



Financing future growth in infrastructure needs

Alain Bonnafous

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Financing future growth in infrastructure needs

by

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Lyon, August 2006

INTRODUCTION

Determining future transport infrastructure needs is traditionally the first stage in the investment planning process. However, this process generally takes place within the framework of national transport policy, even in cases where the infrastructure is used for international traffic flows. This report proposes to address this issue by considering the specific needs of international traffic flows with regard to inland modes of transport.

Obviously, these issues will be shaped by the way in which traffic flows develop over the next few decades, since new infrastructure needs and the associated financing problems clearly depend on the pace and scale of such growth. This uncertainty would be dispelled if growth were to remain zero or very close to zero. In the opposite case, namely if average growth rates were to be higher than 1.5% to 2% in European countries, growth in traffic raises the issue of the so-called decoupling of transport from economic growth.

We must therefore begin by dispelling these uncertainties regarding a possible decoupling, or at least by stating the assumptions underlying the situation in which we find ourselves.

1. A DIFFICULT FORECASTING EXERCISE

Decoupling can occur as a result of several mechanisms that are relatively well understood, particularly in the case of decoupling factors relating to economic development which we shall examine in section 2.1. on the basis of some recent statistics. However, these quantitative analyses have generally been restricted to the time series data currently available, and therefore to domestic goods traffic. We shall supplement these findings in section 1.2. by means of an analysis of international trade based on the specific concept of border effects. Section 1.3. will conclude this part of the discussion on the outlook for decoupling with a discussion of the potential price effects.

1.1. Decoupling and economic development

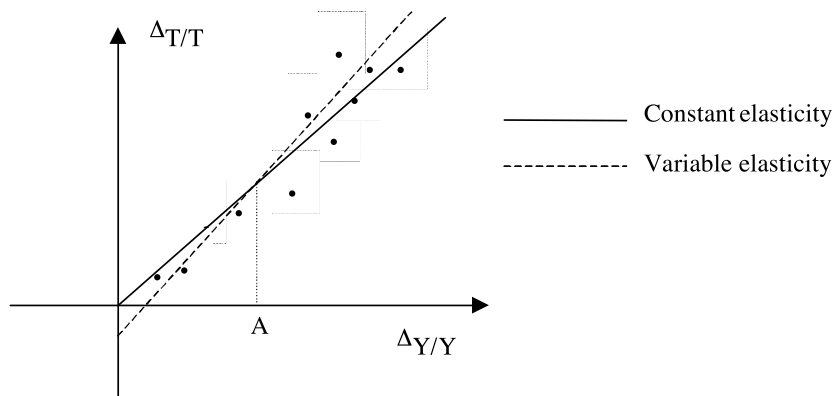
The central issue is clearly whether the nature of current growth, driven by the development of services and intangible goods, can be accompanied by relative stagnation in output and trade in goods. If we express this in terms of the elasticity of traffic flows to growth, then the decoupling hypothesis could be posited as the reduction of such elasticity over time. At all events, any forecasting exercise must take account of such erosion in that, even if we were to assume persistent and vigorous economic growth, it is feasible that the rate of growth in transport might not be as high as the rates observed in the past during periods of strong growth.

However, it is worth recalling that a declining rate of elasticity can result from use of a given econometric construct or might simply be an optical illusion, given that the very concept of elasticity is based on the premise that the ratio between variations in a transport activity indicator (denoted T) with respect to an output indicator (for example, national income, denoted Y) remains constant. It is expressed as follows:

$$e = \frac{\Delta T / T}{\Delta Y / Y}$$

In most statistical studies that propose an estimate, as most forecasting models do, this elasticity is assumed to be constant. Accordingly, when a small data set is available, like the one represented in **Figure 1**, e is measured by estimating the gradient of a (solid) straight line passing through the origin.

Figure 1. Hypothesis of constant elasticity and reality of variable elasticity



Let us assume that the ratio between the observed variations in T with respect to Y is more or less linear but that the straight line providing the best fit with this ratio does not go through the origin, as shown by the dotted line in Figure 1. It is clear that in this case the elasticity can no longer be held to be constant. In the case represented in Figure 1, the strength of the trend increases commensurately with the strength of economic growth.

Accordingly, there may be several reasons for the “optical illusion” of decoupling. The most obvious one can be seen from this Figure which shows that, if growth is high, the elasticity measured in terms of the gradient of the straight line through the origin underestimates the real elasticities (when to the right of point A). In another configuration, it is possible that estimates based on a recent period of low growth might suggest that the “gradient e ” is historically decreasing, because in earlier periods of higher growth the “gradient e ” was clearly steeper.

In place of a postulated elasticity of transport to growth that is variable over time and decreasing, we propose the hypothesis of *variable elasticity that increases in line with growth*, of which examples will be given in the following paragraph (see Figure 2 below). The development of freight models for France, and in particular the Quin-Quin Fret model developed at the *Laboratoire d'Economie des Transports*¹, has provided statistical validation of this hypothesis on the basis of the trends observed over recent decades, although there can be no guarantee that this will continue to be the case in the future.

It should be noted that these studies have clearly revealed the structural effects of output and trade: depending on the type of product considered, growth in tonnages of goods produced and transported is very low or even stagnant, and there is some evidence of a gradual decline in the tonnages transported. However, these studies also show that the range of these transport flows (in terms of average distance) continues to grow regardless of the type of product. This too is further evidence that changes in the spatial division of labour continue to increase average transport distances. Consequently, the hypothesis we are in the process of formulating (of variable elasticity that increases in relation to economic growth) does not relate to the tonnages produced and carried, but rather to tonne-kilometres.

The most recent econometric studies on decoupling have confirmed these trends, particularly those based on the concept of transport intensity. This indicator is in turn based on the concept of the energy intensity used in energy economics², which has been used by analogy in transport economics³ to deal specifically with this concept of decoupling. *The intensity of freight transport is defined as the ratio between the number of tonne-kilometres of freight transported within a country and GDP of that country.* Since the issue of decoupling is closely linked to environmental issues, road traffic intensity is usually the parameter which is taken into consideration and which relates the number of tonne-kilometres of freight transported by road to GDP.

In 2006, Julien Brunel proposed an econometric study of decoupling⁴ based on this indicator and statistics for the initial 15 EU Member States from the period 1982-98. In that study he used the following equation which, although almost entirely expressed in accounting terms, allows a distinction to be made between opposing effects.

$$\left[\begin{array}{c} \text{Intensity} \\ \text{of road} \\ \text{transport} \end{array} \right] = \left[\begin{array}{c} \text{Modal} \\ \text{share} \\ \text{of road} \end{array} \right] \cdot \left[\begin{array}{c} \text{Average} \\ \text{transport} \\ \text{distance} \end{array} \right] \cdot \left[\begin{array}{c} \text{Average} \\ \text{weight of one} \\ \text{dollar of} \\ \text{industrial} \\ \text{output} \end{array} \right] \cdot \left[\begin{array}{c} \text{Share of} \\ \text{industrial} \\ \text{output in} \\ \text{GDP} \end{array} \right]$$

The results can be summarised as follows, taking the factors in this equation from right to left:

- The share of GDP in industrial output tends to decline as soon as per capital GDP falls below USD 15 000. This is therefore the threshold at which it becomes a factor in decoupling.
- The average weight of a dollar of industrial output obviously tends to decline in economies in which heavy industry is becoming less important. It is also a factor in decoupling.
- Average transportation distance increases in relation to growth, even though it is observed to stabilise when per capital GDP approaches USD 25 000. This stabilisation can be interpreted as a kind of saturation of the spatial division of labour, although this is primarily due to the fact that the type of transport discussed in this study, given the lack of good statistical sources, solely takes account of national transport, whereas this spatial division of labour is primarily occurring at international level at the present time. This distance effect nonetheless remains a factor in coupling.

- The modal share of road increases in line with per capital GDP, which is a well-known trend that we shall return to later in this discussion. It is also a factor in coupling.

These results therefore confirm the indirect econometric estimates. So what, in view of this, is the outlook for decoupling? Quite simply, decoupling depends on growth: *if growth remains at a low level, the increase in distances is scarcely sufficient to compensate for the decline in tonnages and traffic as a whole either stagnates or declines; in contrast, in the event of growth rates higher than those observed in Europe to date, growth in traffic could be even stronger*, particularly if account is taken of more than just national traffic, as we are about to demonstrate.

1.2. Decoupling and border effects

In view of our particular focus on transport relating to international trade, we cannot disregard the fact that national and international traffic flows do not exhibit the same characteristics over time. What we can effectively see in the European area, as in other continents, is two contrasting effects: all things being equal (distance, demographics, levels of development, etc.), *national traffic levels are higher than international traffic levels, although the latter are growing more strongly*.

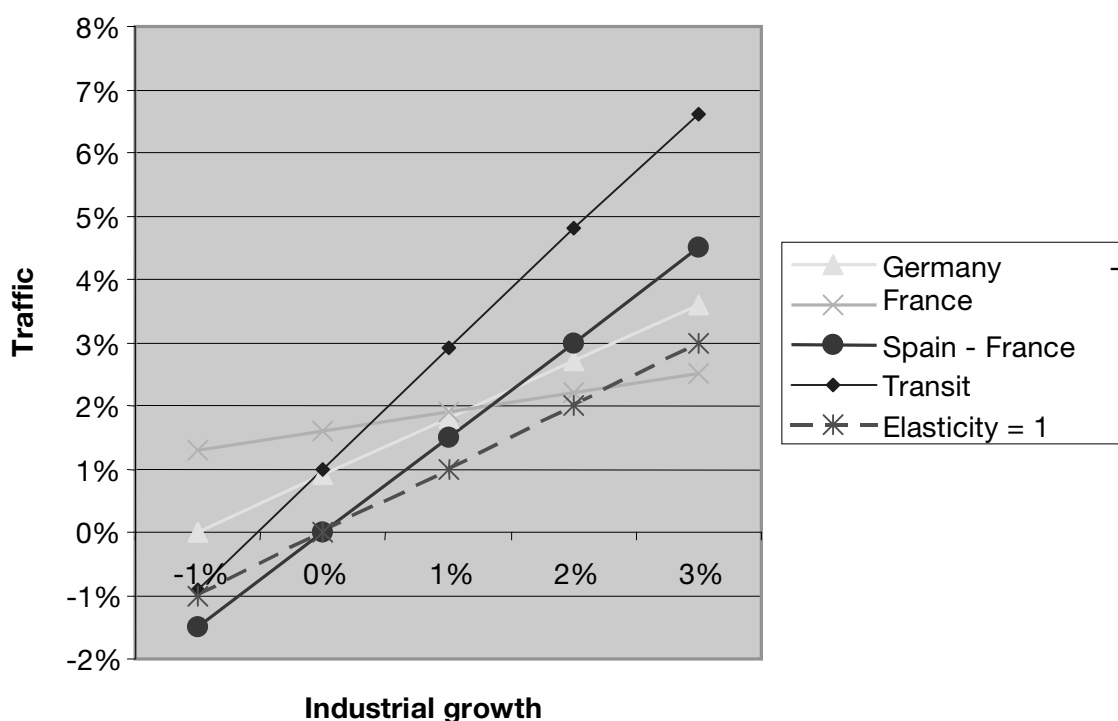
As has already been demonstrated⁵, this simple observation is attributable to border effects and their gradual attenuation. More specifically, if any model is applied to traffic flows between two towns of a given size and located at a given distance from each other, there will clearly not be the same level of trade if a border exists between these two cities as there would be if there is no border. It is as though the border effect reduces traffic by a given coefficient. Estimates of the order of magnitude of this coefficient range from 4 in the case of Netherlands and Germany, to even higher values between other pairings of neighbouring countries⁶.

In purely quantitative terms, internationalisation can be measured by what is usually the very steady decline in this coefficient. This confirms several economic analyses, including that of the spatial division of labour, whose accuracy has been constantly borne out as transport costs have fallen and customs barriers rolled back.

We can give a few findings which illustrate this process and which were obtained in a prospective study of traffic flows on the most congested corridor in France, namely the Rhone Valley⁷. To construct long-term simulations of traffic flows along this corridor, a distinction was drawn between different origin-destination pairings, of which four are considered here as part of our discussion. A variable elasticity model was constructed for each pairing to recreate the growth rate of these flows according to the rate of growth in industrial output, the most relevant indicator in statistical terms (assumed to be identical in the two countries in each origin-destination pairing). These findings, which we can analyse in terms of apparent elasticity (in the sense of the ratio between the rate of growth in traffic flows and the rate of growth in industrial output), are reproduced in **Figure 2**. To make them easier to understand, we have added a dotted line representing the notional case of constant equal elasticity.

The first striking result is that these apparent elasticities are positive (and generally greater than one) in cases where the industrial growth rate is not negative. *These significantly higher values than those observed in national traffic flows confirm that the spatial division of labour is primarily driven by the international division of labour at the present time. Either that or what we are seeing here is an indication of a continuing decline in border effects.*

Figure 2. **Impact of industrial growth on growth in different types of traffic flow through the Rhone Valley**



The other major result lies in the fact that some traffic flows respond significantly more strongly to growth than others. One example of this may be seen in trade flows between France and Spain, whose elasticity to growth in industrial output is always higher than that in trade between France and Germany. This may be attributed to the fact that the reduction in border effects between the latter two countries is a far older phenomenon which dates back to the creation of the Common Market as long ago as the 1960s. It is as though trade between the two countries, which is still highly buoyant, has reached the stage of maturity with elasticities of trade to growth close to national levels, whereas the elasticity of trade between Spain and France to growth remains at a higher level.

However, transit traffic is even more dynamic since it continues to grow even when industrial production is stagnating in sending and receiving countries, and this growth in traffic soars when industrial production becomes positive, for in this case the elasticity of traffic with respect to growth is always higher than 2. This kind of traffic – for example, between Spain and Germany or Italy and Portugal – is more long-distance than that between two neighbouring countries. Although this traffic is generally not extremely large in terms of tonnage, the long distances involved mean that its relative “weight” is greater in tonne-kilometres, which provide a better measurement of the actual use of networks. For example, for transit traffic passing through the Rhone Valley, the distance between the two closest of all the pairs of regions involved (Catalonia and Piedmont) is over 1000 km. This means that each thousand tonnes transported generates over one million tonne-kilometres of traffic on the network, since the multiplier factor is obviously even larger for all the other traffic in this transit category.

To illustrate the dynamism of this kind of traffic, we can point out that it stood at roughly six million tonnes at the end of the 1990s and that, assuming a 3 % average growth in industrial production, by 2020 there would be over 34 million tonnes passing through the Rhone Valley in the category of transit traffic alone.

We should add to these considerations the fact that one of the components of this long-distance traffic consists of the terminal-to-terminal transport of intercontinental trade, which is generally considered to have the highest growth potential. This can be justified by noting that it costs approximately one euro cent to transport a shirt from the Far East to Europe at the current price for a container shipped from Hong Kong and unloaded in Rotterdam, which suggests that the globalisation of trade is just beginning, especially for the very long-distance components of such trade.

With regard to intercontinental trade, it should be noted that the distances of the land traffic involved are expanding regularly with the growing concentration of traffic in ports, which has long been favoured by the increasing returns to scale of maritime and port economies. As a result, there is likely to be strong growth in this terminal-to-terminal transport in terms of tonne-kilometres.

Consequently, there is every reason to believe that international transport will remain dynamic, unless significant increases in transport costs were to restrict trade.

1.3. Decoupling and price effect

Decoupling is sometimes considered as the possible (or probable or desirable) outcome of a significant increase in transport costs. However, the reason why this price effect is taken into account lies in the fact that the long-term outlook for our transport systems that we are tempted to adopt is always highly dependent on the circumstances in which this outlook is examined. At the time of the drafting of this report, the price of oil is over 70 dollars a barrel and it is commonly claimed in the literature that at these energy prices, the mobility of goods and persons will gradually stabilise and even decrease.

This fails to consider the fact that in constant dollars, prices were even higher than in 2006 several times after the first oil shock of 1973. If income growth is added to the inflation effect, i.e. if the current price of oil is assessed in relation to *per capita* income in industrialised countries, which amounts to calculating in terms of buying power per barrel of oil, we can conclude that this “buying power” with respect to oil remains significantly higher than it has been over long periods in the past during which there was no significant and lasting slowdown in transport activities.

Admittedly it is to be expected that transport policies will address, as they should do, the problem of the depletion of non-renewable resources and the equally challenging problem of transport’s contribution to greenhouse-gas emissions. It is also true that the price instrument should be used for this purpose, both to send a signal as to the scarcity of this resource and to internalise the external effects on the biosphere, and that this in turn will reduce the margin of certain transport activities, in particular for low value-added goods.

For example, it seems likely that the transport of grass sod by lorry from Riga to southern Spain, as shown in a news report on a German television channel, would no longer be profitable if fuel prices were to rise significantly and if driving time regulations were strictly enforced. If this transport were switched to rail, then the corresponding traffic and problems of capacity would be transferred to rail networks. If this long-distance trade were eliminated, then a share of the traffic (or of its growth) would disappear.

If such trends became significant, the apparent elasticity of traffic with respect to growth would decrease, but we can also imagine the possibility that rail service that is competitive in terms of price and quality of service could transport these goods in conditions comparable to those that have until now only been provided by road transport. The real anomaly is not that such long-distance transport of a low value-

added product is done by road, but that the rail system is unable to offer more competitive service. However, this state of affairs is currently changing. For example, between 2000 and 2004, the market share of railways increased significantly in those countries where competition between operators has been promoted (+0.9 % in Germany and +1.9 % in the United Kingdom, as compared with -3.6 % in France, where the historic operator's monopoly has in fact been maintained).

We therefore think that it is reasonable to assume that the growth of traffic will only be slightly reduced by price effects and that although transport tariff trends may have a significant short-term impact, there will be less long-term impact on global traffic than on the modal split, which is obviously sensitive to the relative prices charged to passengers and carriers.

These observations are confirmed by all the evaluations that have been proposed for the price elasticities of traffic. Whether these elasticities are short or long-term or for freight or passenger traffic, they are always significantly below one (in absolute terms). It goes without saying that if there were a more serious and lasting "oil shock" than those experienced thus far, our assumption would no longer hold. Except under these exceptional circumstances, it should be noted that these low price effects justify tariff policies to which we shall return later.

On the whole, our working hypothesis for the rest of this report will be that, although domestic traffic measured in tonne-kilometres is tending to grow more moderately, international traffic will remain very dynamic and its elasticities with respect to industrial growth will be very significantly higher than 1. Large-scale studies on major projects confirm that this is the case. For example, studies conducted to evaluate the Lyon-Turin train link (high-speed-trains and freight trains) perfectly illustrate the analysis presented above.

With regard to the situation in the past, the statistics show 4 % average annual growth in traffic between Ventimiglia and Tauern between 1984 and 2004. For the future, the simulations carried out for these studies, based on an assumption of moderate growth in Europe, suggest that traffic through this Alpine Arc would rise from 126 million tonnes in 1999 to 248 million in 2017 and 345 million in 2030. This virtually doubling would correspond to an annual growth in traffic of slightly over 3 % and can reasonably be considered as an average assumption.

Given this outlook and the challenges that it implies, consideration should be given to what form an infrastructure policy adapted to the development of this international traffic might take.

2. PLANNING AND FINANCING NEW INFRASTRUCTURE

The decision to develop new infrastructure in a country is always the responsibility of its central government, whatever the purpose of this infrastructure. At most, the decision may become bilateral in the case of interlinking infrastructure that crosses a border. *With the internationalisation of traffic, differences are emerging between the responsibility for decision-making and financing and the responsibility for needs, which should be reflected in planning.* This is obviously not a new problem.

The problem of co-ordinating cross-border infrastructure and, of course, the related problem of financing it, have long been recognised. In particular, the experience of the European Community and its mishaps perfectly illustrates the difficulty of developing an international infrastructure policy. It is therefore worth taking a closer look at this experience.

2.1. The problems of trans-national infrastructure policy

The Commission's very first memorandum on the common transport policy already showed the difficulties encountered in 1961 (!), in particular the complete lack of financing.

This memorandum touched upon many aspects of the common transport policy which was, it must be recalled, one of the three common policies provided for by the Treaty of Rome (together with trade and agriculture). It was the basis for all aspects of the action programme proposed by the Commission in 1962⁸. A genuine common transport market was envisaged and common policies and regulations were gradually supposed to replace national policies and regulations, thereby establishing fair competition between different modes of transport and, of course, within each mode. Even though it was not the most important aspect, this memorandum addressed infrastructure in two ways.

Firstly, it suggested a harmonisation of charges for the use of infrastructure, an issue that is of course also relevant to the harmonisation of the financial intervention of States, since these charges cannot be isolated from all transfers made through taxation or public subsidies in the field of transport. This issue was addressed in a theoretical study that was to have a major impact on transport economics. This study, known as the "Allais Report"⁹, clarified the theoretical foundations of marginal social cost pricing, but without eliminating the obstacles to implementing this optimality principle concretely, i.e. measurability of social costs and cost functions, public financing needs linked to situations of increasing returns, etc.

However, at that time the more pragmatic and yet more ambitious approach to infrastructure was gradually to promote the co-ordination of investments, starting by recommending a procedure of consultation among States. However, the exchange of information long remained limited to a few cases of common interest, even though the *initial goal was to promote projects of Community interest, but above all a certain complementarity between national projects so that genuine Community networks might be established over time.*

It would be false to maintain that the procedures currently being used to evaluate and plan infrastructure in each State have taken into account what might be called a "Community interest"

criterion. Nevertheless, the Commission has continued its efforts and has even taken policy initiatives, with the creation in 1966 of an Infrastructure Committee theoretically responsible for the co-ordination of national plans, and the adoption in 1978 of the Commission's proposals for improving the consultation procedure¹⁰. *It is obvious that what has really been lacking is specific and above all significant European financing.* In short, the States have paid for their own infrastructure and kept sovereign control over the allocation of their expenditures.

This is a common reaction that can be observed throughout the history of transport infrastructure: *whenever different tiers of government are given responsibility for infrastructure, each tier sets its own priorities.* A commune will only make an investment that will benefit users in neighbouring communes if the investment is of sufficient benefit to its own residents, and this rationale of a local level of solidarity will also be found at the regional level for regional roads and at the national level for national roads. *An international level of solidarity can only become a reality if financing is also made available at this level.* However, the fact is that the efforts made in the field of common regional policy, for example, have thus far had no equivalent in the field of common transport policy.

Nevertheless, if we only consider this level of the European Union, it is fair to say that considerable progress has now been made, even if we are still far from having a perfectly co-ordinated infrastructure policy.

2.2. Initial strategic directions and infrastructure plans

We can consider that the strategic directions regarding the infrastructure that should be developed are now clearly outlined if not well established with, firstly, the approach in terms of Trans-European Networks (TEN or, more accurately, TEN-T for transport networks).

With regard to this first point, we should point out that the concept of a trans-European transport network has only been formally introduced relatively recently, since it is only in Title 12 of the Maastricht Treaty that the EU is given the *objective of developing cross-border infrastructure networks and their international inter-operability*. This may be viewed as a fuller and more detailed reformulation of objectives very similar to the approach adopted to the co-ordination of national projects mentioned above which had originally been formulated 30 years before. However, behind this language, there is an important methodological difference since we can now consider that Europe with its 25 Member States at last has a long-term plan. Even though this plan is more the outcome of an aggregation of major national projects than of a genuine integrated long-term planning policy, it has the merit of existing, with the same hierarchical principle as that which guides national planning procedures. This hierarchy essentially consists of three levels.

The largest envelope concerns all of the TEN-T¹¹ that have been taken into consideration, including projects that have only been selected to spare regional susceptibilities or strike a regional balance. The total cost of this network (which contains projects that reasonably deserve priority and others that are less deserving) is estimated at over EUR 600 billion. This enlarged plan might be described as one that satisfies everyone's desires (and whims). It obviously does not have a definite time frame, which makes it possible to dream.

At a second level, we find a set of TENs which resemble a genuine plan, i.e. based on priorities set by the Van Miert Group, whence the name sometimes given to this plan. It includes all the priority projects that it would be desirable to carry out by 2020, the overall cost of which is estimated at approximately EU 235 billion.

Lastly, at the third level, we find what generally corresponds to medium-term planning, i.e. the short list of projects that it has actually been decided to construct. This includes the “Essen and Dublin projects”, which must still be completed or initiated and which have a budget in the range of EUR 110 billion.

What remains very different from comparable procedures conducted at the national level is, of course, the fact that the Community level is largely left out of the decision-making process. Despite a good level of consistency, it can only encourage decision-making through policy and financial incentives. As for the States, they have preserved their sovereignty with regard to decision-making, especially since they provide the bulk of financing. Consequently, it is at the financial level that the problem is far from being solved.

Indeed, it should be borne in mind with regard to the above costs that the EU budget for TEN-T was EUR 4.17 billion for 2000-2006. The Commission had suggested boosting this joint effort to just over EUR 20 billion for the new period, 2007-2013. It is a known fact that the budget discussions were laborious, and that the final choices were late in coming. The result was especially disappointing for TEN-T: following the agreement on the Financial Perspective 2007-2013 that was reached at the European Council in December 2005, the Commission formulated a new budget proposal earmarking EUR 6.7 billion for TEN-T, as compared with EUR 20.35 billion in its initial proposal and 4.6 billion for 2000-2006.

This is tantamount to a cut in funding, once inflation is taken into account, and especially insofar as it applies to a 25-member Europe whereas the previous amount had been provided for EU-15. It goes without saying that the co-financing outlook for major priority projects will have to be revisited, since the assumption had been that co-financing would be capped at 30% for priority projects and 50% for their cross-border sections.

As a result, new infrastructure requirements and low funding capability are posing a classic challenge that needs to be addressed with a comprehensive sectoral policy response, it being plainly evident that the decision to invest and the capacity to finance are but two aspects of the overall regulation of international transport.

2.3. What sort of governance for trans-national networks?

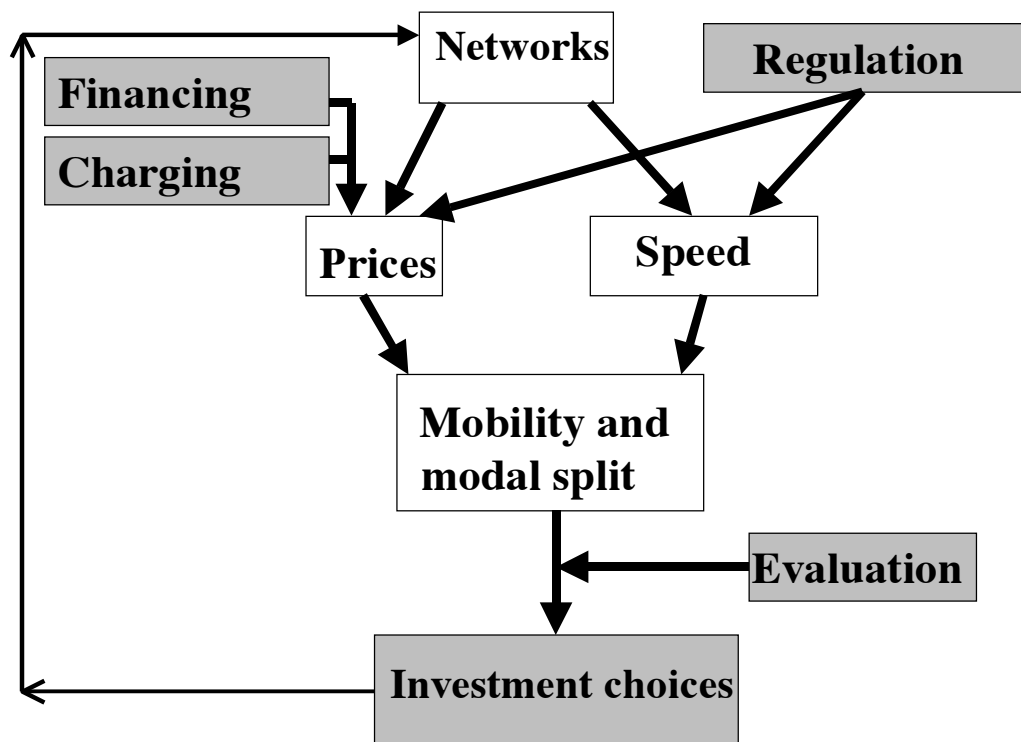
Figure 3 represents the functioning of a transport market such as the continental transport market (passenger or freight) in the simplest possible terms.

At the heart of the market mechanisms is the supply of transport, which determines the mobility levels of passengers and freight provided by each mode. For centuries, the two main factors of intermodal competition have been prices and speed – the latter needing to be considered broadly, encompassing, for example, frequency or reliability.

For each mode of transport, the prices and speeds on offer are clearly dependent on the quality of infrastructure networks and how they are operated. Here we see the role of government’s controls over the system – controls shown above in grey-shaded boxes. The first two means of control, which affect the relative prices of competing modes, are *financing methods* (for infrastructure and operations) and *charging for the use of infrastructure*. Another means of control that also affects relative prices, but speed as well, is *regulation* – a term that we use very broadly to encompass labour and safety matters as well

as the general organisation of transport markets, including those for infrastructure supply and demand, in which the degree of both regulation and competition can vary.

Figure 3. The international transport market and government's controls over the system



The traffic levels resulting from this competition, reflecting the intensity of use of the transport networks, will depend on the efficiency of the corresponding modes. In sum, it is this relative efficiency that will determine the needs for new infrastructure and, in particular, a project's socio-economic and financial returns. As a result, the diagram shows as means of control the *evaluation of investments* and the *investment decision itself*, which should be used consistently with evaluation. It is these investment choices that over time will shape the development of competing networks, thus “closing the loop” of the system.

In this simplified diagram (Figure 3), transport is shaped fundamentally by market mechanisms, but mechanisms that remain in the hands of government, which exercises the five major means of control cited above.

Yet if this diagram is to have any relevance, it is clear that one must factor in all of the means of control and ascertain whether there is a good strategic fit between them, in terms of coherent TEN-T expansion, insofar as they are exercised jointly at the EU and national levels. Each means of control must therefore be examined from two standpoints: how they are duplicated at both these levels of decision-making; and how they interact with the other means of control comprising the system.

2.3.1 *Financing as a means of control*

In section 2.1, we already referred to the means of control that is portrayed in Figure 3 as a dotted arrow, i.e. financing, and more particularly the European Union budget's funding for TEN-T, which at EUR 6.7 billion looks modest indeed in comparison with an overall budget of EUR 862 billion in appropriation commitments for 2007-2013. One of the explanations for this meagre budget is that transport infrastructure has always had other sources of Community financing.

It is indeed a well-known fact that European budgets have financed many a transport operation. It is estimated, for example, that the European Regional Development Fund (ERDF) supplied about EUR 15 billion for such operations during the previous financing period (1994-99). At the same time, the Cohesion Fund has provided EUR 8 billion in transport project financing in the Union's least developed countries. This means that the TEN-T budget proper accounts for less than a quarter of aggregate appropriations for transport infrastructure.

But it is also acknowledged that this financing is fairly remote – both figuratively and geographically – from TEN policy. In many cases it is part of a spatial dissemination policy which happens to be in line with the most widespread conception of regional development policies. For instance, a programme to renovate a rural road would be a more likely target of funding than completion of an arterial road on a major corridor. In addition, the ERDF, like the Cohesion Fund, deals primarily with peripheral regions, which in most cases are connected only to the “extremities” of TEN-T. Clearly, however, these extremities are of no interest unless the central portions have already been built or are likely to be built fairly soon.

Consequently, where financing exists – because it so happens that at one point in its history the European Community had the resources to adopt a regional action policy – policy choices are not especially geared towards the development of major trans-European corridors. As a result, the official priorities of programmes like the ERDF include such considerations as “improving access to the regions by connecting the main networks to local small-scale transport systems”. This is understandable, but only if the main networks do in fact exist; otherwise, the notion of accessibility becomes particularly naïve.

When the details of recent budgetary choices were set forth, those wishing to expand the TEN-T suggested that their own budgets be concentrated on areas not eligible under the terms of the ERDF's first objective, namely convergence. Eligible areas could then direct ERDF funding towards their TEN-T feeder sectors.

The main beneficiaries under the first objective, and the Conference of Peripheral Maritime Regions (CPMR) in particular, lost no time reacting. A CPMR policy position¹² affirmed that “the TEN-T budget should not be considered by the European institutions as a financial instrument reserved solely for developed regions of Europe to compensate them for their non-eligibility for Structural Funds.” It is plain to see that the European Union is probably not prepared to limit the scattering of transport infrastructure financing for TEN-T development.

Nevertheless, the modest size of the budget available for these networks fully justifies a highly selective choice of projects eligible in the short term for Community financing, rather than to disperse meagre resources amongst a large number of projects. This tightening of priorities could be guided by two principles:

- reserving Community financing for cross-border sections;
- strict ranking of priorities, based on rigorous evaluations (see section 2.4. below).

It is not clear that on this basis projects in areas eligible for ERDF funding would emerge as the most useful for the public interest. Barring any possibility of redeploying regional action budgets, it would be reasonable to ensure that the budgets are complementary to specific TEN-T financing.

But TEN-T financing remains modest, and this would suggest exploring alternative funding sources, focusing on revenue that could be provided through a system of charging for the use of infrastructure.

2.3.2 *Charging as a means of control*

Of the three traditional functions of charging for the use of infrastructure – covering costs, steering demand, and redistribution – we are interested primarily in the first, since the question at hand is the extent to which charges can help finance new infrastructure.

A distinction must be drawn between two types of charging: tolls, which are collected for each passage on a section of infrastructure, and which generally add to the income of the infrastructure manager; and fees, which can be levied and collected in a manner very similar to a system of tolls or through some other means (axle taxes, vignettes, fuel taxes, etc.).

Tolls are ultimately simpler, or at least more direct, as a means of financing. For a given facility, they generate revenue that can provide full or partial funding.

This system was long regarded with some condescension by countries that did not practice it. Its concrete results with regard to motorways, the gradual incorporation of recommendations from economic analysis, and acknowledgement of the soundness of the user-pays principle changed that way of thinking. The fundamental issue here has shifted from culture shock (how can a civilised country charge to use its roads?) to a more pragmatic consideration (how to gain acceptance of a system that is economically efficient?).

In the case of railway networks, it was through just such a process that from the early 1990s¹³ the principles of separating “wheels from rails” and charging for the use of railway infrastructure became readily accepted at the Community level, and that today half of the financing for a new service such as the Perpignan-Figueras rail link – the key link in a major TEN-T – is provided by charges for infrastructure use.

The toll system is particularly well suited for major international routes, and especially cross-border segments, because of the substantial and sharply rising proportion of transit users, as we showed in section 1.2. It is therefore not unusual that these users be called on to contribute, insofar as they pay no taxes in the countries that finance most of the infrastructure. It could even be considered that *this principle is objectively reinforced by the collapse of the Community TEN-T budget*.

Other fee-based systems pose more complicated problems with regard to covering the costs of new infrastructure. For one thing, it cannot be assumed that the revenue collected would be earmarked for the transport sector, insofar as its allocation would run counter to one of the major principles of public

finance, namely the unity of revenue. It should be borne in mind that this principle is justified by the fact that to earmark particular income limits resource allocation, and it is unlikely to result in optimal allocation.

Rebutting this time-honoured theoretical principle is one of *realpolitik* to achieve the twofold benefits of “enshrining” infrastructure investment and making it more acceptable to charge users, especially in respect of certain new fee-based systems. In the case of the Swiss distance-related heavy vehicle fee, for example, not only is the revenue allocated entirely to the transport sector, to finance major cross-country rail links in particular, but one-third of it is paid to the cantons for their road-related expenditures.

More generally, many countries have instituted special funding mechanisms that correspond to a more or less direct return of usage charges, among them being France, Germany, Sweden and Switzerland. But this leaves open the question of which investments will get the funding, and there is a major risk that revenue generated by the use of existing TEN-T may not be allocated for their development.

Tolls would therefore seem better suited than fees for financing infrastructure for trans-national use, unless national governments are clearly determined to steer resources in that direction. Moreover, a toll-based approach is consistent with the concession or public-private partnership arrangements that are favoured at the Community level.

*The recent Eurovignette mechanism*¹⁴ fits ambiguously into this alternative between tolls and fees, laying out a common framework for the taxation of TEN-T road infrastructure that will be applicable by May 2008 to vehicles over 12 tonnes and by 2012 to vehicles over 3½ tonnes. It applies to TEN-T proper but also to “parallel roads to which traffic may be diverted”.

The level of tolls is clearly compliant with the user-pays principle and is designed to cover costs. The Directive is very explicit: “Specifically the weighted average tolls shall be related to the construction costs and the costs of operating, maintaining and developing the infrastructure network concerned. The weighted average tolls may also include a return on capital or profit margin based on market conditions.”

This mechanism thus has all the appearances of tolls, except in respect of revenue allocation. It is the Member States that determine how the revenue shall be used, with the Directive stating simply that “revenue from charges should be used to benefit the transport sector and optimise the entire transport system”.

This wide-open option is justified, *inter alia*, by the fact that it should be possible to use road use charges to finance railway infrastructure. Clearly, however, the word “should” opens the door to any number of ways in which the revenue could escape, and *this justifies the establishment of financing agreements to ensure that the revenue is returned*.

2.3.3 Regulation as a means of control

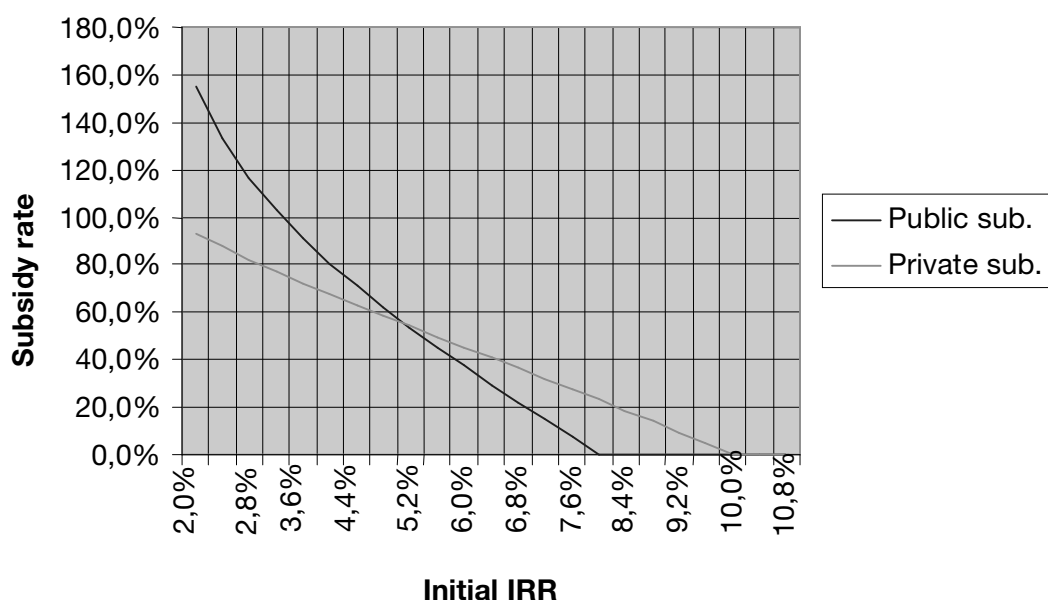
Once again, we consider this means of control in the broad sense, i.e. encompassing all of the dimensions that govern the sector’s operations, including institutional mechanisms. The competitive orientation of these mechanisms may have greater repercussions on the funding of TEN-T than the level of the corresponding Community budget.

Indeed, the EU's stance towards concessions, tendering procedures and the creation of competition between operators, which have clearly helped to open up the market and improve the financing environment through the possibilities offered by public-private partnerships (PPPs). These partnerships are seen as being particularly necessary for key projects experiencing problems. One example is the projected high-speed train and combined transport line between Munich and Verona via the Brenner pass scheduled to be built at a cost of EUR 22 billion, and in particular its most costly section, i.e. the tunnel. The PPP system has also enabled other seemingly abandoned projects, such as the link between London and the Channel Tunnel in the case of the PBKAL project (Paris-Brussels-Cologne-Amsterdam-London), to be re-launched. The Dutch section of that project is also subject to a PPP. Obviously the EIB is helping to steer this policy approach¹⁵, as may be seen from the EUR 17.4 billion it has committed to a series of transport-related PPPs.

The use of PPPs in the transport sector was discussed at length at the previous ECMT Symposium. While it is not our intention to reiterate the arguments in favour of this practice, we shall highlight one of the analyses presented which is particularly germane to our discussion¹⁶.

The results of this analysis are illustrated in **Figure 4**. It is assumed that a public operator obliged to cover the costs of its borrowings plus that of a risk-insurance premium is offered guaranteed profitability, through a subsidy if necessary, at an internal rate of return IRR of 8%, and that the private operator, which must cover the same commitments but must also repay its own capital, is offered a guaranteed return at an internal rate of return of 12%. At the same time, however, the private operator is assumed to be capable of realising an additional 2% on the initial IRR of the operation compared with the public operator. Based on these assumptions, the curves in Figure 4 represent the rate of subsidy, compared with the initial cost of the investment, required for the operation.

Figure 4. **Subsidy rate according to initial IRR based on the assumption that the private operator is more efficient**
(target IRR of 8% for the public operator and 12% for the private operator, initial IRR with private operator = initial IRR with public operator + 2%)



These curves reflect a paradoxical outcome whereby the use of a PPP is of even greater interest to the community, and the public purse in particular, in that the project in question has a low rate of financial return (on the sole condition that the private operator is slightly more efficient than the public operator). As it happens, *projects relating to international traffic flows often offer a low rate of financial return, particularly the cross-border sections of such projects, due if nothing else to border effects.*

This result was based on a standard project and needs to be tailored to the specific values for the updated balance of each project. Recent examples have confirmed this theoretical result, however, as in the case of the Perpignan-Figueras rail link for high-speed and goods trains, where the concession system and creation of competition between operators can be considered to have been relatively beneficial in that, although the project consists in a technically complex and expensive border crossing, the border effects between Spain and France remain significant and the socio-economic profitability of the project is relatively modest, the subsidy rate required by the successful tenderer¹⁷ amounting to merely half the cost of the project. This subsidy rate is significantly lower than that needed to finance comparable projects that are completed and then managed by public enterprises. For example, the first stage of the Rhine-Rhone high-speed train line, which has a comparable level of socio-economic profitability (if not slightly higher), requires a subsidy rate of over 72%.

There is therefore no reason to doubt the economic feasibility of these cross-border segments of TEN lines. And it should be stressed that the strategic option (as applied to rail links) of opening up the concession to competition and to public-private partnerships probably does not solve all the financing problems, although it can at least reduce their severity.

2.3.4 *Evaluation as a means of control*

Clearly, evaluation only offers real over the system if it allowed to play its part in the setting of priorities and the actual decision to invest. We shall assume the latter given that, even though some 30 TEN-T projects might seem to have been underestimated, we can consider the evaluations of those projects held to be a priority are not so far-fetched.

However, further progress in evaluation practices and the way in which the latter provide input to the decision to invest remain essential, as stressed by the European Court of Auditors in a special report on TEN-T¹⁸: “Complex annual administrative procedures for evaluating and selecting TEN-T projects have been established by the Commission and these have not always led to relevant information being available for the evaluation. Consequently, this has caused some problems in properly documenting the evaluation process. In addition, not all evaluation criteria established by the TEN regulation were fully addressed by the Commission.”

Among other recommendations, the report suggests that: “The Commission should also develop an explicit methodology for evaluating proposals submitted under TEN-T and publish it in a manual.”

These criticisms and suggestions were inspired by the need for relevant evaluations that can inform decisions regarding competing projects. *Each project involves the destruction of assets (costs and negative externalities) and the creation of assets (income and positive externalities). It is not the European Union's vocation to promote and finance projects which destroy more assets than they create, particularly in view of the fact that the limited amount of funding allocated to the TEN-T precludes any wastage.*

On the contrary, the limited funding available means that the projects chosen must deserve priority aid, and in order to determine whether this is the case it must be possible to compare the public utility of

the Munich-Verona link through the Brenner tunnel, say, with that of the Seine-Escaut river link. This in turn will be contingent firstly on resolving the problems regarding which method to use, and secondly on the performance of quality control.

The methodological problems are by no means negligible since the aim is to compare two very different types of project. In theory this problem can be solved through cost-benefit analysis, provided that the technical options in the evaluation, such as unit values for externalities, have all been standardised. A number of problems regarding which segments of the network to take into consideration will have to be addressed. In order to direct EU funds to the right area, should all the segments yet to be completed in a TEN-T project be evaluation or solely the cross-border ones?

It is also worth noting that the recurring methodological problem with evaluation, namely how to base it on accurate forecasts, is exacerbated in the case of international traffic flows by the fact that the statistics available on such flows are significantly less informative than those on domestic flows, as we saw in the first part of this report. Experience has shown that a particularly costly cross-border crossing such as the Lyon-Turin link called for a series of specific statistical surveys for both passenger and freight traffic. Although such statistics are needed to calibrate forecasting models, they are scarcely adequate since they provide *cross-sectional* rather than *time series* data. We have known for many years that in statistical terms the international level is far from being as well informed as national levels, and this clearly exacerbates the problems posed by evaluation.

Although these problems have supposedly been resolved through clear and properly disseminated recommendations, *quality control* of evaluation studies nonetheless remains necessary. *These studies are actually performed (or outsourced) by administrations or agencies that in many cases have been captured by pressure groups lobbying for the project concerned, which can result in deliberately distorted forecasts and evaluations.* It is therefore important that evaluations and all the studies on which they are based are systematically duplicated by competing studies and that all the sensitive aspects of the evaluation are subjected to repeated appraisal by other experts.

2.4. The decision to invest

The EU Court of Auditors, in the 2005 audit mentioned earlier, summed up the basic shortcomings in the decision-making system as follows: “The audit found that the execution of the 14 TEN-T priority projects is currently behind schedule. In particular, cross-border sections are facing major difficulties since they receive less priority at national level and require greater co-ordination efforts. Also, TEN-T financial aid is allocated in an overly fragmented way and is not sufficiently focused on cross-border projects (or project sections). As such, TEN-T cannot achieve its European added value to the fullest.”

It is therefore confirmed that the weak point in TEN-T projects lies in their cross-border sections and that it is on these sections that the limited financial resources of the EU budget ought to be concentrated. However, to avoid the “overly fragmented” aspect of this aid, it is necessary to have both the means and the political will to rank projects. The question of means raises the earlier issue of evaluation and the use that should be made of the latter in choosing priority projects.

In a national context, the choice of priority projects is a core issue in investment planning. In practice, the budget envelope for transport investment is usually insufficient for investments to be made at the optimal date¹⁹. Public financing capacity is therefore a constraint and the choice of investment a second-tier optimisation whose objective function remains the sum of the net present values (NPV) of the socio-economic benefits generated by all the projects implemented.

On the basis of a few standard assumptions it can be shown²⁰ that for a given public financing constraint the order of project implementation which optimises the social return of a programme, that is to say which maximises the net present value of the socio-economic benefits generated by the series of projects in the programme, is the order of ranking of projects according to decreasing values of the ratio: **NPV/euros of public funding invested**.

This ratio, which bears out both common sense and the standard theory of welfare²¹, implies a certain degree of consistency between the socio-economic benefits of projects (which determine the NPV of each project) and their financial profitability (which determines the subsidies they will require). The numerator of the ratio represents the socio-economic value that each project generates for the community (its “full value added” to use the terminology of the EU Court of Auditors), whereas the denominator will be the direct outcome of the commercial income from the projects that will be used to determine how much additional public funding will be required for the project.

The best possible use of this public funding can easily be made at the national level, and this would seem to be more or less the case in a number of countries. The situation is obviously very different at the level of TEN-T projects in that the degree of priority with which a section in country A needs to be completed, compared with that of a section in country B, can vary substantially, not to mention the cross-border section.

If the requirement to secure a social return on funding is fully acknowledged at the EU level, then the most appropriate algorithm to make the best possible use of scarce budgetary resources would have to be fairly close to the following:

- 1) Divide the TEN-T into sections that are primarily national and that should therefore be financed by the country concerned and international sections that deserve significant aid from the EU. (The current breakdown, which identifies cross-border sections, is not necessarily the best, but does at least have the merit of being based on a simple, objective criterion and thus less vulnerable to lobbying in that it makes sections that are trans-European only in name completely ineligible for EU funding.).
- 2) Take note of national plans and the most likely completion schedules for the “national” segments of each TEN-T.
- 3) Establish on this basis the baseline situation and its schedule (needed for evaluations of international sections).
- 4) Carry out, using a clearly standardised methodology, socio-economic and financial evaluations of international sections (validated by numerous expert appraisals).
- 5) Classify projects eligible for EU financing according to the **NPV/euros of public funding invested ratio** and establish on this basis a programme compatible with the EU budget constraint (and also with the co-financing decisions of the bordering countries concerned).

To ensure that such an exercise is genuinely more than a statement of intent, that is to say a genuine financing programme, it is obviously necessary to have a high degree of co-ordination (as mentioned in the audit by the Court of Auditors) between the countries concerned and the Commission.

This collaboration can lead to changes in national programmes and consequently in the associated baseline scenarios and cross-border evaluations. But it should be noted that, in order to carry any weight in this collaboration, the international rationale must be matched with a significant financing capability. This is an enduring problem, although the very weakness of the EU budget implies that the contribution to project financing can only be significant if it is accepted that the projects benefiting from the funding are chosen on a highly selective basis.

It is also worth noting that if this contribution is *a priori* set as a given share of public funding for the project (which would obviously be desirable), then the classification ratio suggested clearly arrives at the same result regardless of whether the denominator represents all the public funding or merely European public funding

CONCLUSION

While there is every likelihood that international trade will continue to grow, and probably at very high rates for the longest trade flows, meeting future infrastructure needs will be complicated by the fact that investment planning still remains at the national level and EU financing capacity remains well below what might have been hoped (around a third for the period 2007-13).

The issue at stake is therefore how to optimise the planning of such investment under the constraint of limited budget resources. This requires that:

- *EU financing be concentrated in cross-border sections of TEN-T;*
- *The use of PPPs be confirmed and developed in a competitive market fully opened up to potential operators;*
- *User charges be treated as income assigned to the financing of the project, in accordance with the principle of PPPs, and that charges be set with the aim of maximising income;*
- *National programmes for investment in TEN-T be co-ordinated and that the socio-economic and financial evaluations of links eligible for EU funding be established on this basis;*
- *Projects be planned and financed in decreasing order of their socio-economic net present value/euro of public funding invested.*

The aim, in sum, is to lend strategic consistency to the controls we have identified in the system. The need for such strategic consistency is all the more pressing in that the budgetary resources available preclude any wastage, particularly on token gestures.

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