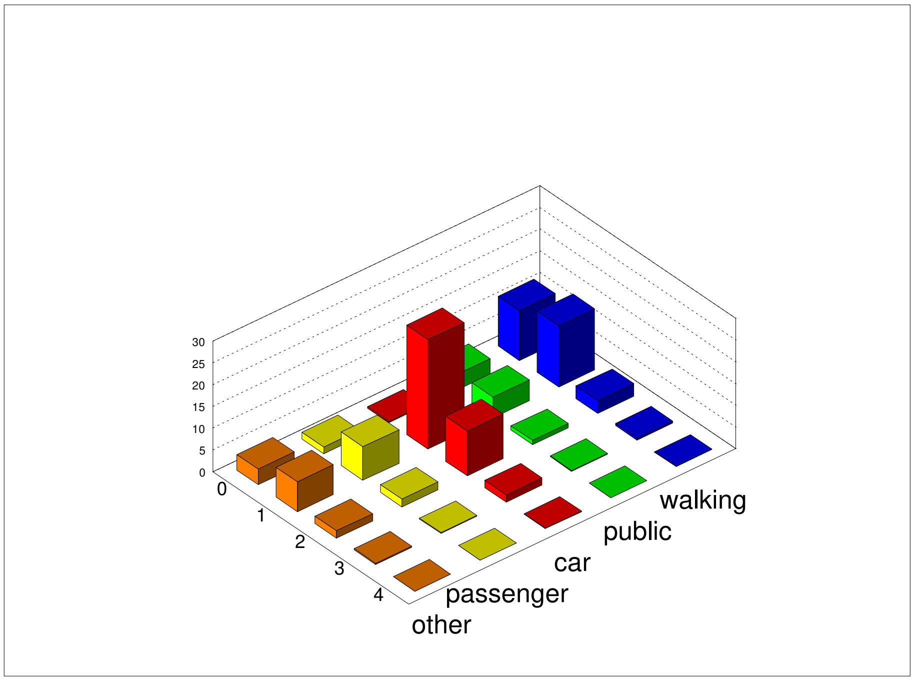

Figure 16: Modal choices with respect to car ownership in Belgium

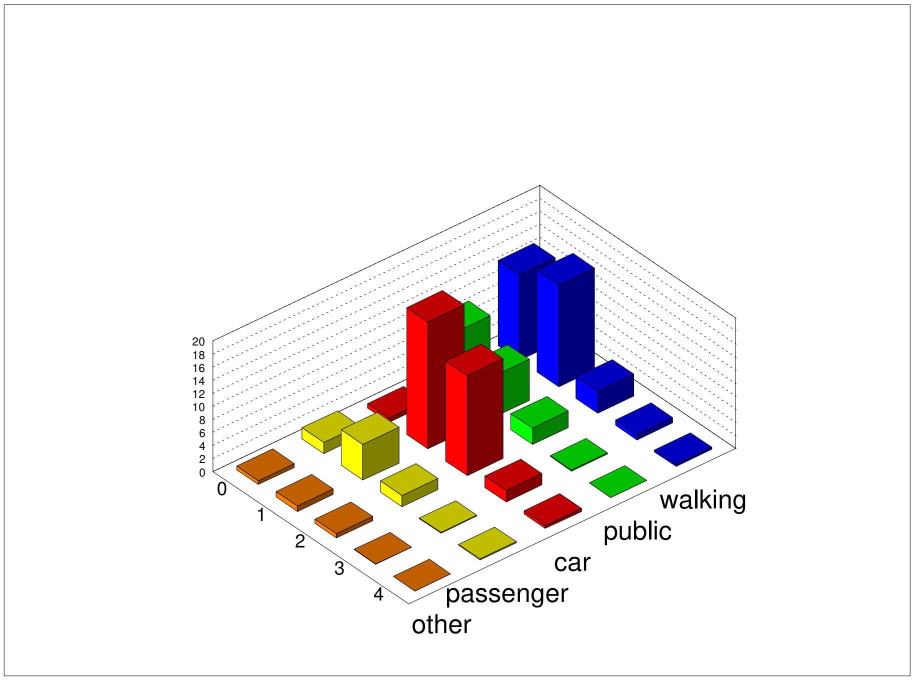

Figure 17: Modal choices with respect to car ownership in Brussels

trips) but remain significant for other categories (especially for households with one or four cars where their part is over 30%). The part of the public transport expectedly decreases with car ownership. It is remarkable that multimodal trips never represent an important part of the displacements involving public transport (the maximum is 14%). The car is the most commonly used mode for motorized households but this predominance is less marked for people from (the few) families with four cars (where the car represent only 51% of the trips). The share of the "passenger" mode is surprisingly the largest (17% of the trips) for these households. The "other" mode remains marginal and seems unaffected by the number of owned cars. This last point can maybe be explained by the difficulties of using bicycle of motorbike in the streets of the capital.

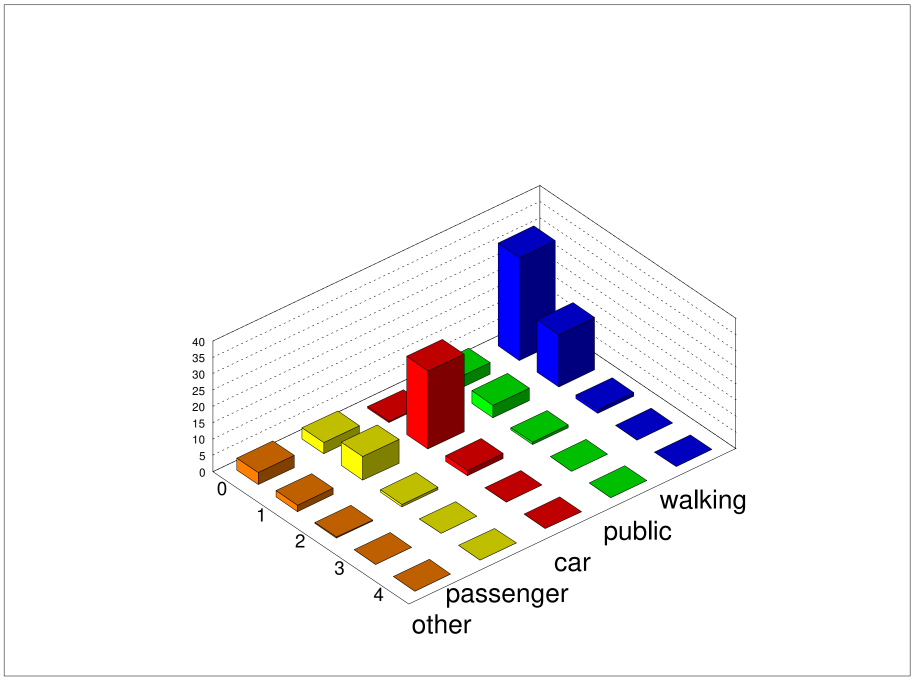

Figure 18: Modal choices with respect to car ownership in Charleroi

In Charleroi, we immediately note the absence, in the sample, of households with more than two cars. The families with two cars are also quite uncommon. This partly explain the small observed mobility rate and the recorded importance of walking.

As usual, people without cars in the household are under-represented in the recorded trips (they represent 48% of the sample but only generate 43% of the trips). Their trips are essentially pedestrian (74%). The part of all other modes is below 10%.

For people from motorized households, the most common mode is driving a car. But walking remains the second choice. However, the share of public transport somewhat surprisingly increases when car ownership increases, at the expense of car driving: public transports rise from 7% to 17% and car use drops from 45% to 36%.

Finally, let us note that similar studies of different factors have been realized, in [4] and [3], for the city of Brussels, its periphery and Charleroi. The emphasis is put, in this work, on the influence of these factors on mobility rather than on modal choice, but the conclusions drawn on this last aspect are not incompatible with ours.

5 Other aspects of the "Énergie" survey

We now further exploit the general database for Belgium. We firstly examine the influence of sex and social origin on modal choices. We also have a closer look at multimodal trips involving car use followed by a public transport.

Table 16 shows that women walk more than men. But, most noticeably, men drive the household car twice more often than women while women are three times more frequently passenger than men. The gender seems to have weak influence on the use of public transport or "other" mode.

	Women	Men
Walking	22%	12%
Public transport	19%	16%
with another mode	*3%*	*3%*
Car	26%	54%
Passenger	21%	7%
Other	11%	11%

Table 16: Modal choices in function of gender

The last factor we study is the variation of modal choice across working people and students. The results from Table 17 show that students constitute a good clientèle for public transports, that they don't use the car often but rather the "other" mode (bicycle, motorbike, ...). The percentages for working people are quite surprising. The most commonly chosen mode is walking (26%) while the share of the car is only 22%. Working people are also more often passengers than students.

	Students	Working people
Walking	15%	26%
Public transport	38%	19%
with another mode	*4%*	*2%*
Car	9%	22%
Passenger	16%	19%
Other	21%	14%

Table 17: Modal choices for students and working people

We finally investigate multimodal trips made using the car first, followed by public transport.

About half (48%) of them take place during the morning peak hours (7 to 9 am). The majority of the others (34%) start earlier (between 4 and 7 am). Most often, the specific public transport used is the train (81%) and the trip is an usual one made each day. The car displacement is often very short (less than 10 km) and the average length of the trip with the train is 51 km. 35% of such trips end by walking 1 or 2 km. 75% of the households making such modal choices come from the flemish region and 58% own one car. Almost all people recording such trips are white collars, 69% of which are men. Their average age is 37 years.

6 Conclusion

It is difficult to draw solid conclusions on the temporal evolution of displacements from the surveys made in Brussels and in Charleroi since the sample are not equivalent. The differences in social structuration probably influence the difference in observed behaviour.

We have also examined, in this paper, the impact of various determinants of transportation behaviour in Belgium as a whole, in Brussels and in Charleroi. This study brings useful insights in this otherwise little explored subject, even if the conclusions depending on the S.P.P.S. survey of Charleroi in 1986 must be tempered because of the small size and bias of the sample.

Despite its shortcomings, the S.P.P.S. "Énergie" survey appears to be crucially interesting, because of its unique character. The conclusions drawn from the travel diaries on travel behaviour in Belgium and Brussels seem of particular value.

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A Definition of the surveyed zones in terms of municipalities

We present here the list of municipalities of the areas covered by the STRATEC survey, and for which we extracted data from the S.P.P.S. database.

Brussels area	Anderlecht
	Auderghem
	Berchem Sainte Agathe
	Bruxelles
	Etterbeek
	Evere
	Forest
	Ganshoren
	Ixelles
	Jette
	Koekelberg
	Molenbeek Saint Jean
	Saint Gilles
	Saint Josse Ten Noode
	Schaerbeek
	Uccle
	Watermael Boistfort
	Woluwe Saint Lambert
	Woluwe Saint Pierre
Charleroi area	Chapelle lez Herlaimont
	Charleroi
	Châtelet
	Courcelles
	Farciennes
	Fleurus
	Fontaine l'Evêque
	Gerpinnes
	Les Bons Villers
	Montigny le Tilleul
	Pont à Celles
	Thuin

B Tables

In all the following tables, we use the same conventions. Each cell contains three numbers. If the cell c is at the intersection of row X and column n, these numbers correspond respectively to

- the percentage of journeys in cell c taken relatively to all the journeys in row X: this number is printed in "roman" font.
- the percentage of journeys in cell c taken relatively to all the journeys in column n: this number is printed in *"italic" font.*
- the percentage of journeys in cell c taken relatively to all the journeys in the table: this number is printed in **"bold" font.**

	home	work	school	other	total
home	4%	42%	3%	50%	100%
	4%	*92%*	*93%*	*78%*	*47%*
	2%	**20%**	**1%**	**24%**	**47%**
work	87%	3%	0%	10%	100%
	42%	*3%*	*0%*	*7%*	*22%*
	19%	**1%**	**0%**	**2%**	**22%**
school	94%	0%	0%	6%	100%
	3%	*0%*	*0%*	*0%*	*2%*
	2%	**0%**	**0%**	**0%**	**2%**
other	80%	4%	0%	16%	100%
	51%	*5%*	*7%*	*15%*	*29%*
	24%	**1%**	**0%**	**5%**	**29%**
total	46%	21%	2%	31%	100%
	100%	*100%*	*100%*	*100%*	*100%*
	46%	**21%**	**2%**	**31%**	**100%**

Table 18: Trip purposes in Brussels in 1986

	home	work	school	other	total
home	0%	49%	8%	43%	100%
	0%	*85%*	*87%*	*73%*	*45%*
	0%	**22%**	**4%**	**19%**	**45%**
work	80%	9%	1%	10%	100%
	47%	*9%*	*3%*	*10%*	*25%*
	20%	**2%**	**0%**	**3%**	**25%**
school	83%	0%	3%	14%	100%
	8%	*0%*	*3%*	*2%*	*4%*
	3%	**0%**	**0%**	**1%**	**4%**
other	78%	6%	1%	15%	100%
	46%	*6%*	*7%*	*15%*	*26%*
	20%	**2%**	**0%**	**4%**	**26%**
total	44%	26%	4%	26%	100%
	100%	*100%*	*100%*	*100%*	*100%*
	44%	**26%**	**4%**	**26%**	**100%**

Table 19: Trip purposes in Brussels in 1991

	home	work	school	other	total
home	3%	32%	8%	57%	100%
	3%	*93%*	*95%*	*83%*	*47%*
	2%	**15%**	**4%**	**27%**	**47%**
work	83%	0%	0%	16%	100%
	35%	*0%*	*0%*	*10%*	*20%*
	17%	**0%**	**0%**	**3%**	**20%**
school	100%	0%	0%	0%	100%
	9%	*0%*	*0%*	*0%*	*4%*
	4%	**0%**	**0%**	**0%**	**4%**
other	88%	4%	1%	8%	100%
	53%	*7%*	*5%*	*7%*	*29%*
	25%	**1%**	**0%**	**2%**	**29%**
total	48%	16%	4%	32%	100%
	100%	*100%*	*100%*	*100%*	*100%*
	48%	**16%**	**4%**	**32%**	**100%**

Table 20: Trip purposes in Charleroi in 1986

	home	work	school	other	total
home	1%	44%	9%	47%	100%
	1%	*90%*	*99%*	*80%*	*46%*
	0%	**20%**	**4%**	**21%**	**46%**
work	89%	5%	0%	6%	100%
	43%	*5%*	*0%*	*5%*	*23%*
	20%	**1%**	**0%**	**1%**	**23%**
school	97%	0%	0%	3%	100%
	9%	*0%*	*0%*	*0%*	*4%*
	4%	**0%**	**0%**	**0%**	**4%**
other	81%	5%	0%	15%	100%
	47%	*6%*	*1%*	*15%*	*27%*
	22%	**1%**	**0%**	**4%**	**27%**
total	46%	23%	4%	27%	100%
	100%	*100%*	*100%*	*100%*	*100%*
	46%	**23%**	**4%**	**27%**	**100%**

Table 21: Trip purposes in Charleroi in 1990

	home	work	school	other	total
home	4%	60%	1%	35%	100%
	4%	*92%*	*72%*	*71%*	*47%*
	2%	**28%**	**0%**	**16%**	**47%**
work	85%	3%	0%	13%	100%
	56%	*3%*	*0%*	*17%*	*30%*
	26%	**1%**	**0%**	**4%**	**30%**
school	100%	0%	0%	0%	100%
	1%	*0%*	*0%*	*0%*	*1%*
	1%	**0%**	**0%**	**0%**	**1%**
other	79%	7%	1%	13%	100%
	39%	*6%*	*28%*	*13%*	*23%*
	18%	**2%**	**0%**	**3%**	**23%**
total	46%	30%	1%	23%	100%
	100%	*100%*	*100%*	*100%*	*100%*
	46%	**30%**	**1%**	**23%**	**100%**

Table 22: Trip purposes for employees in Brussels in 1986

	home	work	school	other	total
home	0% *0%* **0%**	77% *87%* **34%**	2% *55%* **1%**	21% *57%* **9%**	100% *44%* **44%**
work	82% *72%* **31%**	6% *6%* **2%**	1% *19%* **0%**	11% *26%* **4%**	100% *38%* **38%**
school	53% *2%* **1%**	1% *0%* **0%**	15% *14%* **0%**	32% *3%* **0%**	100% *2%* **2%**
other	69% *26%* **11%**	17% *7%* **3%**	1% *11%* **0%**	14% *13%* **2%**	100% *16%* **16%**
total	43% *100%* **43%**	39% *100%* **39%**	2% *100%* **2%**	16% *100%* **16%**	100% *100%* **100%**

Table 23: Trip purposes for employees in Brussels in 1991

In the following tables, the percentages related to the use of public transport in combination with another mode[12] are indicated with four numbers. The first three correspond to the different percentages already explained above for all cells in all arrays. The fourth represents the part of the modal choice "public transport +o ther mode" in all public transport trips. This last percentage is indicated in ``typewriter'' font.

	1 - 2 km	3 - 5 km	6 - 10 km	11 - 20 km	21 - 50 km	> 50 km	**Total**
walking	87%	11%	2%	0%	0%	0%	100%
	60%	*13%*	*3%*	*1%*	*0%*	*0%*	*28%*
	25%	**3%**	**0%**	**0%**	**0%**	**0%**	**28%**
public transport	3%	25%	30%	18%	15%	9%	100%
	1%	*10%*	*18%*	*17%*	*22%*	*27%*	*10%*
	0%	**2%**	**3%**	**2%**	**1%**	**1%**	**10%**
with another mode	0%	6%	23%	15%	36%	19%	100%
	0%	*0%*	*2%*	*2%*	*8%*	*9%*	*2%*
	0%	**0%**	**0%**	**0%**	**1%**	**0%**	**2%**
	`1%`	`4%`	`12%`	`13%`	`38%`	`32%`	`16%`
car	21%	28%	22%	15%	10%	4%	100%
	20%	*46%*	*52%*	*58%*	*58%*	*47%*	*38%*
	8%	**11%**	**8%**	**6%**	**4%**	**2%**	**38%**
passenger	21%	26%	20%	16%	10%	6%	100%
	6%	*13%*	*15%*	*19%*	*17%*	*21%*	*12%*
	2%	**3%**	**2%**	**2%**	**1%**	**1%**	**12%**
other	45%	34%	15%	4%	2%	1%	100%
	14%	*18%*	*12%*	*5%*	*3%*	*4%*	*12%*
	6%	**4%**	**2%**	**0%**	**0%**	**0%**	**12%**
Total	41%	23%	16%	10%	7%	3%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
	41%	**23%**	**16%**	**10%**	**7%**	**3%**	**100%**

Table 24: Modal choices with respect to the trip length for Belgium

[12] which are part of the total "public transport" percentages

	1 - 2 km	3 - 5 km	6 - 10 km	11 - 20 km	21 - 50 km	> 50 km	**Total**
walking	87%	12%	1%	0%	0%	0%	100%
	71%	*14%*	*1%*	*1%*	*0%*	*0%*	*30%*
	26%	**4%**	**0%**	**0%**	**0%**	**0%**	**30%**
public transport	4%	31%	43%	16%	1%	6%	100%
	2%	*22%*	*39%*	*32%*	*4%*	*24%*	*19%*
	1%	**6%**	**8%**	**3%**	**0%**	**1%**	**19%**
with another mode	1%	24%	61%	9%	1%	4%	100%
	0%	*2%*	*6%*	*2%*	*1%*	*2%*	*2%*
	0%	**0%**	**1%**	**0%**	**0%**	**0%**	**2%**
	2%	9%	16%	6%	16%	7%	11%
car	19%	30%	26%	14%	6%	5%	100%
	21%	*47%*	*49%*	*59%*	*65%*	*49%*	*40%*
	8%	**12%**	**10%**	**5%**	**2%**	**2%**	**40%**
passenger	20%	34%	18%	7%	10%	11%	100%
	5%	*13%*	*9%*	*7%*	*29%*	*25%*	*10%*
	2%	**3%**	**2%**	**1%**	**1%**	**1%**	**10%**
other	17%	47%	24%	6%	2%	3%	100%
	1%	*4%*	*2%*	*1%*	*1%*	*2%*	*2%*
	0%	**1%**	**0%**	**0%**	**0%**	**0%**	**2%**
Total	37%	26%	21%	9%	3%	4%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
	37%	**26%**	**21%**	**9%**	**3%**	**4%**	**100%**

Table 25: Modal choices with respect to the trip length for Brussels

	1 - 2 km	3 - 5 km	6 - 10 km	11 - 20 km	21 - 50 km	> 50 km	**Total**
walking	94%	5%	1%	0%	0%	0%	100%
	85%	*16%*	*4%*	*0%*	*0%*	*0%*	*48%*
	45%	**2%**	**1%**	**0%**	**0%**	**0%**	**48%**
public transport	0%	12%	53%	10%	20%	4%	100%
	0%	*7%*	*25%*	*8%*	*54%*	*35%*	*8%*
	0%	**1%**	**4%**	**1%**	**2%**	**0%**	**8%**
with another mode	0%	0%	17%	2%	69%	12%	100%
	0%	*0%*	*2%*	*0%*	*42%*	*25%*	*2%*
	0%	**0%**	**0%**	**0%**	**1%**	**0%**	**2%**
	0%	0%	7%	4%	78%	70%	22%
car	21%	26%	24%	26%	4%	1%	100%
	10%	*44%*	*36%*	*66%*	*31%*	*19%*	*26%*
	5%	**7%**	**6%**	**7%**	**1%**	**0%**	**26%**
passenger	11%	24%	43%	17%	2%	3%	100%
	2%	*19%*	*29%*	*20%*	*7%*	*35%*	*12%*
	1%	**3%**	**5%**	**2%**	**0%**	**0%**	**12%**
other	26%	39%	17%	12%	4%	2%	100%
	3%	*15%*	*6%*	*7%*	*8%*	*12%*	*6%*
	2%	**2%**	**1%**	**1%**	**0%**	**0%**	**6%**
Total	53%	15%	17%	10%	3%	1%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
	53%	**15%**	**17%**	**10%**	**3%**	**1%**	**100%**

Table 26: Modal choices with respect to the trip length for Charleroi

	< 5 min.	6-9 min.	10-14 min.	15-29 min.	30-59 min.	≥ 1 h.	**Total**
walking	4%	28%	26%	27%	10%	5%	100%
	54%	*43%*	*35%*	*25%*	*15%*	*22%*	*29%*
	1%	**8%**	**8%**	**8%**	**3%**	**1%**	**29%**
public transport	0%	0%	3%	21%	53%	23%	100%
	0%	*0%*	*1%*	*7%*	*26%*	*33%*	*10%*
	0%	**0%**	**0%**	**2%**	**5%**	**2%**	**10%**
with another mode	0%	0%	0%	11%	53%	36%	100%
	0%	*0%*	*0%*	*1%*	*4%*	*8%*	*1%*
	0%	**0%**	**0%**	**0%**	**1%**	**1%**	**1%**
	0%	0%	0%	8%	15%	25%	15%
car	2%	17%	22%	35%	20%	4%	100%
	28%	*34%*	*38%*	*42%*	*39%*	*26%*	*38%*
	1%	**6%**	**8%**	**13%**	**8%**	**2%**	**38%**
passenger	2%	16%	19%	36%	20%	7%	100%
	8%	*10%*	*10%*	*13%*	*12%*	*13%*	*11%*
	0%	**2%**	**2%**	**4%**	**2%**	**1%**	**11%**
other	2%	21%	28%	32%	14%	3%	100%
	10%	*14%*	*16%*	*13%*	*9%*	*6%*	*12%*
	0%	**3%**	**3%**	**4%**	**2%**	**0%**	**12%**
Total	2%	19%	22%	31%	20%	7%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
	2%	**19%**	**22%**	**31%**	**20%**	**7%**	**100%**

Table 27: Modal choices with respect to the trip duration for Belgium

	< 5 min.	6-9 min.	10-14 min.	15-29 min.	30-59 min.	≥ 1 h.	**Total**
walking	2%	29%	25%	28%	11%	6%	100%
	84%	*66%*	*45%*	*30%*	*14%*	*20%*	*33%*
	1%	**10%**	**8%**	**9%**	**4%**	**2%**	**33%**
public transport	0%	0%	3%	19%	59%	19%	100%
	1%	*0%*	*3%*	*11%*	*40%*	*38%*	*18%*
	0%	**0%**	**0%**	**3%**	**11%**	**3%**	**18%**
with another mode	0%	0%	0%	31%	55%	15%	100%
	0%	*0%*	*0%*	*2%*	*4%*	*3%*	*2%*
	0%	**0%**	**0%**	**1%**	**1%**	**0%**	**2%**
	0%	0%	0%	17%	10%	8%	11%
car	0%	10%	20%	37%	26%	6%	100%
	5%	*26%*	*42%*	*45%*	*37%*	*26%*	*38%*
	0%	**4%**	**8%**	**14%**	**10%**	**2%**	**38%**
passenger	0%	12%	16%	37%	21%	14%	100%
	3%	*7%*	*8%*	*11%*	*7%*	*14%*	*9%*
	0%	**1%**	**2%**	**3%**	**2%**	**1%**	**9%**
other	2%	5%	20%	48%	19%	7%	100%
	7%	*1%*	*2%*	*3%*	*1%*	*2%*	*2%*
	0%	**0%**	**0%**	**1%**	**0%**	**0%**	**2%**
Total	1%	15%	18%	31%	26%	9%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
	1%	**15%**	**18%**	**31%**	**26%**	**9%**	**100%**

Table 28: Modal choices with respect to the trip duration for Brussels

	< 5 min.	6-9 min.	10-14 min.	15-29 min.	30-59 min.	≥ 1 h.	**Total**
walking	2%	18%	22%	42%	13%	3%	100%
	100%	*79%*	*63%*	*43%*	*31%*	*34%*	*49%*
	1%	**9%**	**11%**	**21%**	**6%**	**1%**	**49%**
public transport	0%	0%	0%	17%	71%	11%	100%
	0%	*0%*	*0%*	*3%*	*30%*	*25%*	*8%*
	0%	**0%**	**0%**	**1%**	**6%**	**1%**	**8%**
with another mode	0%	0%	0%	0%	66%	34%	100%
	0%	*0%*	*0%*	*0%*	*6%*	*17%*	*2%*
	0%	**0%**	**0%**	**0%**	**1%**	**1%**	**2%**
	--	--	0%	0%	21%	66%	22%
car	0%	6%	16%	58%	17%	2%	100%
	0%	*14%*	*25%*	*32%*	*23%*	*12%*	*26%*
	0%	**2%**	**4%**	**15%**	**4%**	**0%**	**26%**
passenger	0%	7%	11%	66%	14%	3%	100%
	0%	*7%*	*7%*	*16%*	*8%*	*8%*	*11%*
	0%	**1%**	**1%**	**8%**	**2%**	**0%**	**11%**
other	0%	1%	15%	46%	25%	13%	100%
	0%	*0%*	*5%*	*6%*	*7%*	*20%*	*6%*
	0%	**0%**	**1%**	**3%**	**1%**	**1%**	**6%**
Total	1%	11%	17%	47%	19%	4%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
	1%	**11%**	**17%**	**47%**	**19%**	**4%**	**100%**

Table 29: Modal choices with respect to the trip duration for Charleroi

	< 20	20 - 30	31 - 40	41 - 50	51 - 60	> 60	**Total**
walking	9%	24%	15%	12%	15%	25%	100%
	27%	*26%*	*21%*	*22%*	*30%*	*54%*	*29%*
	2%	**7%**	**4%**	**4%**	**4%**	**7%**	**29%**
public transport	20%	28%	14%	13%	12%	13%	100%
	20%	*10%*	*7%*	*8%*	*8%*	*9%*	*10%*
	2%	**3%**	**1%**	**1%**	**1%**	**1%**	**10%**
with another mode	17%	33%	23%	10%	12%	6%	100%
	3%	*2%*	*2%*	*1%*	*1%*	*1%*	*2%*
	0%	**1%**	**0%**	**0%**	**0%**	**0%**	**2%**
	15%	20%	28%	13%	18%	8%	17%
car	1%	26%	28%	22%	16%	7%	100%
	5%	*37%*	*52%*	*50%*	*42%*	*20%*	*38%*
	0%	**10%**	**10%**	**8%**	**6%**	**3%**	**38%**
passenger	10%	31%	20%	13%	13%	13%	100%
	13%	*13%*	*11%*	*9%*	*10%*	*10%*	*11%*
	1%	**4%**	**2%**	**1%**	**1%**	**1%**	**11%**
other	26%	27%	14%	14%	11%	7%	100%
	35%	*13%*	*9%*	*11%*	*9%*	*7%*	*12%*
	3%	**3%**	**2%**	**2%**	**1%**	**1%**	**12%**
Total	9%	26%	20%	16%	14%	14%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
	9%	**26%**	**20%**	**16%**	**14%**	**14%**	**100%**

Table 30: Modal choices with respect to the trip makers age for Belgium

	< 20	20 - 30	31 - 40	41 - 50	51 - 60	> 60	**Total**
walking	7%	24%	16%	14%	13%	27%	100%
	36%	*31%*	*28%*	*27%*	*26%*	*53%*	*33%*
	2%	**8%**	**5%**	**4%**	**4%**	**9%**	**33%**
public transport	10%	34%	10%	15%	15%	17%	100%
	30%	*24%*	*9%*	*17%*	*16%*	*18%*	*18%*
	2%	**6%**	**2%**	**3%**	**3%**	**3%**	**18%**
with another mode	7%	29%	28%	1%	10%	25%	100%
	2%	*2%*	*3%*	*0%*	*1%*	*3%*	*2%*
	0%	**1%**	**1%**	**0%**	**0%**	**1%**	**2%**
	8%	10%	36%	1%	8%	18%	12%
car	2%	22%	27%	22%	20%	8%	100%
	10%	*32%*	*53%*	*50%*	*46%*	*19%*	*38%*
	1%	**8%**	**10%**	**8%**	**8%**	**3%**	**38%**
passenger	5%	28%	19%	10%	19%	19%	100%
	8%	*10%*	*9%*	*5%*	*11%*	*10%*	*9%*
	0%	**3%**	**2%**	**1%**	**2%**	**2%**	**9%**
other	46%	30%	5%	7%	12%	1%	100%
	16%	*2%*	*1%*	*1%*	*2%*	*0%*	*2%*
	1%	**1%**	**0%**	**0%**	**0%**	**0%**	**2%**
Total	6%	25%	19%	16%	17%	17%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
	6%	**25%**	**19%**	**16%**	**17%**	**17%**	**100%**

Table 31: Modal choices with respect to the trip makers age for Brussels

	< 20	20 - 30	31 - 40	41 - 50	51 - 60	> 60	**Total**
walking	13%	32%	10%	14%	15%	16%	100%
	58%	*54%*	*29%*	*41%*	*51%*	*67%*	*49%*
	6%	**16%**	**5%**	**7%**	**7%**	**8%**	**49%**
public transport	21%	20%	20%	22%	5%	13%	100%
	15%	*6%*	*9%*	*11%*	*3%*	*10%*	*8%*
	2%	**2%**	**2%**	**2%**	**0%**	**1%**	**8%**
with another mode	33%	26%	40%	0%	0%	1%	100%
	6%	*2%*	*5%*	*0%*	*0%*	*0%*	*2%*
	1%	**1%**	**1%**	**0%**	**0%**	**0%**	**2%**
	42%	35%	54%	0%	0%	3%	27%
car	0%	22%	35%	22%	16%	6%	100%
	0%	*20%*	*51%*	*34%*	*28%*	*14%*	*26%*
	0%	**6%**	**9%**	**6%**	**4%**	**2%**	**26%**
passenger	19%	35%	15%	12%	16%	3%	100%
	19%	*14%*	*10%*	*8%*	*12%*	*3%*	*11%*
	2%	**4%**	**2%**	**1%**	**2%**	**0%**	**11%**
other	15%	36%	5%	19%	14%	12%	100%
	8%	*7%*	*2%*	*7%*	*6%*	*6%*	*6%*
	1%	**2%**	**0%**	**1%**	**1%**	**1%**	**6%**
Total	11%	29%	18%	16%	15%	11%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
	11%	**29%**	**18%**	**16%**	**15%**	**11%**	**100%**

Table 32: Modal choices with respect to the trip makers age for Charleroi

	0	1	2	3	4	**Total**
walking	39%	49%	10%	2%	0%	100%
	55%	*24%*	*17%*	*17%*	*21%*	*29%*
	11%	**14%**	**3%**	**0%**	**0%**	**29%**
public transport	38%	50%	10%	1%	0%	100%
	18%	*8%*	*5%*	*4%*	*3%*	*10%*
	4%	**5%**	**1%**	**0%**	**0%**	**10%**
with another mode	26%	58%	15%	1%	0%	100%
	2%	*2%*	*1%*	*0%*	*1%*	*2%*
	0%	**1%**	**0%**	**0%**	**0%**	**2%**
	12%	20%	26%	7%	26%	17%
car	1%	67%	27%	5%	0%	100%
	2%	*43%*	*58%*	*60%*	*63%*	*38%*
	0%	**25%**	**10%**	**2%**	**0%**	**38%**
passenger	14%	68%	16%	2%	0%	100%
	7%	*13%*	*10%*	*8%*	*11%*	*11%*
	2%	**8%**	**2%**	**0%**	**0%**	**11%**
other	29%	55%	13%	2%	0%	100%
	18%	*12%*	*9%*	*10%*	*1%*	*12%*
	4%	**7%**	**2%**	**0%**	**0%**	**12%**
Total	21%	59%	18%	3%	0%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*
	21%	**59%**	**18%**	**3%**	**0%**	**100%**

Table 33: Modal choices with respect to car ownership in Belgium

	0	1	2	3	4	**Total**
walking	39%	47%	10%	2%	1%	100%
	52%	*33%*	*14%*	*27%*	*31%*	*33%*
	13%	**16%**	**3%**	**1%**	**0%**	**33%**
public transport	50%	35%	14%	1%	0%	100%
	36%	*13%*	*11%*	*5%*	*0%*	*18%*
	9%	**6%**	**2%**	**0%**	**0%**	**18%**
with another mode	48%	42%	10%	0%	0%	100%
	4%	*2%*	*1%*	*0%*	*0%*	*2%*
	1%	**1%**	**0%**	**0%**	**0%**	**2%**
	12%	14%	9%	0%	--	12%
car	2%	52%	41%	5%	1%	100%
	3%	*41%*	*65%*	*61%*	*51%*	*38%*
	1%	**19%**	**15%**	**2%**	**0%**	**38%**
passenger	18%	60%	19%	2%	2%	100%
	7%	*12%*	*7%*	*5%*	*17%*	*9%*
	2%	**6%**	**2%**	**0%**	**0%**	**9%**
other	28%	39%	30%	2%	0%	100%
	2%	*2%*	*3%*	*2%*	*0%*	*2%*
	1%	**1%**	**1%**	**0%**	**0%**	**2%**
Total	25%	48%	23%	3%	1%	100%
	100%	*100%*	*100%*	*100%*	*100%*	*100%*
	25%	**48%**	**23%**	**3%**	**1%**	**100%**

Table 34: Modal choices with respect to car ownership in Brussels

	0	1	2	3	4	**Total**
walking	65%	33%	2%	0%	0%	100%
	74%	*30%*	*26%*	–	–	*49%*
	32%	**16%**	**1%**	**0%**	**0%**	**49%**
public transport	43%	47%	9%	0%	0%	100%
	8%	*7%*	*17%*	–	–	*8%*
	4%	**4%**	**1%**	**0%**	**0%**	**8%**
with another mode	1%	73%	26%	0%	0%	100%
	0%	*3%*	*13%*	–	–	*2%*
	0%	**2%**	**1%**	**0%**	**0%**	**2%**
	1%	41%	73%	--	--	27%
car	1%	92%	6%	0%	0%	100%
	1%	*45%*	*36%*	–	–	*26%*
	0%	**24%**	**2%**	**0%**	**0%**	**26%**
passenger	30%	64%	7%	0%	0%	100%
	8%	*14%*	*17%*	–	–	*11%*
	3%	**7%**	**1%**	**0%**	**0%**	**11%**
other	64%	32%	4%	0%	0%	100%
	9%	*4%*	*5%*	–	–	*6%*
	4%	**2%**	**0%**	**0%**	**0%**	**6%**
Total	43%	53%	4%	0%	0%	100%
	100%	*100%*	*100%*	–	–	*100%*
	43%	**53%**	**4%**	**0%**	**0%**	**100%**

Table 35: Modal choices with respect to car ownership in Charleroi