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Regional development and high speed rail in France: accessibility gains are not enough

Yves Crozet

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**VINGT ANNÉES
SOUS LA MANCHE,
ET AU-DELÀ ?**

***TWENTY YEARS
UNDER THE CHANNEL,
AND BEYOND?***



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DIRECTEUR DE LA PUBLICATION

Jean-Louis ROHOU

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« The origin of productivity is therefore not accessibility but accumulated human and technical capital. Elective affinities between accessibility and productivity do exist, but it is productivity which is the determining factor. The most important thing is the agglomeration effect. »


Yves Crozet

Yves CROZET

✉ yves.crozet@let.ish-lyon.cnrs.fr

University of Lyon (Institute of Political Studies)
Urban planning Transport Economics Laboratory

**REGIONAL DEVELOPMENT AND HIGH SPEED RAIL
IN FRANCE: ACCESSIBILITY GAINS ARE NOT ENOUGH**
**GRANDE VITESSE FERROVIAIRE ET DÉVELOPPEMENT
RÉGIONAL EN FRANCE : LE RÔLE LIMITÉ DES GAINS
D'ACCESSIBILITÉ**

 **Abstract:** The improvement of mobility has been an outstanding feature of the industrial revolution. Over a long period of time, per capita GDP was increasing at a rate which was similar to the rate of increase in the annual distance travelled. Taking into account the fact that the travel time budget has been almost stable, there is an undeniable correlation between economic growth and speed. From this correlation, can we infer causality? In other terms, can we convert the increases in utility provided by increases in accessibility into potential increases in GDP and number of jobs? The fact that there is a close correlation between accessibility and productivity does not mean that the first causes the second. By comparing the economic growth of French "regions" since 1989, even the correlation between accessibility and economic growth is not obvious. The same result is obtained at the level of a lot of French agglomerations close to the high speed line, for instance in the Nord-Pas-de-Calais region. These results should discourage us from seeing accessibility improvements as a magic wand to foster regional development.

Résumé : *Le développement de la mobilité a été une caractéristique remarquable de la révolution industrielle. Pendant des décennies, le PIB par habitant a augmenté à un rythme similaire à celui*

de la distance annuelle parcourue. Compte tenu du fait que le budget du temps de transport est presque stable, il existe une corrélation indéniable entre croissance économique et vitesse. De cette corrélation, pouvons-nous déduire la causalité ? En d'autres termes, peut-on convertir les gains d'utilité offerts par les transports en augmentations potentielles du PIB et du nombre d'emplois ? Le fait qu'il existe une corrélation étroite entre l'accessibilité et la productivité ne signifie pas que la première cause la seconde. En comparant la croissance économique des « régions » françaises depuis 1989, même la corrélation entre accessibilité et croissance économique n'est pas évidente. Le même résultat est obtenu au niveau de nombreuses agglomérations desservies par grande vitesse, notamment dans la région Nord-Pas-de-Calais. Ce résultat devrait nous dissuader de considérer les gains d'accessibilité comme une baguette magique pour soutenir le développement régional.

Keywords: accessibility, employment, GDP, regional development, speed, time gains.

Mots-clés : accessibilité, développement régional, emploi, gains de temps, PIB, vitesse.

Introduction

In 2008-2009 many European countries have been experiencing a severe economic depression. In many cases, unemployment has reached high levels. The per capita gross domestic product (GDP) at the end of 2013 was, in countries such as France and the United Kingdom, lower or just above what it was 5 years before. This lack of economic growth has caused many to call for increased investment in transport infrastructures. Referring more or less explicitly to the major public works policies that were introduced during the crisis of the 1930s, many political leaders are calling for large-scale investment.

This is occurring at the scale of the European Union (EU) too. The transport White Paper (2011) recommends tripling the length of the high speed rail (HSR) network by the year 2030. The EU has volunteered to pay for 40% of the construction costs of major cross-border projects such as the tunnel under the Alps between France and Italy (an estimated total cost of €26 billion, 10 billion of which are for the principal Tunnel), or a canal between the Paris region and Belgium (a total cost of €6 billion). Similarly, the United Kingdom is considering large-scale investment in a second high speed railway line (HS2, with an estimated total cost of €60 billion).

These projects come up against three difficulties:

- the first is the lack of public money at a time when public debt and public deficits continue to pose problems;
- the second is due to the fact that the cost of these projects is often astronomical;
- the third, which is an outcome of the second, is these projects' low, or even negative, economic return on investment (ROI). Even when non-monetary benefits such as time savings and environmental benefits are taken into account; it is very difficult for cost-benefit analysis to justify such investments.

In order to get round this third difficulty, in recent years new evaluation methods for transport infrastructure projects have been developed, particularly in the United Kingdom and France. Although they adopt different approaches, these methods share the fact that they attempt to assign an economic value to the accessibility improvements provided by new infrastructures and new transport services (part 1). More precisely, they assume there is a direct link between accessibility gains and increases in GDP (part 2). The results they obtain are frequently spectacular, and appear to justify the most ambitious projects (part 3). But a look at what happened in French regions, with or without high speed rail (HSR) services, is an invitation to be careful with the idea that HSR is a magic wand for regional development. The Nord-Pas-de-Calais region is a good example of the limits to speed gains (part 4).

Accessibility gains and consumer surplus

The concept of accessibility was developed more than 50 years ago (Hansen, 1959) and since that time economists and geographers have devoted much research and many scientific publications to it. From the theoretical point of view, the concept of accessibility is closely linked to the methodology used to perform economic calculations in order to evaluate infrastructure projects. It is directly linked to the concept of welfare and the measurement of welfare on the basis of increases in consumer surpluses.

In the economic theory of urban accessibility, as in economic calculations (Koenig 1974; Ben-Akiva and Lerman, 1979) and the traffic forecasts the latter use, transport networks and services are considered as a source of opportunities. A reduction in the generalized cost of transport increases the number of opportunities that are available to a household or a set of households. In other terms, a lowering of costs increases the consumer surplus as for the same cost the consumer can access a wider range of choices. The economic approach to accessibility has the advantage that it takes account both of the inherent costs of any trip and the benefits that users derive from the use of a transport network. On this basis of a comparison between costs and benefits, economic calculations produce a one dimensional result, the net present value (NPV), which is expressed in money. This is its principal quality. Presenting the effects of a project in monetary terms has the considerable merit of being easy to interpret and understand. By comparing NPVs and the internal rates of return (IRR) derived from them, it is straightforward to compare different projects and advise the public decision-maker about the best possible choices.

The difficulty arises when the projects, which have strong political support at the local or national levels, have low IRRs which cannot be used to justify them. This is the case for a large number of urban public transport projects which do not generate significant time savings for users, result in small gains in consumer surpluses and

therefore have a low ROI. It is also the case for large costly projects for HSR, tunnels or bridges. Would it be possible to measure the utility of these projects, which is stated loud and clear by their proponents, by another method which provides results which are as comprehensible as those obtained from economic calculations, that is to say in monetary form?

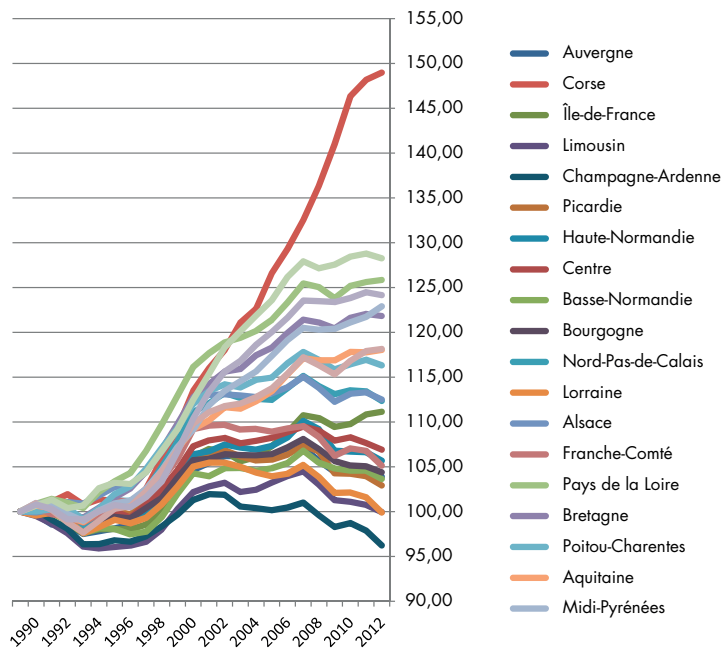
In order to solve this problem, methodologies have been developed in the United Kingdom and France which although different share the same goal.

In the United Kingdom, the concept of wider economic effect (WEE), also known as wider economic benefit (WEB) has been developed in the last 10 years or so (Venables, 2007; Graham, 2007). WEBs are largely due to agglomeration effects. Recently they have been evaluated in detail for the HS2 project (KPMG, 2013) as a result of the development of the concept of connectivity, which is directly derived from that of accessibility as presented in the DfT's methodological recommendations. The KPMG study states that the construction of the entire HS2 project could increase GDP by £15 billion per year from 2037, the date by which the entire line would be open. This sum could justify the £60 billion cost of the project even after discounting.

In France, the measurement of accessibility improvements is recommended in the context of the economic appraisal of urban transportation for which it is laid down that "the indicators of accessibility attempt to measure the satisfaction individuals obtain from the transport system". Accessibility is also mentioned in the Robien circular (2005) which lays down the official appraisal methods for transport infrastructure projects. Contemporary with this publication was a study which proposed to transform accessibility gains into GDP (Poulit, 2005). In a recent memo, the author of this publication showed that a new HSR between Paris and Normandy (costing €30 billion) could easily be made profitable if the increases in GDP provided by the improvement of accessibility were considered.

But such an optimistic view should be questioned, how accessibility gains could be turn into GDP growth?

Figure 1. Number of Jobs in French regions - 1989 = 100



Can accessibility improvements be converted into increases in GDP?

The improvement of mobility has been an outstanding feature of recent decades. The increases in speed provided in the 19th century by rail transport then in the 20th century by the car followed by high-speed air and rail transport have completely changed our lifestyles. At the end of the 19th century our ancestors covered an average of 4 to 5 km per day, mainly on foot. We have increased this distance by a factor of 10, without radically altering our travel time budget which is still about one hour per day (Crozet, 2011). It is thus increases in speed which are central to the lifestyle changes. However, over a long period of time, per capita GDP is

increasing at a rate which is similar to the rate of increase in the annual distance travelled (Shäfer et al., 2009). Does this undeniable correlation between economic growth and travel mean that we can infer causality? In other terms, can we convert the increases in utility provided by increases in accessibility into potential increases in GDP?

If the answer is yes, the cost of investments, instead of being a burden on public budgets would become a source of growth, and promise macroeconomic gains in which belief becomes more and more tempting as the IRRs measured by economic calculations for the same projects diminish. But how is it possible to obtain such an attractive result?

The central reasoning in the method developed in France involves two key stages.

The first involves the link between a trip and the utility derived from it. Let us assume that accessibility provides a measure of the net utility of a trip which weights the gross opportunities (i.e. the accessible opportunities) by the generalized cost to which is allocated a certain decay function. In order to obtain a monetary value for this net utility, it is suggested to use the logarithm of an accessibility formula with a negative exponential decay function. This transforms the equation that links the opportunities to the generalized cost by a negative exponential function into a subtraction. The net utility is thus defined as the gross utility (the log of the opportunities) minus the cost of travel. In order to take account of the choices that are really available for home-to-work links, only those opportunities which can be accessed within 40 minutes in the case of a car journey are considered. Time is deemed to account for two-thirds of the generalized cost.

In the second stage, the net utility, which is the result of the increased travel that can potentially be generated by the accessibility gains, is converted into an increase in GDP. For this a correlation is established for every area in France which shows that in each conurbation the per capita GDP is directly linked to the number of jobs that are accessible in 40 minutes. The coefficient of correlation between the level of accessibility and the

per capita GDP is very close to unity. Why not therefore extrapolate? When the accessibility in one zone is improved, it is as though the zone changes category. The increase in accessibility is ipso facto transformed into productivity increases. Any increase in accessibility would allow a conurbation of one type to move into the rank above it, which automatically justifies all infrastructure investments!

The method proposed by KPMG, which is based on the concept of connectivity, does not rely on such simplifications, but it shares the same approach. For example it computes a travel decay function for different modes (train, car) and different trip purposes (business, commuting). It links a level of travel between zones i and j to each level of accessibility. On this basis, improvements in accessibility are assumed to increase travel between the zones. This generates productivity increases insofar as the most productive zones are better connected to peripheral zones whose per capita productivity is lower. This has a structural impact as thousands of workers become able to work in more productive zones and these zones are more productive because of a better connectivity leading to some positive clustering effects.

There are therefore methodological differences between the two approaches, but they are both based on causality from accessibility to per capita productivity. In both methods, an increase in travel increases the productivity of the players. It is as though better accessibility would allow every individual to find the right job. An improvement in accessibility would give every individual the opportunity to use their skills better, thus increasing the utility of the journey, hence their income and finally the collective product. Workers would find jobs that are better suited to their skills and firms would find a workforce that is better suited to their needs. It should be noted that in the French method, these productivity gains are short-term, with a given production capacity. They are the simple outcome of a better distribution of the workforce. Surely there are risks involved when one makes such simplistic hypotheses?

In the British WEB method, the agglomeration effects assume that firms have made investments as the reduction in transport costs for persons, and potentially goods, has encouraged them to develop supply. The reasoning is therefore less simplistic – the increases in productivity are generated by firms. But are firms really ready to react in such a significant manner to improvements in accessibility which will ultimately only affect a small proportion of the total workforce?

Converting a correlation into causality is very risky!

Is it necessary to restate that a correlation does not necessarily reflect causality, and that when causality exists it is not always in the direction we think? The fact that there is a close correlation between accessibility and productivity does not mean that the first causes the second. On the contrary, when two variables are so closely correlated it is because another key variable is involved ¹. Thus, productivity in Paris is higher than in a small French town not primarily because accessibility is better but principally because the qualifications structure is not the same. If the level of productivity increases with the size of the city, it is mainly because the larger the city the higher the proportion of activities which make use of skilled work and sophisticated technical capital. Thus, Venables has shown that salaries in Central London are 50% higher than in Outer London. But if the differences in qualifications and types of activity are taken into account the difference is reduced to 30%.

This difference can be explained by agglomeration or clustering effects, but these are not the outcome of accessibility, the causal process is in the other direction. What is of primary importance is the density, and accessibility is the outcome of this, not its cause. In a conurbation like London or Paris, in addition to density, factors such as the long-standing nature and the diversity of human and material capital also count. A Chinese or Indian conurbation of the same size and level of accessibility would not have the same productivity.

¹ Thus, there is a very strong correlation between the mean level of wages and the size of a conurbation. We could deduce from this that all that is needed is a considerable increase of the population of a city to increase wages!

The origin of productivity is therefore not accessibility but accumulated human and technical capital. Elective affinities between accessibility and productivity do exist, but it is productivity which is the determining factor. The most important thing is the agglomeration effect. Providing greater accessibility to a zone with a low population density in which low-skilled jobs dominate would have very small effects compared to the gains obtained by attracting new workers into a large dense zone where highly-skilled jobs dominate. This obvious fact should discourage us from seeing accessibility improvements as a magic wand. They should not be used to give the impression that we can easily boost growth just by making investments in transport infrastructure. Accessibility improvements must not be automatically transformed into increases in GDP or the number of jobs.

On this point, even if the method developed in the KPMG study does not make such outrageous simplifications as the French method, we can nevertheless question the scale of the results. Quite rightly, the “WEBs” lay emphasis on the idea that if it is necessary to invest in transport infrastructure, it is better to do so where per capita productivity is already high, i.e. in major conurbations. The KPMG study shows the beneficial effects of the HS2 project not only for London, but also for several other English conurbations. Having said this, what should we make of the figure of a £15 billion increase in GDP?

This figure is extremely debatable in that it depends on the major hypothesis that firms’ technical capital and productivity automatically increase as a result of accessibility improvements. However, although the latter may be necessary condition for economic development they are not a sufficient condition. Many factors can discourage firms from investing and taking advantage of the opportunities provided by better accessibility.

– Macroeconomic factors are the most important of these. Thus, in France, since the TGV-Est line between Paris and the Lorraine and Alsace regions was opened in June 2007, these two regions have lost respectively 5 and 2.2% of their jobs. This change has not benefited the Paris region, as between end of 2008 and end of 2012, the number of jobs there has only risen by 0.3%. The role played by macroeconomic factors is extremely

dominant. We could also mention the case of Spain which has constructed outstanding motorway and rail networks in recent years. But has this helped growth? Or should we think that the massive subsidies awarded to high speed rail have taken money away from investments that would have been more effective?

– Next, we have microeconomic factors such as the return on invested capital. Providing greater accessibility to the employees of firms which are otherwise overburdened by taxes and charges will only have a limited impact on growth and jobs.

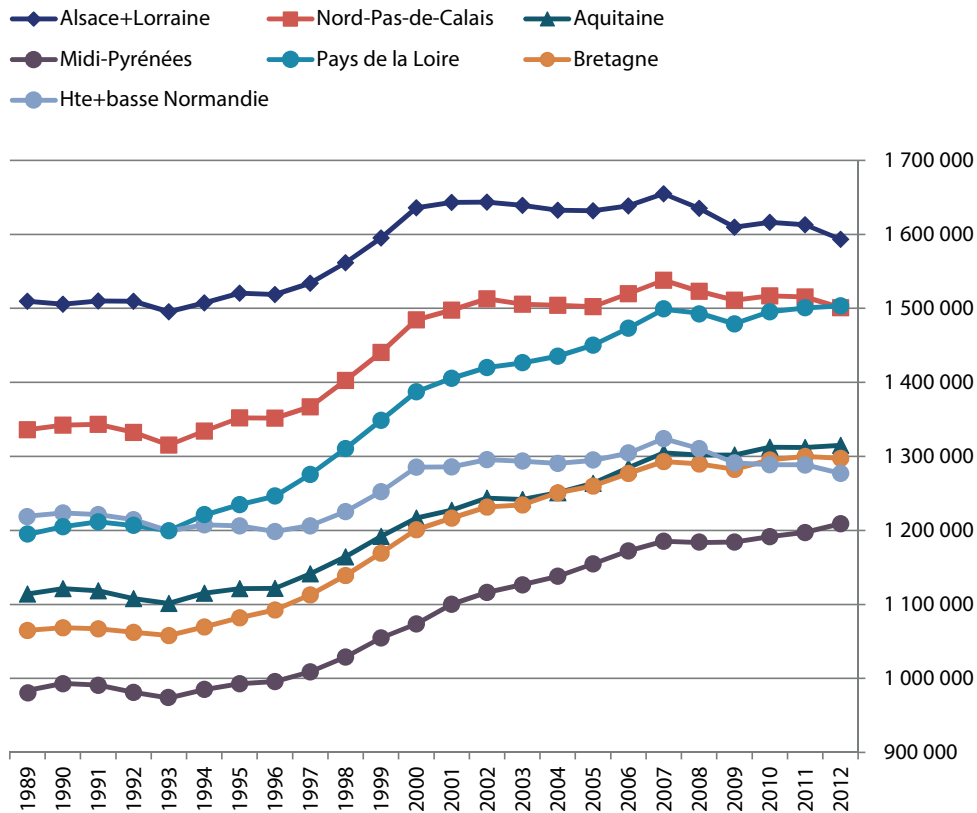
France has provided a good example of the key role of macro and microeconomic for a number of years.

Growing regions and accessibility in France: even the correlation is not obvious

As shown in figure 1, the regions that gained jobs are not the regions with the best accessibility. At the top of the figure, we find the Corsica region: almost 50% more jobs from 1989 to 2012. Is it necessary to recall that Corsica has no HSR, and just few kilometres of motorways? The 2nd region in terms of jobs growth is Languedoc-Roussillon and the 3rd is Midi-Pyrénées. Those 3 regions are regions with demographic growth, located near the Atlantic and Mediterranean coasts. The sun, via demographic growth, does more for jobs than transport infrastructure. The changes in the number of jobs between 1989 and 2012 were not linked to the fact that regions have or have not HSR services. The Nord-Pas-de-Calais region has a very good HSR relation to Paris, Brussels and London, but the number of jobs is not growing since the beginning of the 2000' as indicated in figure 2.

Figure 2. Number of jobs in French regions with or without HSR services.

1989, Opening of HSR Atlantic. 1993, Opening of HSR North. 2001, Opening of HSR Mediterranean. 2007, Opening of HSR East. 2011 of HSR Rhine-Rhone.



The graph above should force us to abandon oversimplified claims that economic growth and the increase in the number of jobs is the outcome of the development of transport infrastructure. Macroeconomic waves and demography are playing the crucial role.

It is particularly obvious for 2 new high speed lines opened in 2007 (East) and 2011 (Rhine-Rhone). What happened in the areas where the HSR stations are located? An area of employment is a geographical area within which most of the workforce resides and works, and in which institutions can find the bulk of the workforce needed to fill the jobs offered. As indicated by INSEE, the division into zones of employment constitutes a partition of the territory adapted to local studies on the labour market. Zoning also defines territories relevant to local diagnoses.

We refer to these areas and not to the municipalities because the possible impacts of a station cannot be measured on the only municipality where it is located, especially if the latter is in a rural area. This is particularly the case for new stations constructed along a new line but outside the main agglomerations. For the HSE East, opened in 2007, this is particularly the case of the stations of Reims, Lorraine-TGV and Meuse-TGV. For the Rhine-Rhone line, opened in 2011, this is the case for the stations of Besançon-TGV and Belfort-Montbéliard-TGV. The following graphs therefore show the evolution of employment for the following areas of employment:

- HSR East. Three new stations were built on the outskirts, Reims-TGV, Lorraine-TGV between Nancy and Metz, and Meuse-TGV near Bar-le-Duc. It should be noted that HSRs also serve the central stations of Reims, Metz and Nancy. This is an additional reason for measuring the possible impact of the TGV at the level of the employment area and not the municipality where the station is located.

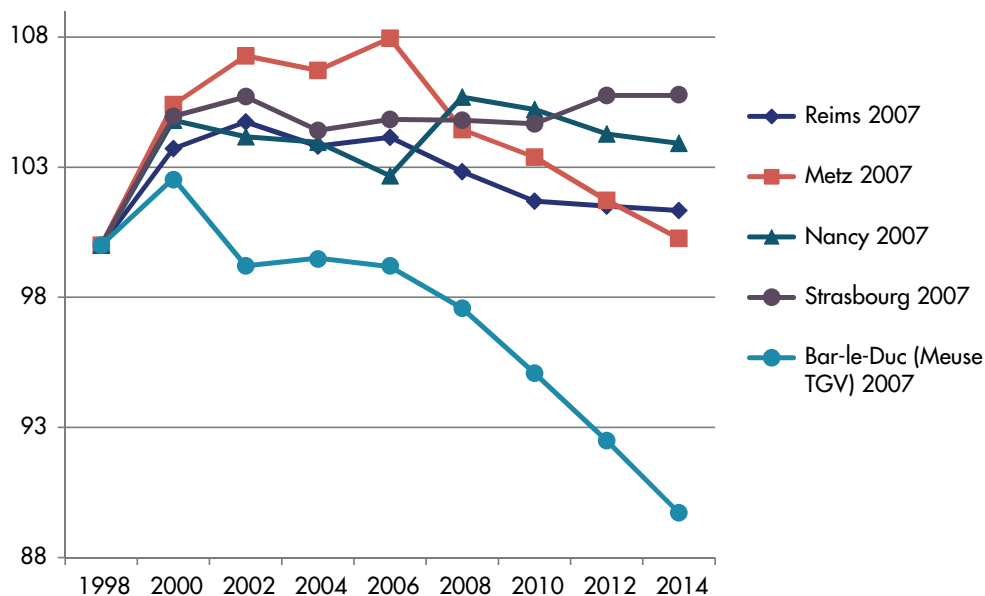
- Reims: 329 municipalities
- Metz: 378 municipalities
- Nancy: 395 municipalities
- Bar-le-Duc (Meuse TGV): 106 municipalities;

- HSR Rhine-Rhone. Two new stations have been set up in the outskirts. It should be noted that TGVs from Paris continue to serve the central station of Besançon-Viotte which is connected by a regional train to the new Besançon-TGV station.

- Besançon: 420 municipalities
- Belfort-Montbéliard: 345 municipalities.

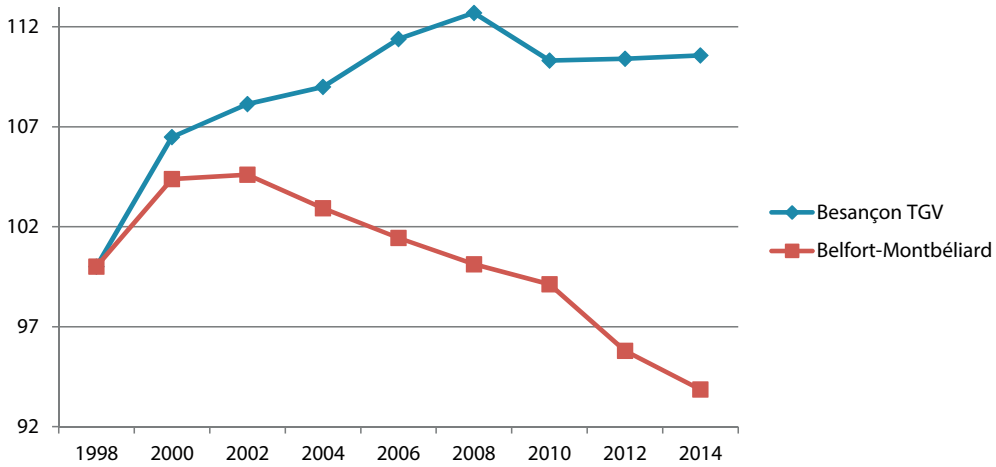
The number of jobs in France has been greatly affected by the financial crisis of 2008-2009. The recovery was only late and uneven. The regions affected by the HSRs East and Rhine-Rhone were particularly affected by the fall in industrial employment. But as the data below show, the downsizing is often prior to 2008. It intervenes as early as the years 2000 in Reims, Metz or Bar-le-Duc. In the latter zone, the fall is spectacular, with 12.5% fewer jobs in 14 years. Nancy and Strasbourg are doing better, but for all of these employment areas, it is difficult to detect a "HSR effect".

Figure 3. Evolution of employment in the areas surrounding the HSR-East stations (1998 = 100) (source: INSEE).



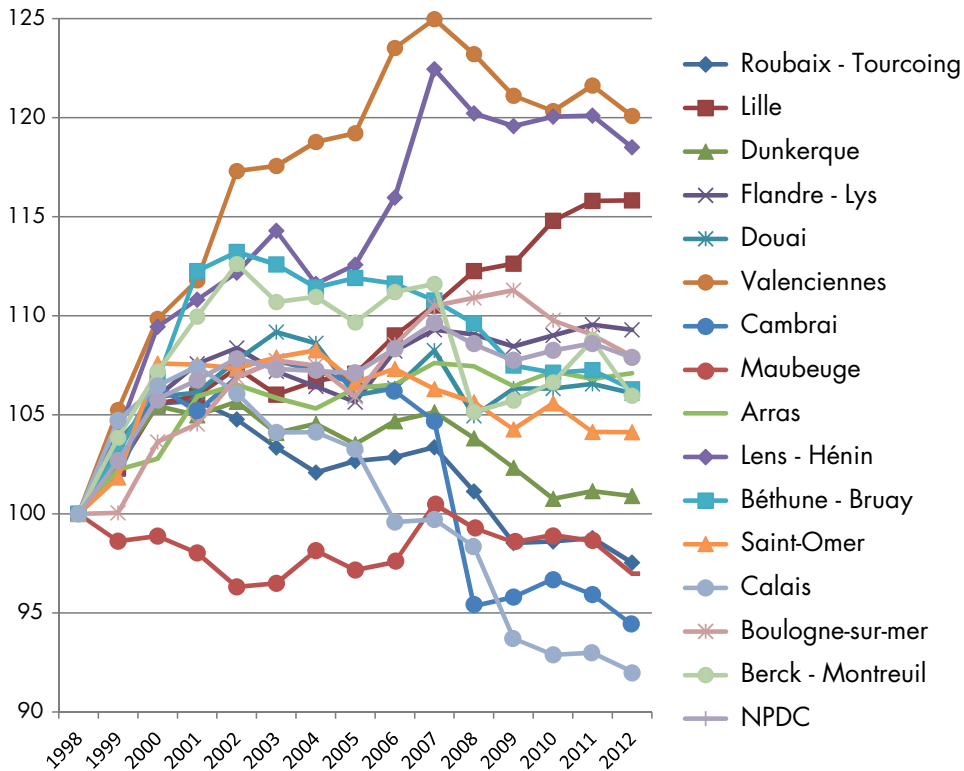
The same is true for the employment zones along the line Rhine-Rhone. Again, macroeconomic factors and local employment dynamics explain overall developments. Thus, in the Belfort-Montbéliard area, the sharp decline in employment in automotive factories was evident at the beginning of the 2000s. The arrival of HSR did not change the situation. The Besançon area is more resilient but the level of employment in 2014 remains lower than in 2008. There is no change between 2010 and 2014.

Figure 4. Evolution of employment in the areas surrounding the Rhine-Rhone HSR stations (1998 = 100) (source: INSEE).



If we put again the focus on the Nord-Pas-de-Calais region we observe the same limited impacts. Since 2001 and even more after 2008, the number of jobs is no more growing and even declining. As we can observe on figure 5 the evolution of the number of jobs is, on one hand globally correlated to the macroeconomic waves, and on the other hand linked to the specific assets of the different areas of employment. Lille is clearly attracting more and more jobs while a lot of other areas like Calais (despite or because of the proximity to the Channel Tunnel?) or Dunkerque are losing regularly a lot of jobs even before 2008. There is a clear polarisation of the activities benefiting also to Lens and Valenciennes because of the location of a big plant of Toyota.

Figure 5. Evolution of employment in the Nord-Pas-de-Calais areas of employment (1998 = 100) (source: INSEE).



To summarise, transforming increases in accessibility into increases in GDP involves two errors of reasoning:

- ignoring the fact that the local benefits of transport infrastructure include a great deal of relocation and little net creation of activities (Vickerman, 2007). New infrastructure attracts new activities, but often to the detriment of other areas (Delaplace, 2011). A local elected representative may be motivated by the creation of a new piece of infrastructure, but the national or regional community must not exaggerate the net gains;
- ignoring the fact that, historically, the main process is that growth in demography and the economy (GDP, productivity) gives rise to transport demand not vice-versa as we have seen with the French example.

Conclusion

The main lesson of HSR in France is the weak relation between speed gains and the local and regional development. Data on employment reveal the absence of a clear relationship between the arrival of HSR and the dynamics of the job market. Other factors, economic and demographic, are at work. We can illustrate this by using the famous formula of Archimedes: *«Give me a sufficiently long lever and a solid fulcrum and I will raise the world.»* Regarding HSR, the lever is the time savings and the fulcrum is the number of travellers. But in comparison with the mass to be lifted, an area of several tens or hundreds of thousands of jobs, the time savings of a few hundred or thousands of passengers offer neither a strong fulcrum, nor a powerful leverage. HSR cannot change the face of the world especially in regions losing inhabitants.

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