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E6 : Case Studies

**Atlantic-TGV and mobility trends:
The influence of crisis and of mode competition**

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INTRODUCTION

Thanks to the funding of the Ministry of Transportation, the Laboratoire d'Economie des Transports could carry out in September 1989, and then in September 1993 a passenger survey into the West and the South-west of France, right before the start of the first branch (western branch: Paris -Le Mans) of the new line, and then three years after the start of the second branch of the Atlantic TGV which took place in 1990 (south-western branch: Paris-Tours).

The purpose of this paper is to exhibit the main changes in mobility revealed by the comparison of the results of the two waves of survey [Klein, Claisse, 1997]. It begins with a brief presentation of the main characteristics of the survey. Then, the results are split according to 3 geographical areas a significantly different distance from Paris. Within each of them, the three main purposes of travel (business, commuting, and private) are successively considered. Last, the conclusion relates the observations carried out on the Atlantic-TGV to the knowledge already gathered concerning long-distance mobility and high-speed rail services. It basically confirms the characteristics of " high speed mobility " as well as the fact that many elements outside the sphere of transport have a definite influence on mobility dynamics.

1 AN ORIGINAL SURVEY

This research belongs to a stream highlighting the whole transformations due to the generalisation of high-speed rail travel. The following technical list summarises the main characteristics of the data collected. The survey is of a before/after type, co-ordinated on the three transport modes. It was carried out according to methods appropriate to each of them: surveys inside the trains (distributing and collecting the questionnaire during the trip), surveys in departure lounges in airports and, on the motorways, distribution of the mail-back questionnaires at the toll. In order to avoid double counts, the survey proceeded in the provinces-Paris direction only. Provinces-Paris journeys were thus observed at the moment of departure, Paris-provinces trips, at the time of return. More than 15,000 questionnaires were thus collected in 1989 and more than 18,000 in 1993.

TECHNICAL DATA SHEET

1 Survey dates							
1989				1993			
Sunday, Sept. 17 ,from 2 to 12PM				Sunday, Sept. 19,from 2PM to 12PM			
Monday, Sept. 18 ,from 6AM to 1PM				Monday, Sept. 20,from 6AM to 1PM			
Tuesday, Sept. 19, from 6AM to 12 PM				Tuesday, Sept. 21,from 6AM to 12PM			
2 Average survey rate by transport mode							
train : passengers 1/4, trains 1/2							
plane : passengers 1/3, planes 1/1							
motorway : vehicles 1/5							
3 Numbers and weighting							
	1989			1993			a # of questionnaires
	a	b	c	a	b	c	after sorting out
plane	2277	11559	5,08	2864	11661	4,07	b traffic on surveyed
motorway	2137	64136	30,01	2546	69322	27,23	destinations
train	4224	61962	14,67	4901	59185	12,08	c average weighting
Total	8638	137657	15,94	10311	140168	13,59	coefficient

The preparation of the data then proceeded in three stages :

- first a "logical" cleaning consisting in testing the completeness and the coherence of the questionnaires ;
- the grossing up was then practised on the basis of counts carried out during the survey by operators ;
- a "geographical" cleaning finally proved necessary to eliminate the questionnaires gathered from a specific transport modes but relating to a trip out of the survey scope (for example motorway trips from Clermont-Ferrand to Paris, collected at the toll in St-Arnoult).

Before reporting on the analyses derived from this set of data, it is advisable to inform the reader of difficulties of a methodological nature encountered during this study. They come first of all from the sample size and representativeness. Indeed and contrary to appearances, a mass of 19,000 exploitable questionnaires often proved insufficient to analyse a sample of 24 different origin-destination pairs, three means of transport, three main purposes of travel and two distinct periods within the week. The reliability of the results obtained is thus generally very low from a statistic point of view. The statement of a conclusion results consequently more from a convergent beam of presumptions which can make sense rather than from a rough fact. This weakness, in addition to the fact that it blocks the precision of the analysis, limits it considerably.

The second difficulty which must be raised relates to taking into account the general context of the observations carried out and in particular of its variability over time and space. This aspect is extremely sensitive in the present survey as a consequence, on the one hand, of the extension of the geographical area covered, and, on the other hand, of the high deterioration of economic conditions which occurred between 1989 and 1993. Having said this, neither local specificity, nor short-term economic variations are an exception in the economical and social landscape of contemporary Europe. It remains that a passenger survey is hardly the means to appreciate the weight of these occurrences in mobility changes. However, if one wishes to better understand how modification of the transport supply influences these changes, progress in this field is absolutely necessary. One can then wonder whether a panel survey such as planned initially (and abandoned because of lack of funding) would not have had a better cost/efficiency ratio from that point of view.

2 THE EFFECTS OF THE ATLANTIC-TGV ON MOBILITY

The expected effects of the introduction of a high-speed rail infrastructure are initially an important rise in traffic and an increase of the rail market share. The Atlantic-TGV has not been an exception.: it is initially in terms of evolution of traffic volume and of market shares of the various modes that its consequences on mobility must be considered.

2.1 A determining factor : the distance to Paris

The graph presented below appears as a summary of the main changes noted between 1989 and 1993. Formally, it doesn't mean much since it results from the addition, simple but meaningless, of Sunday afternoon, Monday morning and all-day Tuesday traffic. However this aggregation makes it possible to some extent to erase the specificity of such or such a period, of such or such traffic motivation in order to emphasise the main results.

The interpretation of this graph states first of all that the three transports means existing in the study area have known , from 1989 to 1993, a very different evolution. It also shows that the distance to Paris is a paramount explanatory factor of the variations in traffic which have occurred between both surveys. It seems finally that the increase or the reduction in road traffic is mainly independent from the situation of the two other modes, whereas air and railway traffic show perfectly symmetrical tendencies.

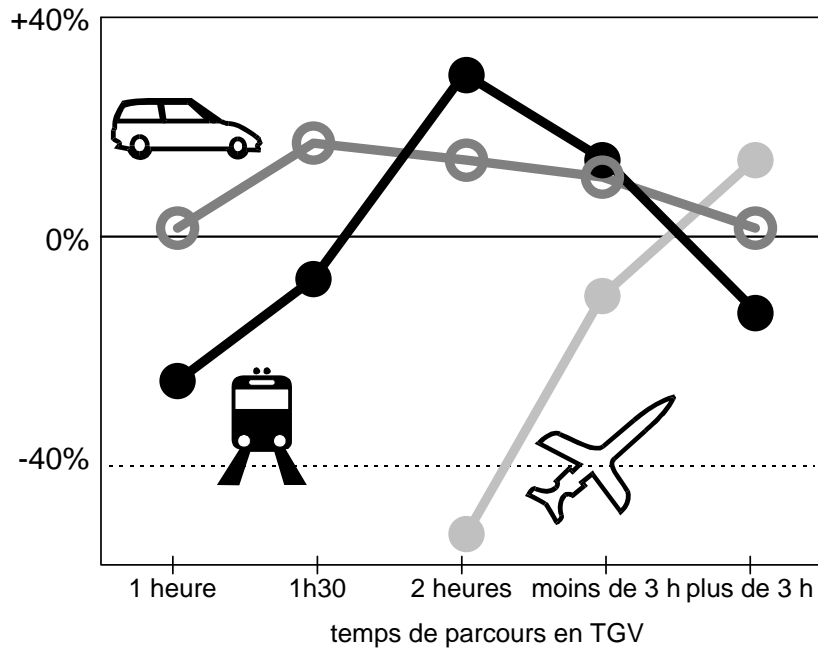


Figure 1 : Evolution of all-round traffic for the survey period according to transport means and to TGV distance-time to Paris

According to the distance to Paris, one distinguishes three successive areas. In the first, the shortest distance from Paris, the plane does not compete with the other means of transport. Contrary to private cars, the train sees a decrease of its traffic volumes and market shares. This unfavourable evolution falls into a context, in which the traffic towards the destinations which the TGV serves in an hour is decreasing noticeably, for all transport means.

The intermediate zone, ranging between two and three hours travel time, is that of the positive effects of the TGV. Rail traffic is increasing strongly to the detriment of air traffic. This importance of railroad traffic peters out nevertheless with the distance. The road, with an increase of about fifteen points, seems to remain, over a 4 years period, marked by an important deterioration of the economic situation, on a positive tendency of about +2% per annum. All in all, and although the figures presented here widely over-emphasise week-end trips, car traffic does not seem to have suffered from any competition from the TGV on those destinations where it is the most efficient.

The area furthest away from the capital does not seem to be sensitive to the reduction in travel times introduced by the TGV. In this area, the railroad company has seen an important erosion of its traffic. The use of private cars does not benefit either from the same dynamics as in the closer areas. It looks as if, somewhere around 600 km from Paris, there is a threshold beyond which the length of motorway trips starts to weigh on the organisation of car travel. This reasoning is of course only valid outside of holidays periods. On the faraway area finally, only the plane seems able to benefit from the dynamics of mobility. In the pages which follow, the effects of the Atlantic-TGV on mobility will be detailed according to main traffic motivations by respecting this geographical distinction.

2.2 In 1993, the TGV lacks competitiveness on the shorter trips

On the shorter destinations in our sample, we have already seen that overall the railroad loses market shares compared to the road. This phenomenon is noticed for each of the two main

traffic motivations considered: business trips and weekend private trips. It is advisable nevertheless to specify as of now that the delimitation of this geographical space where the train seems to lose some of its attractiveness between 1989 and 1993 is not the same for two day-leisure trips as for business trips which are mostly return within the day.

Concerning weekends, all trips between 200 and 350 km are affected by a major reduction in rail traffic whereas motorway traffic progresses in a general way. The results are a bit different concerning the business trips : reduction in the number of train trips carried from or towards the two departments closest to the capital (Sarthe and Indre-et-Loire) but in the following ring, located approximately 300 km from Paris, the train reinforces its position.

This variation of the limit within which the competing situation of the railroad seems to deteriorate is easily explained by a difference in stays, as by a difference in the nature of the trips. It is nevertheless characteristic that in all cases, the closest destinations are unfavourable to the train. The elements to explain this situation revealed by the analysis are organised into two topics :

- it is necessary to take into account a context which appears to be generally unfavourable to mobility growth in this space ;
- secondly, the specificity of railway supply on a short distance tends not to reinforce the competitiveness of railroad, in spite of the start up of the Atlantic-TGV.
- *A not very favourable general context for mobility growth*

The comparative results of mobility surveys carried out in 1989 and in 1993 are very sensitive to the economic and social context of these different spaces. Concerning business traffic, certain areas appear to be in crisis while at the same time others, fewer, show, over a period of 4 years, a most remarkable dynamism. The analysis of the data concerning the Sarthe and the Indre-et-Loire departments allows, as much from a quantitative point of view as from a qualitative one, to place them among those which suffered from an important recession in September 1993. It is the main reason for the decrease of railroad business trips in these areas, and more generally of the whole business mobility.

The unfavourable economic situation of 1993 also weighs on the evolution of weekend traffic. But a phenomenon quite specific to the areas relatively close to Paris appears. It can be interpreted as a saturation of these spaces as Parisian leisure areas. Indeed, the growth rate of all means Parisian weekend traffic increases between 1989 and 1993 with the distance from Paris (to subside nevertheless in the remotest areas). Within this movement of leisure spreading out, there is a decrease in visits in the closest departments (Sarthe and Indre-et-Loire). Conversely there is an increase of weekend trips to destinations in the following ring (300 km), which only profits to the road.

This phenomenon decreases the weekend traffic to areas of relative proximity. It can also partly explain the negative changes characteristic of railroad traffic. Indeed, in these almost-saturated areas, one can very well imagine that private cars benefit from their much larger aptitude to disseminate its flows. They are able then to take advantage of the residual dynamism of the least frequented regions in these departments while the train is confined by its network of stations to the already highly-frequented areas. Actually, this idea of saturation is to be taken less in term of physical density than it appears here. This phenomenon indicates changes in needs and leisure behaviours, which can be coupled with a deeper change in what people are now looking for.

In all events, the marked economic crisis of 1993 combined with this phenomenon of leisure areas saturation closest to the capital are the first elements which explain the unfavourable evolution of railroad traffic from one survey to the other.

- *A deterioration of the commercial supply not compensated by time-saving from the TGV*

From 1989 to 1993, railway supply was obviously transformed with the start-up of the Atlantic-TGV. In addition to a substantial reduction in trip time, an important increase in prices and more complex marketing procedures were introduced. It seems that on the shorter distances, the two commercial aspects of supply deterioration were more heavily felt than for longer distances. In addition, a reduction in railroad trip time, does not make it possible to go over a significant threshold regarding travel behaviour, any more than it widens the gap with road travel.

Regarding prices first of all, the increase was essentially introduced through " Résa 300 " which combines a compulsory seat booking and a possible supplement. The " Résa " prices no longer depend on the distance nor do they depend on time gained by the TGV. One notes moreover that in 1993, the distribution of the TGV into various price groups does not favour the shorter distances. Under these conditions, one can easily understand that the flat-rate increases in tariff which occurred were more penalising for the shorter distances than for the longer.

If one compares these rises to the time saved by taking the new line one notices two things. First, that the hour gained is very expensive on short distances: almost 80 F average on a Sunday afternoon, travelling second class, on a Le Mans-Paris or Tours-Paris trip, which is largely beyond the commonly accepted values for time average on this kind of traffic. Secondly, the price of the hour gained decreases rapidly with distance and appears to be inversely correlated to changes in railroad traffic.

Concerning marketing procedures, the obligation for the user to book his/her seat induces a waste of time which is all the less bearable than the trip is short. But this obligation also introduces a certain rigidity into the use of this means of transport: it becomes more difficult, and sometimes expensive, to change one's travel time. This aspect is also more sensitive on short trips because proximity often induces trips moved by less formal relations, calling for more flexibility.

Lastly, it may very well be that the closer railway destinations in this particular geographical area suffered more than others from the crisis related to the mishaps of the SNCF "Socrate" ticket marketing system. There are two arguments which show this. The first one is a lengthening of precaution time induced, at the worse moments of the crisis, by the queues at the ticket counters, and which was felt more on the shorter trips. On the other hand, a severe deterioration of railroad service, for destinations on which private car provide a real alternative, may have induced, more easily than on other destinations, a shift in the clientele from rail to road.

Because travel by private car, in spite of the performances of the Atlantic-TGV, is not seriously challenged by the railroad. It is important that one realise that, TGV or not, the situations in which one of the two means does not have a distinct advantage on the other are rare. Thus the trips which, starting in Tours or in Le Mans, consist in gaining the centre of Paris are very difficult by car. In this case, businessmen for example, mainly travel by railroad. According to an identical logic, the trips which end in the suburbs are, in their great majority taken by car. In the same way, family trips usually avoid the railroad. On the shorter destinations served by the Atlantic-TGV, modal competition on the whole is thus limited to trips or precise categories of customers. Time savings brought about by the new line are therefore not likely to induce a massive shift to rail.

This transfer occurs all the less than the performances of the TGV are insufficient to create a real difference in time travel compared with the road. By way of illustration, we compared a Le Mans -La Défense trip by TGV and by car. The following results were obtained :

- by TGV : Trip to Le Mans station + precaution time = 20min.
Travel time = 55 min.
Trip Montparnasse -La Defense (métro+RER) = 30min.
Total = 1h45
- by road : Trip Le Mans -Les Ulis (motorway A10, 155km) = 75min.
Trip Les Ulis -La Defense (F18+quais of Seine, 50km) = 60 min.
Total = 2h15

Besides the half-hour advantage to the train, one must add a higher reliability of this transport means. On the other hand, the road solution remains more comfortable and more flexible. The advantages of the TGV on the private car thus appear to be quite relative.

Lastly, one can see with this example that the reduction in train travel time generated by the TGV does not induce new mobility behaviours. Compared to the opportunities already offered in the former situation, therefore compared to what is possible by car, the TGV, between Tours or Le Mans and Paris, does not bring about a radical improvement in transport supply. There is no crossing of an accessibility threshold beyond which true proximity mobility behaviours, of an urban or peri-urban type, can generalise.

These many arguments, which contribute to explain the decrease in attractively for the railroad noticed between 1989 and 1993 on the shorter destinations served by the Atlantic-TGV, should not be considered independently from each other. It is their conjunction which creates a situation largely unfavourable to the train. It is now advisable to examine briefly, for each of the three main purposes of trip, the qualitative trends which have been noticed on these trips.

2.2.1 business trip : the fall in rail traffic is general

On the Tours-Paris and Le Mans-Paris trips, there was a reduction in the number of train business trips, between Tuesday September 19, 1989 and Tuesday September 21, 1993, of about 40%. Comparatively, the corresponding road traffic was maintained. The position of railroad traffic, as much in relative as in absolute terms has decreased in a considerable way.

From a qualitative point of view, in a context where business mobility on all means tends to be fall back on strategic trips (products or services sales for example), the fall in railroad use appears relatively undifferentiated. It is as much the fact of the inhabitants of the Indre-et-Loire or the Sarthe that of Paris. Merchant and non-merchant purposes of trip seem to be concerned in an identical way by this phenomenon. Furthermore, no branch of activity and no profession appears to escape from him. Lastly, the length of stay do not seem to make any noticeable difference.

In this quite uniform picture of rail traffic reduction, there are a few exceptions which need to be underlined. The first one relates to the considerable increase of half-day train trips. In this specific niche, railroad travel has gained market shares on the road. The development of this new type of travel behaviour is the tangible demonstration that in spite of the absence of massive transfer, time savings with the TGV has had an effect on mobility since return trips, which before, claimed one day, are now carried out in half a day. However, this movement of shortening of very short stays already appears in a context in which the rotations carried out over a whole day have fallen considerably, and are nowhere near compensated by the rise in half-day trips. The valorisation of this new opportunity thus appears real, but remains marginal.

The other resistance points of rail traffic are more anecdotal. It seems that the mobility generated by organisations operating in the sector of non-merchants services, and, consecutively, that of administration executives are maintained both in volume and in proportion. The number of business trips related to the sale of a product has increased, but without train travel increasing significantly as a consequence of this.

2.2.2 Commuting : less migrants, but on daily return trips

Commuting was at the heart of the debate, at the time when the Atlantic-TGV started up. The commuters, frequent train users were the first to denounce the important increase in prices which occurred on this occasion. Moreover, a whole theory was developed around the danger of transforming towns like Tours or Le Mans into "dormitory-suburbs" of Paris, being now only an hour's travel from the capital.

In 1993, these towns were indeed closer to the Parisian labour market, but as it turned out, only partially . It has indeed become common practise to commute from these two towns towards Paris. It is in any case how one explains the important erosion of the number weekly return trips and the increase in the number of daily return trips.

Nevertheless, other elements indicate that this generalisation has remained very relative. It should first of all be indicated that the increase in daily migrations which has been noted does not correspond to a simple change in rhythm from people who, before high speed railway travel, spent the week in Paris and who now go home every evening. In so far as one can recompose volumes of traffic over several days, moreover concerning such restricted segments, it seems indeed that there is a reduction in the number of migrants (this phenomenon is very clear in Le Mans, much less in Tours). From 1989 to 1993, there appears to have been a distinct reduction in the number of people from Le Mans and Tours working in Paris. However we are not able to specify, inside this tendency, how much is due to a change in the transport supply and how much results from the 1993 economic crisis. In 1993, in spite of the opening of the Atlantic-TGV line, the number of inhabitants from Tours and Le Mans travelling to Paris has remained marginal.

Between 1989 and 1993, mobility commuting also evolved concerning the social composition. One notes indeed that on the one hand the executives are, more than the other categories, responsible for the transition from a weekly commuting rate to a daily one. In addition, the least favoured categories have seen a greater erosion of their traffic commuting towards Paris. This rise in the average social standing of the commuters is obviously related to the rise in railway travel prices. But it is also true that a deterioration of economic conditions and the resulting pressure on the labour market can also lead to some social differentiation (some province executives, in periods of crisis, won't hesitate to seek employment in Paris while for the lower job categories, the rise of unemployment closes the labour market to provincials).

Concerning business trips, only the departments of the Sarthe (Le Mans) and the Indre-et-Loire (Tours) show characteristics specific to the shorter destinations served by the Atlantic-TGV. Concerning commuting trips, the major phenomenon of replacement of weekly migrations by daily migrations is also found, although attenuated, on the following ring made up of the departments of Mayenne, Maine-et-Loire and Vienne located at approximately 300-350 km of Paris.

On the whole, commuting trips make up, on the shorter destinations, the market segment on which the railroad defends its position the best. Not only does it maintain, it even increases its lead. But moreover, certain migrants make the most of its performances and new

opportunities to adopt new travel rhythms. However this success of the TGV is relative in so far as it concerns a limited traffic volume.

2.2.3 Parisian weekend trips : a strong social differentiation

As for the previous traffic segment, the area of the shorter destinations presents, from the point of view of the competitive position of the railroad, homogeneous characteristics until a distance of approximately 350 km from the capital. On this area, private trips have receded in absolute volume as much as in modal share.

This evolution, however massive, does not concern the whole of the segments of the Parisian weekend trip market in a uniform way. In terms of demographic composition first of all, one notes that the 20-30 year-olds are alone responsible for almost the entire fall in railroad trips and its loss of competitiveness compared to the private car. Secondly, in terms of social composition, the main part of the fall in traffic comes from disaffection from younger employees, workmen or technicians, i.e. low status categories. In comparison, the other important categories of population roughly maintain their rail ridership. This is especially true for young students, young people with a high professional status and people between the ages of 30 and 60 whatever their GCV. As far as week-end journeys of Parisians are concerned, the decrease in rail traffic on the shorter destinations served by the Atlantic-TGV is therefore the result of a trend of global mobility highly contrasted among social categories. Concerning the only rail mobility, this trend is even increased

The changes noted according to detailed purposes of trip are largely determined by this very distinctive movement of social differentiation. Thus the decrease in the number of train trips taken by young people is translated initially, and altogether rather logically, by a strong reduction in the "visits to close relations" purpose. Nevertheless, leisure stays, though to a lesser extent, have also suffered from a fall in traffic. It seems finally that two-person journeys are those that have deserted the railroad the most. As it is also on this segment that the car has known its strongest growth, one can safely presume that there has been an important modal transfer at this level.

In conclusion, on the shorter destinations served by the Atlantic-TGV, the railroad does not present many strong points in 1993. The two niches in which the TGV performance has been somewhat developed by users are return within the half-day business trips and daily commuting. But in both cases, the volume of traffic remains relatively marginal. Slightly lower, one distinguishes some segments on which the train resists more or less to competition from road travel. Examples are middle age Parisian weekend leisure trips or administrative executives business trips. But, on most of the market, the train loses shares and traffic.

The explanations of this situation are due initially to an unfavourable context for mobility growth on the shorter destinations: a distinct effect of the economic crisis doubled, for private trips, by a tendency towards longer trips. It is also necessary to evoke the points on which S.N.C.F's commercial supply was degraded between 1989 and 1993: an increase in prices which penalised the shorter distances more and a lengthening of precaution time made necessary by the obligation to book one's seat and by the "Socrate" system's abnormal operation. Lastly, it appears that, in spite of the TGV's performances, railroad travel possibilities towards these destinations in 1993, on the one hand do not differ appreciably from car travel, and on the other hand do not cross any accessibility threshold which would allow a generalisation of new mobility behaviours. On the whole, everything occurs as if rail supply had got worse between 1989 to 1993 on the shorter destinations served by the Atlantic-TGV.

2.3 Two-three hours by TGV: the effects area

When one gets away from the Ile-de-France region, one reaches spaces on which one finds a number of well-known phenomena because already observed on the Paris-Lyon relation, and others more specific of the Atlantic- TGV in 1993. It is in any case on this area that the TGV induces the most important changes in traffic flows. Railroad traffic has increased and important market shares have been gained, mainly to the detriment of air traffic. In addition to the transfer of customers from air traffic and, to a lesser extent, from road traffic towards the train, a clear traffic induction in favour of the TGV can also be seen.

The general explanation for this situation is given by comparing performances of the various modes. At these distances, about 400 to 600 km, the speed of the TGV allows the railway to offer possibilities in travel behaviour that the car, and in certain cases the plane, does not allow. Compared to air travel, the railroad also profits from an overall favourable difference in prices.

To these explanations in terms of supply, it is advisable to add some elements of context which favour mobility. First of all, the effects of a deteriorated economic situation is, on the area which interests us here, much less uniform than on the departments closest to the capital. It should be said that the surface covered here is broader and thus more diversified. The effect also of lengthened weekend distances, which created a loss in the preceding case, here has positive effects. Last, together with this increase in distances, a specific growth trend has been observed for Atlantic coast departments.

2.3.1 Despite the crisis, the demand in business travel is answered by the TGV supply

In spite of strong disparities according to the areas, which depend on the distance to Paris and the local severity of the economic crisis, business traffic appears to have reacted rather strongly to the start up of the Atlantic-TGV. From a quantitative point of view, the traffic transfer from air and road, as well as the net induction are maximum for destinations reached in 1h30 or 2 hours by TGV. Beyond that, the effect of high speed peters out.

The first discriminating characteristic of this response of business traffic to the reduction of travel time by rail comes from the more important reaction of Parisians " going out " into the provinces compared to provincials " going in " to Paris. The growth in Parisians business rail traffic is higher, transfer from plane travel is more massive and generally speaking, they adopt more clearly than provincials the specific behaviour of high speed mobility.

Between 1989 and 1993, there has been a reduction in the length of stays due largely to the train. The development of daily trips, or even half-day trips is, from this point of view, quite remarkable. On this range of distance, the plane completely loses the dominant position it had before. But the increase in business rail traffic on the short time niche cannot be explained only by this movement from the plane towards the train. Connected to this, a phenomenon of traffic induction related to an increase in the number of trips should be mentioned. This combination of factors - shortening of stays and increase in travel frequency - entirely conforms with what was noted, at the time, on the Paris-Lyon connection. It appears nevertheless highly attenuated here by a crisis context which slowed down mobility growth.

The following table shows some 89-93's evolutions concerning business traffic in the "effects area" served by the Atlantic-TGV. In comparison, the same datas, concerning the south-east TGV between Paris and Lyon are given. They come from a before/after type survey carried out in 1980 and 1985 on business traffic by plane and train.

traffic evolutions	1989-1993 Atlantic-TGV	1980-1985 south-east TGV
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total traffic	+8%	+56%
train traffic	+39%	+151%
total traffic from Paris region	+20%	+18%
total traffic from provinces	+4%	+86%
0-night trips in total traffic	+15%	+104%
0-night trips in train traffic	+91%	+432%
executives in total traffic	+20%	+23%
non-executives in total traffic	-8%	+189%

Table 1 : some traffic evolutions in the "effects area"

Concerning travelling habits, it is also advisable to mention an evolution in rail traffic in favour of joint trips (several people travelling together). There again, the transfer of customers from air travel seems to make up the main part of this tendency. But more than individual or joint trips taken by plane in 1989, it appears that the train collects air trips which, in 1989, were individual and which, in 1993, are carried out jointly, making the most of the fall in cost induced by taking the train.

Concerning professions, one notes that only the executives have seen an increase in the number of their trips. Independent professions, shopkeepers, craftsmen and the self-employed suffered more heavily from a worsening in economic conditions. They have seen a reduction in their business mobility. One could have expected, according to what took place in the south-east, a certain " democratisation " of business travel resulting logically from the reduction in costs permitted by the use of the railroad rather than of the plane. It seems that, there again, the crisis thwarted this tendency towards an increase in business mobility for the higher hierarchical levels only. Perhaps one should add to this economic explanation, a more structural one concerning a change in certain company practices, less in favour of this type of opening. One can more surely mention here the effect of the SNCF's tariff policy.

The growth in mobility for executive, however isolated, is all the more remarkable. On the area we are interested in, the rail traffic of administration and commercial executives has doubled, that of technical experts tripled. This result is obviously the consequence of an important modal transfer, but also of a clear induction of traffic especially relating to Parisian administration and commercial executives and to technical experts in the provinces.

Distributed according to the branches of industry of the companies, the growth of business rail traffic appears to concentrate on two segments: industry and the " study-consulting-assistance " sector. These results conform with what was observed on the Rhône-Alpes area. They are articulated, like already at the time, around two themes valorising the new trip opportunities provided by the TGV: the conquest of new market areas on the one hand and the internal organisation of firms on the other hand. The opening up to new market opportunities is more related to services exchanges than to product exchanges. It is moreover mainly due to Parisians. The increase in the number of trips motivated by the development of internal contacts in firms is mainly for exchange of information. It touches the Parisian ones as much as the provincial ones and, for the latter, makes up the bulk of the increase in business mobility.

traffic evolutions for different purposes of trips	1989-1993 Atlantic-TGV	1980-1985 south-east TGV
in total traffic to buy products or services	-34%	+76%
to sell products or services	+23%	
internal contacts	+16%	+89%

	other		-4%	+9%
in traffic	train	to buy products or services	-23%	+41%
		to sell products or services	+106%	+194%
		internal contacts	+57%	+220%
		other	+3%	+66%

Table 2 : traffic evolutions for different purposes of trips

All of these changes, specific to business rail traffic, show that on an intermediate zone, corresponding to travel times ranging from one hour and a half and three hours, the travel opportunities offered by the TGV are being put to good use. More so by Parisians than by provincials, perhaps on account of an earlier appropriation of the TGV due to their former experience with the south-eastern TGV. The relative weakness, compared with the Rhône-Alpes region, of the economic base of the areas served by the Atlantic-TGV can undoubtedly also help to explain why the Parisians attack the provincial markets much more than the provincials attack those of the capital. Lastly, it is necessary to underline here again this tendency which limits the development of the use of high railway speed only to executives.

2.3.2 Commuting : development and socially selective modal split

For distances ranging between 400 and 600 km, the only commuting frequency usually possible is weekly. As from 1989, the train share is high on this market. In 1993, commuter mobility on these itineraries increased quite a bit, but this growth seems to have benefited road travel as much as railway travel. The level of market penetration from railroad did not increase with the start-up of the Atlantic-TGV. Difficult, under these conditions, to allot the rise in the number of commuting trips towards Ile-de-France region to changes in transport supply.

If one now distinguishes migrants flows according to their GCV, one can observe a difference in evolution in the two main categories. That of the executives has grown more than the average of their commuting mobility and this appears to be rather in favour of the railroad. The employees, workmen and technicians have a higher propensity for using their car for their alternating weekly migrations. One should probably see, behind this socially differentiated evolution, an effect of the penalising tariffs on the TGV at commuter travelling time.

2.3.3 Parisians' weekends : a social differentiation accentuated by train travel

In the intermediate distance area, ranging from 400 to 600 km from Paris, the evolution of the Parisian weekend traffic favours very definitely the railroad. In a context of general flow growth, the train succeeds in increasing its market shares quite clearly. The volume of trips has thus increased, sometimes considerably. It is advisable nevertheless to stress that, in spite of this remarkable performance of the TGV, the private car is never excluded from this tendency in traffic growth. It also has seen its use progress. More than by its capacity to divert the road traffic, the TGV is successful on those destinations which are reached in two or three hours, while succeeding in collecting the dynamism of the weekend trips market.

This growth in traffic volume also induces important changes in the composition of the railway clientele. One of the remarkable features of this evolution is due to the relative reduction of the number of people travelling alone by train. Between 1989 to 1993, trips by two or three are those which have known the most considerable growth. In comparison with to a situation, in 1989, in which train customers usually travelled alone, this tendency indicates the capacity of the TGV to penetrate new market segments.

In terms of clientele composition, the main result comes from the evolution in the socio-demographic structure of flows. Indeed, the increase in railroad traffic in the 2-3 hour zone is largely due, on the one hand to the increase from the highest social categories (executives + independent professions), and on the other hand to the increase from middle age categories (30-60 years). That does not mean that young people or lower category passengers do not take part in the increase in weekend mobility, but only that the increase is lower (elderly people are almost absent from this type of trip).

This socially differentiated growth is not specific to the TGV. In this area of average distances, road traffic shows the same evolution profile. This indicates explanations initially exogenous to transport supply. One can of course mention the consequences of the economic crisis. Another element towards a better understanding lies in the tendency for Parisians to cover longer distances in weekend, which profits entirely to the area that we observing now. It is indeed probable that this basic evolution is first carried out by the categories of population best integrated, economically and socially, in our society.

Nevertheless, this social differentiation is clearly accentuated among railway travellers. One can blame the high tariff policy set up at the starting of the TGV for this result. To this more than plausible explanation, it is at least necessary to add the effects of the deterioration of the image of the SNCF which occurred at the time of the "failure" of the "Socrate" marketing system. "The TGV is expensive" is in a way the main contents of the message that was spread around during those few months of intense media coverage. No doubt that it was perceived all the more so by the lower class social groups. Lastly, it should be stressed that, compared to road traffic, collective transport traffic accentuates by nature the evolution and the effects of any economic situation. One should therefore try to put back into perspective the consequences of the rise in prices introduced at the time of the TGV start up on the socially differentiated evolution in traffic.

This socially differentiated growth in railroad traffic can be specified in two ways. From a geographical point of view first of all, it seems that the sea resorts of the Atlantic coast rather stress the differences in favour of the higher classes and the middle age group. On the contrary, the urban destinations would rather tend to smooth out these differences by re-balancing the traffic growth rates, in particular between generations.

From the purposes of trips point of view, the evolution confirms entirely the general movement of social differentiation. It is indeed for the least constrained and least usual purposes (leisure, visiting friends) that the traffic growth of the higher categories (or of the 30-60 years-old) is the most visible. On the contrary, the socially lower classes see their weekend mobility restricted to more obliged trips (visits to close relatives, family events). Those trends, apparent for all modes, are, again, reinforced as far as railroad traffic is concerned.

It is only right to finish this panorama of the effects of the TGV on private mobility for destinations reached into 2 or 3 hours by stressing that there exists, beside Parisian weekend traffic, other types of trips with often looser time constraints. On these market segments, longer stays, trips taken by elderly people, the advantages of the TGV are less easily developed. Nevertheless, they generally allow the railroad to maintain its position, without however, reinforcing it.

In conclusion, the destinations reached in 2 to 3 hours (starting at 1 hour and a half for business travel) have largely benefited from the introduction of the high speed line. They unquestionably make up the mobility "effects area" of the TGV. One finds, on the detailed market segments, many signs of an increased competitiveness from the railroad. Concerning

business trips, this situation is shown first of all through an important transfer of customers from the plane to the train, and to a lesser degree, by a transfer from the road. One also notes a certain capacity of the TGV to induce new trips, in spite of a deterioration in the economic situation. Lastly, also representing a valorisation by customers of the possibilities offered by the TGV, one can note an important qualitative evolution of the kinds of trips: shortening of stays linked to a lesser degree with an increase in travel frequency, increase in the volume of joint trips. Also these trends are not uniform. First, Parisians react more to these changes than provincials. Then, business trip growth is concentrated on executives. Last, the conquest of new market areas and internal organisation of companies are the two basic elements behind this growth.

Parisian weekend traffic also reacts very favourably to the TGV, but without one being able to detect any movement of road users towards the train. With the TGV, the railroad acquires the capacity rather to collect a significant part of the growth of these flows. The essential characteristic of the evolution in weekend train customers is the strong social differentiation which takes place in favour of the higher GCV and the middle age groups (30-60 years). This phenomenon, which can also be seen on road traffic, is much stronger on railroad traffic.

2.4 On the long-hauls : train traffic is marginal

When distances increase even further, the TGV advantages are quickly reduced until they disappear. Thus, the Toulouse-Paris trip is the result of this evolution. In spite of the introduction of the TGV which now connects the two cities in five hours and in spite of a general context of traffic growth, the railroad has lost important market shares and has seen a decrease in its traffic volume.

The limit between the TGV effects area and the zone where railroad travel becomes marginal is not the same neither for all market segments, nor in all directions. It is observed first of all that the time constraints of business trips are most strict. In fact, beyond three hours travel time, the competitiveness of the TGV strongly decreases and, as from four hours, one considers the train as being systematically marginal.

Concerning weekend trips, we have already mentioned that time constraints were looser. It is moreover necessary to take into account the threshold which, beyond 600 km approximately, makes it difficult to reconcile car travel with two days trips. Under these conditions, it is possible to find particularly favourable situations for railroad travel. In those situations, users make the most of the performances of the TGV. It results in consequent rises in traffic. It is the case on the south-west Atlantic-coast (Landes + Pyrénées-Atlantiques). This area combines a particularly high speed service, a relative concentration of traffic generating poles and a general increase in demand for weekend trips. In spite of the distance from Paris (approximately 700 km, from 4 to 5 hours TGV travel), this area can, given the evolution concerning private railroad trips, be integrated into the mobility "effects area" of the TGV.

The Brittany isthmus on the other hand, in spite of it being closer to Paris, has several drawbacks which do not make it possible for the TGV to increase the railroad market shares. The traffic in Brittany, first of all, appears to be generally receding. In addition, the TGV's commercial speed is lower there than in the south-west. Then, the spreading out of the demand poles does not favour the railway. Lastly, the recent arrival of the TGV in Quimper (in 1992 only) perhaps had not left enough delay for trip behaviours to develop, at the time of the survey in 1993, and adapt completely to the new transport supply. With receding rail traffic and market shares, the Brittany isthmus appears excluded from the TGV effects area.

CONCLUSION

The survey whose main results have been presented here is quite specific of the geographical area covered, as well as of the characteristics of the period at which it was carried out. For this reason, it is not obvious to know what one should retain to apply to other contexts of transport supply transformation. Nevertheless, the diversity of the results obtained, as well as the experience gained regarding observation of mobility changes on the long-haul, make it possible to identify some main trends and a certain recurrence of the phenomena at work here.

1st conclusion : a general tendency towards an increase in mobility

All the surveys confirm a heavy tendency towards increase in mobility on the long-haul. Thus, the comparison of the two transport surveys in French households in 1981/82 and 1993/94, reveals that the number of 100 km or more trips undertaken between these two dates by all individuals over 5 years of age has increased overall by approximately two thirds, making the annual level of individual mobility go from 3,7 to 5,7 [Gouider, 1997]. The results obtained with the introduction of the Atlantic-TGV are inscribed in this general movement. This conclusion does not appear very clearly from a quantitative point of view since the total traffic has only risen slightly, by only 2% over a period of 4 years. But to interpret this figure, one must first point out the important deterioration of economic conditions which occurred between 1989 and 1993, and inevitably influenced the traffic dynamism. It is also necessary to understand that the type of survey is better adapted to reveal structural rather than volume trends.

This last remark focuses attention on the qualitative changes which were highlighted at the time of the TGV-A survey. One can see there an increase which is spatially differentiated from the flows, and which rather clearly reveals an increase in the distances covered. One also notes an marked tendency in traffic towards the most high-performing modes: the plane on very long distances, the TGV in intermediate zones. Here again are signs of what is interpreted like a reinforced space integration of the economic bases thus served (extension of market areas, labour pools, reorganisation and spatial distribution of the productive organisations).

All these changes fit without ambiguity, and in spite of the consequences of the crisis, into a long term process of mobility increase on the long distance. It is in this respect interesting to note that the social costs related to the development of this mobility do not seem, in France, to limit traffic growth.

2nd conclusion : the relevance zone of high speed rail

We have already pointed out how much the results obtained are spatially differentiated. The economic and social efficiency of the TGV seems indeed directly related to the performances of this means of transport on the destinations which one wishes to study.

To make things simple, let us say that the field of high speed rail is limited to the distances which the TGV is able to cover in 3 hours maximum (3h30-4h on the destinations with a very strong tourist potential). Beyond that, the TGV succeeds with difficulty in improving the relative position of the railroad compared to other transport means. Its capacity of resistance to competition from air travel remains low and it does not induce any significant modification in mobility practices. This limit is thus all at the same time commercial, in terms of market shares, and social, in relation to behaviours.

Between 2 and 3 hours travel time is what we called the " effects area". In this respect, the survey on the TGV-A completely corroborates the observations which were carried out previously, and in particular in 1980 and 1985 during a survey of the same kind concerning

business trips between Paris and Lyon [Plassard, Routhier, 1986, Bonnafous, 1987]. Over this period, one sees the main characteristics of high speed railway mobility: strong competitiveness of the train compared to the plane, shortening of the length of stays compensated by an increase in the number of return trips within a day to the detriment of trips with one or more nights spent away, increase in the habit of return within the half-day trips, increase in travel frequency.

In relation these quantitative changes, one also notes a change in the contents of trips. The specific growth of the volume of trips motivated by the sale of a product and most of all of services serves to reveal the phenomena of market area extension. This is very clear in 1993 on the TGV-A as well as in 1985 on the South-eastern TGV and particularly relates to the activity sector of elaborate services (studies, consulting, assistance...). The other source of strong flow increase consists of trips motivated by meetings inside a company or a group. This evolution highlights the strong internal reshuffling in productive organisations. It mainly concerns management and administrative positions in reasonably large firms.

The whole of the characteristics and changes which have been just mentioned seems to make up the heart of what can be called high speed railway mobility. They appear to be present in all the situations where railroad performance improvement leads to a significant change in travel behaviour. They testify, by their permanence as the TGV network develops, of a high resistance to the diversity of contexts for each specific destination which has seen a transformation of its service conditions.

A last important point is related to the intensity of this prototype of high speed rail traffic. On the destinations reached in 3 hours with the TGV, the changes in travel behaviour already go clearly in the direction which has been just described, but these changes are fragile: they still relate to a limited fringe of flows and can be questioned, the example of Paris-Bordeaux in 1993 illustrates it, by an unfavourable economic situation or a badly adapted tariff. On the other hand, on the destinations reached in 2 hours by TGV, the changes are greater and longer-lasting. The impression, largely intuitive at the beginning, according to which the Paris-Lyon line represented the ideal configuration for a social and economic development of the TGV performances has been largely confirmed by the later examples. In this respect, the case of Nantes, that the TGV-A now places 2 hours away from Paris and where one finds almost identical and just as massive changes in travel behaviour, is impressive.

The innovation of the Nineties resides, in France, in the start-up of high speed railway routes on much shorter connections. Not only are TGV travel times significantly reduced here (roughly one hour from Paris to Tours, Le Mans or Lille for example) but the configuration of the travel market is also singularly different there since the main competitor is no longer the plane but the car by motorway. Another difference concerning these short destinations compared to "effects area" is that return trips within a day are possible here, by traditional train as well as by car, leaving time for business on arrival. In this case it is therefore not a new service that high speed railroad travel would bring.

The general configuration of the connections reached in 1 hour appears overall less favourable to the TGV developing new travel behaviours. Thus the phenomena of modal transfer, very largely determined by travel time and prices when competition occurs between the train and the plane, are much more complicated when the car is concerned. The use of the car, one knows it, is linked to practices and a psycho-social dependence of a very different order.

Conversely, certain arguments would plead in favour of high speed railway giving rise to renewed social uses on the short connections :

- The stronger intensity of exchanges, which generally peters out with the distance, leads to massive traffic which the railway supply can usually answer satisfactorily.
- Moreover, this massive traffic often generates increasing problems of road congestion that the train can contribute to lessen. It is in particular the case for connections between Paris and the closer cities (Tours, Le Mans and especially Lille).
- The shortening of the TGV journey time to one hour makes moreover possible to take very short trips (half-day, even less). The nature of the "accessibility threshold" that the high speed railway service then makes it possible to cross certainly needs to be specified. It remains none the less true that, even in a highly deteriorated economic situation as observed in 1993, one sees this type of practice start up- although it remains marginal - between Paris and Tours for example.
- A last potential of important changes is finally to seek in the pendular commuter travels. In spite of the declared will of political decision makers and of operators alike, to discourage this type of practice, the 93 observations reveal without ambiguity a demand for daily migration rhythm using high speed railroad performances. It is necessary to stress the reality of this phenomenon, outside of any judgement.

If high speed and its procession of mobility changes seems to exclude the further destinations (reached in over 3 hours), it is particularly relevant on connections reached in 2 to 3 hours, the assessment being more complex on the shorter destinations. High speed can perfectly find its relevance on this type of connection, provided that one does not expect the same functions from it as on the longer connections, and also that be created proper marketing conditions for its competitiveness. In any case, travel time on each destination appears as a key-variable in the analysis of high-speed rail mobility.

3rd conclusion : the weight of elements external to the transport sphere

In the immediately preceding pages, we have presented some of the very general characteristics of what we named high speed railway mobility. These permanent characteristics, since it seems that one finds them in various cases and in particular between Paris and Lyon in 1985 and on the Atlantic-TGV in 1993, do not prevent each studied destination to have its own important specificity. The presentation of the results of the 1989-93 survey largely insisted on the weight of the economic crisis which started in France as from 1990 and culminated in 1993. The observations carried out then are largely tributary of this deteriorated economic situation. On the Paris-Lyon connection, on the contrary, the very dull economic situation in 1980 had rather improved by 1985 and this is felt in the results.

Another difference is due to the phenomenon of market area extension which can be seen in all cases. In the case of Lyon in 1985, the changes appeared balanced enough in the sense that the movement appeared to benefit companies from the Rhône-Alpes area as much as companies from the Ile-de-France. This result is basically linked with the solidity and the diversity of Lyon's economic base. The TGV-A connects Paris with towns with less favourable characteristics [Damette, 1994]. The deteriorated economic situation also plays a part here. In fact, one notes in 1993 that the Parisian firms increase their presence on the western and south-western markets without the reverse taking place.

A last difference relates to mobility motivated by internal contacts within companies or groups. In 1985 on the Lyon connection, the development of these traffics was based on a certain "democratisation" insofar as subordinate personnel (technicians, employees...) took part in it. The results obtained in 1993 on the TGV-A did not show up the same phenomenon. On the contrary, mobility was tightened around executives' trips. There again, the crisis effect which encouraged the company to decrease their expenditures on transport has all its weight.

It seems nevertheless that it is necessary, to understand this difference, to further examine the contents of the productive reorganisations which we already mentioned. We will present a very brief summary of it.

A first tendency is to abandon the hierarchical and pyramidal structures to the profit of more horizontal cellular structures. When it relates to geographically spread-out organisations, this evolution implies a great fluidity in information flow between the various sites and results in an intensive use of telecommunication and travel means. This tendency is rather characteristic of the branches of industry in which, to competition on production costs, is added a competition on quality, reactivity, innovation capacity [Veltz, 1993]. It generates exchanges on all levels in companies and thus explains partly why a less "hierarchical" mobility develops. The importance of higher services activities in the exchanges between Paris and Lyon confers a significant place to this process.

Another tendency in transformation of productive organisations relates to the activities where the competition on costs prevails. The space distribution of activities is then only guided by the search for production costs reduction opportunities whereas the structure of the organisations remains very vertical. Outside of management responsibilities, the needs for communication essentially relate to standardised information which calls for few physical meetings of different parties. The transport demand resulting from these changes is therefore limited and more concentrated on the higher levels of the hierarchy. In 1993, the crisis probably accentuated this tendency that the characteristics of the economic bases served by the TGV-A already showed.

One sees it in connection with the three factors of increasing complexity mentioned above (sensitivity to the general economic situation, potential of market area extension, evolution of relationships within companies), the analysis of the differences between the results obtained in 1985 and in 1993 is very enlightening. One notes especially that it is based mainly on phenomena the origin of which is largely external to the transport system. This is undoubtedly the main result of the experience accumulated over 15 years now of observing high speed railway mobility in France, to be able to measure the importance attached to these exogenous elements. Before being an element in the evolution of mobility practices, the TGV is initially a product of our society. Its success and its spreading come from the fact that it is a part of our ways of life and of production transformation processes. To understand how traffic flows change, it is also necessary to understand in which environment they move.

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