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► **To cite this version:**

Nathalie Lenoir, Isabelle Laplace. Rail deregulation in Europe, and prospects of air rail integration. ATRS 2006, Air Transport Research Society World Conference, May 2006, Nagoya, Japan. pp xxxx. hal-01021781

**HAL Id: hal-01021781**

**<https://enac.hal.science/hal-01021781>**

Submitted on 15 Jul 2014

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# Rail deregulation in Europe, and prospects of air-rail integration

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**Preliminary Draft<sup>1</sup>**

**Do not quote**

We are looking into the evolution of cooperation and competition between airlines and railroads, in the context of rail deregulation, with the tools provided by network economics. After looking at the progress of rail deregulation in Europe, we describe the situation of air and rail in terms of cooperation (intermodality). We then examine the current strategies of airlines and railroads considered as networks industries. In this light, we then analyse their possible strategies in a context of rail deregulation, with a complete opening of rail markets. We conclude by assessing the possibility of emergence of multi-modal network operators.

Keywords: air transport, rail, deregulation, intermodality, networks

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<sup>1</sup> See [www.enac.fr/recherche/leea](http://www.enac.fr/recherche/leea) for completed version

## Introduction

In the context of rail deregulation, we are looking into the evolution of competition between air and rail operators, with the tools provided by network economics. We study more specifically two questions: the choice of compatibility between air and rail networks, and the possibility of integration between networks. In networks economics literature, both questions have been examined, in different contexts. The choice of compatibility arises when the consumer is faced with composite goods, and has to compose a “package” of goods: hardware and software for example, or between different legs of a travel. Compatibility choices depend on the costs and benefits associated; and so do the effects in terms of social welfare. The case for integration of components of networks in a single firm has been studied as well as the impacts of integration on competition and social welfare. Does it make any sense for air transport networks and rail networks to merge, and what would be the implications in terms of competition?

In the first section, we look at rail deregulation in Europe, its progress and its results so far in terms of entry into the industry. In the second section, we describe the current situation of air and rail in terms of cooperation and endeavour to explain the current difficulties of intermodality due to partial incompatibilities at different stages of the production process. In the third section, we consider airlines and railroads as network industries and analyse their strategies in this context. In the fourth section, we study the impacts that rail deregulation could have in terms of competition and cooperation between airlines and railroads. We conclude by assessing the possibility of emergence of multi-modal network operators.

## I- Rail deregulation in Europe

Rail deregulation is on the agenda of the European Union. It has progressed slowly so far, much slower than air transport deregulation. The reluctance of national firms, unwilling to open their networks to competition, has probably slowed the deregulation process, especially concerning passenger transport. Technical obstacles also remain, with networks being still by and large incompatible all over Europe (rail width, signalling, electricity voltage...).

However, the European commission is strongly pushing towards opening of network industries. The European Union passed a first railway package in 1991, starting the opening of rail markets (for international combined transport of goods, operated by international groupings of railway undertakings). Following this first package, in most countries, the network management has been separated from train operations, to give future new operators the possibility of entering the market.

The second package came much later, (29/04/2004) after more than two years of negotiation. Concerning the opening of markets, it deals with freight services. The international rail freight market will have to be completed by 2006. The agreed date for the complete opening of the rail freight markets, including cabotage, is 1<sup>st</sup> January 2007.

A third package has already been proposed by the European commission, in March 2004, and is still being discussed. With the "Third railway package", the Commission is proposing to open up international passenger services to competition within the European Union in 2010. In order to create favourable economic conditions to develop the services operators will be permitted to pick up and set down passengers at any station on an international route, including stations located in the same Member State.

So far, there are few international passengers railways undertakings, because only incumbent railways alone or pooled have access to the network. Thalys International, for example, which has been operating international services for nearly 10 years between, France, Belgium, the Netherlands and Germany, is owned by the French, Belgium, Dutch and German railways. With the third package, they could be joined in 2010 by new private railways undertakings.

Eventually all services, except public service routes, should be liberalised, but it could take some more time to happen. Then new firms will be able to set up nearly any kind of services.

In this context, an interesting question is: what kind of firms will be motivated in rail operations? Apart from existing railways undertakings, the obvious answer is: transport and logistics firms. While logistics firms are already multimodal operators (like the integrators operating aircraft and trucks), and could follow easily a multimodal approach including railroads, it is more unusual for passenger transport firms. They are mostly following a one-mode-only strategy: airlines operate aircraft, railroads operate trains, and bus companies operate buses. It can

be the case that airlines operate buses, for the city centre to airport trip, but this is a quite marginal part of their business.

However, several factors could lead airlines to become more and more interested in rail. First, slots are becoming increasingly scarce on major European airports, and this compromises further development of services from these platforms. With curfews being added in more and more airports, early and late take-offs are not a solution. Furthermore, rising fuel costs, which are particularly perceived on short-haul flights, (less fuel efficient because of short navigation duration) could lead airlines to re-evaluate their hub feeding strategy: using rail more intensively in order to bring “domestic” passengers to the airlines hub may well become a relevant answer to the preceding problems.

We know, from existing high speed train (HST) services, that rail is competitive compared to air on “less than four hour routes”. On routes up to 3h30 by train, modal share is about the same (provided there is an equivalent choice of frequencies). It can be explained quite simply: when looking at the generalised cost of travel, including time and prices at the current level of prices, they are quite similar for each mode for this kind of travel time (travel time including airport or train station access, at each end of trip), for the average passenger. It is to be noted, indeed, that on average access times are quite higher for air, as well as boarding times (including check in, security, and actual boarding). So far, modal share has been mostly determined by travel time, and price is only of secondary importance. So, this duration is not likely to change much, unless air tickets increase quite significantly, which would be bad news for air transport.

So far, on distances longer than about 400 km, air services compete with HST services. The profitability of those services is already questioned today (on a stand-alone basis, they are mostly not profitable, but are used to bring passengers to the hubs!), and may be even more dubious tomorrow.

For these reasons, rail deregulation can be seen as an opportunity for airlines to develop partnerships with new operators, or even launch their own services, on specific HST routes. Before examining if this is in the best interest of airlines, we look at the current state of compatibility and cooperation between air and rail.

## II- Passenger intermodality in Europe : new opportunities

Historically air and rail transports were two competitive transport modes on short and medium-haul destinations. However, the interconnection of their network thanks to the existence of railway stations at some airport terminals has led to a certain degree of compatibility.

As is pointed out in the economic analysis of networks, the complementarity between different types of goods is the hallmark of networks. In networks, the goods are composite goods, made of complementary elements of the network. However, complementarity between goods is in many cases not inevitable and may result from choices made by producers. For complementarity to exist, compatibility is necessary.

Air and rail networks are not compatible by nature, but have been made so to a certain extent by the firms. They have developed compatibility in the form of commercial joint undertakings. They cooperate on certain routes by coordinating their services for the successive use of both transport modes. Some air and rail companies have indeed concluded so-called intermodal agreements for proposing intermodal services to passengers as for instance a common reservation for the whole trip, coordinated timetables, a common checking, etc.

We can distinguish two types of air/rail intermodality:

- Airport access to the city centre,
- Integration of the airport in the regional or national network of rail transport modes.

The second category of air/rail intermodality mainly concerns the cooperation between air carriers and high-speed rail companies. In Europe, only few airports have connections with high-speed rail networks: Paris Charles de Gaulle airport, Lyon Saint-Exupery airport, Frankfurt airport, Amsterdam Schiphol airport, Köln/Bonn airport and Düsseldorf International airport. Other airports can receive high-speed trains at their railway stations if these trains use suburban or regional train infrastructure network; so that we can not consider that they are directly connected to high-speed rail networks. This is in particular the case of Brussels Zaventem airport

These connections can constitute an opportunity for airlines to attract more passengers on their flights. By operating trains on links where there is no air service or on links where airlines do not operate flights (in particular internal origin-destination not operated by foreign airlines), the high-speed train operates as a feeder for these airlines. Hence at Paris Charles de Gaulle airport, 11 non-French airlines (European or non-European) have concluded an agreement named TGV Air with the SNCF, the French high-speed rail company, what allows them to attract passengers from 15 French cities.

In addition, the connection of high-speed rail networks to these airports may lead the dominant airlines on the airport to cooperate with high-speed rail operators in order to substitute some short and/or medium haul flights by high-speed trains. Nevertheless, this substitution is not always total since air carriers generally continue operating on destinations on which they have an agreement for cooperation. When considering that rail is competitive to air when the train journey time does not exceed 3 hours, we observe that 5 destinations are operated by Lufthansa at Frankfurt airport while intermodal agreements with Deutsche Bahn AG also exist on these destinations. Despite the Airail Service involving Lufthansa and Deutsche Bahn AG and planning the transport by train of Lufthansa's passengers to and from Stuttgart or Cologne, the airline still operates flights on both destinations. In addition, Lufthansa still operates flights to and from Düsseldorf, Hanover and Nuremberg while these destinations belong to the Rail&Fly intermodal agreement with the Deutsche Bahn AG. Air France continues operating flights between Paris Charles de Gaulle airport and Nantes or Lyon despite the TGV Air agreement on these destinations concluded with the SNCF. At Amsterdam Schiphol airport, if no competition exists between air and high-speed rail transport on domestic routes, this competition exists on German destinations that are also proposed in the scope of the Rail&Fly Amsterdam agreement, involving KLM and the Deutsche Bahn AG.

However, if modal competition exists despite intermodal agreements, its level can differ between airports. Indeed when comparing the number of daily flights and of daily trains to and from the intermodal destinations, we observe that the air/high-speed rail competition is greater between Air France and SNCF than between Lufthansa and Deutsche Bahn AG or KLM and Deutsche Bahn AG. Indeed, at least 35% of the daily services between Paris CDG and the intermodal destinations are proposed by air (this figure going up to 50% for Nantes) while the

proportion of air frequencies on intermodal destinations to and from German airport do not exceed 20% (see Table 1 : Proportion of flights over the total daily services (trains + flights) to and from the intermodal destinations). This difference can be explained by the declared objective of Lufthansa at Frankfurt airport is to substitute as much as possible flight by train (cf. M3 SYSTEMS, ENAC-AEEL, ANA).

<b>Airport</b>	<b>Intermodal destination</b>	<b>Proportion of daily flights over the total daily services (trains + flights) to and from the intermodal destination</b>
<b>Paris Charles de Gaulle airport</b>	<b>Lyon</b>	35%
	<b>Nantes</b>	50%
<b>Frankfurt airport</b>	<b>Cologne</b>	7%
	<b>Düsseldorf</b>	15%
	<b>Hanover</b>	20%
	<b>Nuremberg</b>	19%
	<b>Stuttgart</b>	16%
<b>Amsterdam Schiphol airport</b>	<b>Cologne</b>	18%
	<b>Düsseldorf</b>	24%
<b>Dusseldorf airport</b>	<b>Franfurt</b>	16%
<b>Koln-Bonn airport</b>	<b>Franfurt</b>	5%

**Table 1 : Proportion of flights over the total daily services (trains + flights) to and from the intermodal destinations**

Finally, there is only so far one case in which the dominant airline has stopped operating its flights after concluding an agreement with the train operator: on the Brussels-Roissy CDG route, Air France entrusts its passengers to Thalys in order to get them to and from the airport.



Hence, not only there is a few number of European airports connected to high-speed rail but there is also finally a few number of intermodal agreements at these airports concluded between air and high-speed rail operators. Why so few cooperation between both modes of transport? As well as the traditional competition between rail and air carriers, the poor degree of compatibility between rail and air products can also explain this weak level of cooperation.

This lack of compatibility concerns different aspects such as booking, ticketing, check-in, schedules, taxation, reliability and punctuality:

- Booking: A first incompatibility between air and rail products is the impossible technical communication between air and rail distribution systems. If the Global Distribution System (GDS) containing all schedule flights, also displays intermodal products jointly proposed by air and rail operators on predefined rail links, this GDS cannot combine rail and air segments in order to sell air-rail products. The Rail Air Intermodality Facilitation Forum (RAIFF) composed of industry experts from both the rail and air transport modes aiming at developing recommendations for encouraging operational integration of both transport modes, underlined this problem in its report. RAIFF explains that this lack of compatibility between both systems comes from a difference in language/syntax but also in the data. In particular coding systems are not the same and integrating rail database in GDS would require to expand the air industry database and modify coding structure, what would cost hundreds of millions of US\$.

In addition, another element showing the difficulty of integrating rail products in GDS systems lies in the display. The display of a GDS indeed ranks transport products according to elapsed journey time and does not give consideration to the advantage of departing or arriving at the city centre. As a consequence the air-rail solution are generally displayed on the last GDS screen, while the major parts of the sales are made from the first screen. This means that intermodal products have only a chance to be sold only if sale agents or passengers already know them and specifically search for them.

- Ticketing: Although only one booking for successive air and (or rail and air) journeys can be made in the case of intermodal products, two separate tickets are

generally required for using successively the two modes of transport. For instance, customers of the TGV-Air product can not use directly their TGV Air coupon as a TGV ticket since the information written on the TGV Air coupon is not sufficient for the needs of the railway ticketing system. Indeed this coupon does not contain seat and carriage numbers attributions whereas this information is needed on a railway ticket. As a consequence, passengers are asked to come at least 20 minutes before TGV departure for proceeding to an exchange of their TGV-Air coupon with a SNCF railway transport ticket.

- Check-in: Two different checks-in are generally required when travelling with an intermodal product due to additional costs related to the luggage check-in. The transfer of luggage between the two modes of transport is indeed a complex and costly operation in terms of security and the agreed distribution of the related costs between the two transport modes' operators. Except in scarce examples as for the AiRail product proposed by Lufthansa, Deutsche Bahn AG and Fraport, most of current products do not provide check-in facilities at the railway station and passengers still have to carry their luggage themselves on trains.

- Schedules: Air and rail schedules often have problem of compatibility preventing some air destinations to be connected via high speed links. Rail's frequencies and timetables are not always in adequacy with flights' schedules what lead intermodal products unattractive. For instance, the earliest Thalys train from Brussels to CDG airport arrives at 09:04 at CDG. In the scope of the agreement with Thalys International the minimum connecting time between rail and air schedules have to be of 1 hour. This implies that all flights taking off before 10 AM from CDG airport are not available from passengers coming from Brussels. Some long-haul destinations, especially towards North America, can not consequently be proposed as an intermodal product. Rail operators indeed face the problem of lack of "sillons" that are the slots of trains. Due to the interconnection of rail tracks, modifying the trains' slots would affect the entire high-speed rail network and is therefore difficult to do. Impacts of this lack of modularity of

rail slots is non negligible and can be a serious obstacle for the development of intermodality.

- Reliability and punctuality: Proposing intermodal products generally require air and rail operators to transport passengers to their final destination. This means that if the train arrival (respectively the flight arrival) at the airport is delayed, the airline (respectively the rail operator) has to transfer intermodal passengers to a next flight (respectively a next train). However if there are a few number of daily flights (respectively of daily trains) to this destination, passengers will have to wait a long time at the airport before travelling to their final destination. Due to this lack of reliability and punctuality passengers can therefore be reluctant for travelling with intermodal products.

- Taxation: If value added tax (VAT) rates on transport services often differ between countries, they can also differ a lot between transport modes. As stresses RAIFF, while international air transport is remitted from VAT, rail carriers may have to add VAT to international passengers. These differences of taxation between both modes of transport penalize the rail transport mode and as a consequence air/rail intermodal transports.

All these identified incompatibilities explain why so little cooperation has occurred. It is only part of the story, however, since the strategies of network firms, in terms of complementarity between the components of the transport network, are also at the root of these feeble efforts at compatibility. In other words: if you do not want complementarity, why invest in compatibility?

### III-Transport networks operators strategies

Transport networks are characterized by what is called indirect network externalities or production externalities. It means that the utility of a consumer increases with the size of the

network. As a consequence, demand also increases with the size of the network. It is therefore a strategic key variable, and operators' strategies have to be analyzed with this in mind.

Airlines have perfectly understood this fact, and have been using the hub and spoke network, which enables to increase dramatically the possibilities of trips (numbers of destination) for each added route from the hub. One element of success of this type of network is the ability to mix local demand with "long distance" demand.

Bringing short haul passengers to and from the hub is an important component of European hubs<sup>2</sup>. So far, airlines have relied on their short haul services (400-1000 km) to do so, and on roads for shorter distances (people coming by themselves by private cars or rental cars).

Foreign airlines in Europe may be interesting to look at. Lacking short haul flights to bring their passengers beyond the European hubs, they have been fast to see the potential of high speed trains to increase network size. Several foreign airlines, including for example American Airline in Paris, have signed contracts with the HST operator in order to offer their passengers destinations outside of the big hubs in Europe.

For local airlines, things may be a little bit more complicated: they rely on their short haul network, and are therefore less interested in rail; moreover, they are also competing with rail firms on some of their short haul markets. This can explain why, on the part of these airlines, cooperation with railroads is only half-hearted. Let us point out that there is a quasi monopoly on the rail network, and that the air network firms cannot expand into the rail network themselves. They are "obliged" to cooperate with railroads to do so. They have developed such cooperation, but only on a limited number of well identified routes, as seen on part I.

Is rail also interested in expanding its network, and/or attracting new passengers? Some could say that, railroads being historically national operators, their position as national monopolies suits them well. However, they have begun venturing into the international markets, and this shows that they are capable of evolving. But, considering that they might be willing to do so, they will not do it at any cost! When there is a high speed train station in the airport (not in so many places so far), two things come in the way: limited capacity, and limited demand.

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<sup>2</sup> It may not be the case everywhere: the so-called 6<sup>th</sup> freedom airlines have long haul-long haul hubs; an example is Emirates in Dubai

As is the case for airlines, railroads have capacity problems, and face allocation conflicts. Rail slots can be scarce in some area, particularly in important urban area, where the same infrastructure is used for many routes. This is the case, for example, on certain traffic nodes around Paris. In this context, a service between CDG airport and Marseille can enter in competition with a service from Paris centre to Marseille, for the use of a rail slot. In this case, railroads will quite systematically prefer the city-centre to city-centre service, as it will generate more demand. After all, one of the main advantages of trains is to bring people in the heart of the cities!

Even in the quite ideal case where capacity is not an issue, the railroads will be confronted to the fact that demand is not unlimited; Offering a new service on an airport route may not bring only advantages: on the one hand it may bring passengers, taken away from an air service (or from a car), but on the other hand, it may turn passengers away from the city-centre to city-centre route, thus spreading demand over the two services. It could well be the case where added demand is not sufficient to justify keeping two services. For a railroad operating in monopoly position, the opportunity of opening such service will depend on the order of magnitude of each effect: added demand versus redistributed demand.

#### IV-Strategies after rail deregulation

We have seen what the current strategies of transport operators are. Placed in a different setting, or even foreseeing a different setting, they will reevaluate those strategies, and act accordingly. What is most probable setting at a time horizon of 10 to 15 years? First, rail deregulation is likely to be almost completed. Another feature is the rise of fossil energy prices, pushing transport prices upwards.

This is especially worrisome for air transport, which is less energy efficient than rail. Finally, one last feature is the scarcity of slots at major airports. This is clearly not independent from the energy prices: the higher the energy prices, the higher the air transport prices; the obvious consequence is a decrease (or a slower increase) in demand for transport, which makes slot scarcity less of a problem. We do not know which one of these questions will be the most

problematic: energy prices or slot scarcity? In any case, airlines will have to tackle one or the other (or both).

In both cases, short haul flights are definitely in danger: they are fuel inefficient, and they use up slots that could be put to better uses, on long haul routes. On the other hand, they are useful to bring passengers to the hubs and cannot be simply eliminated, at the risk of seeing the hubs collapse like a house of cards.

With rail deregulated, one possibility for airlines would be to develop rail services to feed the hubs. They could do so through partnerships with existing or new railroads, they could also have their own train operations.

One could draw a parallel with what happened with regional air services: the large airlines first passed franchise agreements with small regional airlines that expanded during the deregulation process, and ultimately those became subsidiary of the large airlines.

If small rail undertakings appear after deregulation, the same could happen. The easy way would be to identify one or several likely candidates, franchise them, and later on integrate them into the firm. If this is too slow, the airlines could also set up their own rail subsidiary in order to operate the routes that they see as strategic links to their hub. Jean Cyril Spinetta, Air France-KLM CEO, made a statement lately (March 27, 2006) hinting in that direction: "It is quite likely that with rail passenger traffic deregulation on domestic markets, there will be high speed trains in Air France's colors, for example between Roissy and cities like Angers, Tours or Vendôme."<sup>3</sup>

After all, there would be clearly economies of scope in doing so: airlines have expertise in selling, marketing, yield management, which could be directly transferred to their rail operations. Trains schedules could be integrated in their reservation systems, as are Thalys trains today (in several airlines systems), and the level of compatibility would be easier to increase in an integrated firm.

In terms of networks economics, this would be tantamount to integrating all the components of the networks, a strategy quite similar to what is called vertical integration in non-network

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<sup>3</sup> "Il est fort probable qu'avec la libéralisation du trafic ferroviaire de voyageurs sur les marchés domestiques, il y aura des trains TGV aux couleurs d'Air France par exemple entre Roissy et des villes comme Angers, Tours ou Vendôme", a déclaré Jean-Cyril Spinetta, le PDG d'Air France-KLM dans le quotidien La Tribune.

industries. As shown in Economides ([2], [3]), the existing literature on vertical relationship is relevant in this setting and can give insights about the consequences of such integrations/mergers. In general, mergers of this kind have benefits: improved coordination (and therefore compatibility) and elimination of double marginalization, possibility of greater innovation (since the integrated firm will reap all benefits of innovation). The dangers are also well known: excessive quality differentiation and price discrimination, in order to extract all consumers' rent. Moreover, in case of difficult entry or increasing returns to scale, vertical mergers are a way to increase market power. Both elements could lead to a reduction of social welfare.

For the airlines' passengers, the result would be interesting in terms of coordination between modes, in terms of number of destinations (both short haul by rail, and long haul by air), and possibly in terms of innovations (especially on the rail part of the journey).

Concerning the level of competition in the airline industry, such a move on the part of the main hub airline could be detrimental to the other airlines of the hub. They would probably not have a non discriminatory access to the rail service operated by their competitor, and probably not much choice of other solutions on short haul markets. This could indeed lead to an increase of market power of the hub airlines on their base of operation, which is something we do not see right now (since railroads can contract with any airline they want). The increase in market power constitutes an additional incentive for the hub airlines to integrate, but is negative for the passenger, which may be faced with higher prices. Overall, the effect

The consequences for the rail industry are difficult to estimate, since we have no idea of the level of entry and competition after deregulation. Likewise, the reaction of the historic rail operators remains to be seen. They could either refocus on their city centre to city centre services which are at the core of their business, or try to develop partnership with (other) airlines on airport services.

The effect on the environment is hard to predict: if short haul flights are replaced by trains it is positive in terms of global warming, but if the number of slots used at the hub remains the same, it means that formerly short haul slots are used for long haul services, which is clearly not good in terms of pollution and global warming (a long haul flight is more fuel efficient per km per passenger, but is much longer...).

Overall, the effect on social welfare depends on these combined effects: effects on passengers, on competition and on the environment.

### Conclusion

We have examined the perspectives for air and rail integration after rail deregulation in Europe. The timeline for this is not clear; the international passenger services should be liberalised in 2010, but rail deregulation for domestic passenger services is not yet fixed.

Today, cooperation between air and rail already exists, and compatibility, though far from excellent, is an area where progress is being made. This cooperation is however limited by the fact that air and rail firms have different objectives, which do not always coincide.

In a context of open markets in the rail industry, hub airlines could easily integrate rail undertakings, in order to secure the feeding of their hubs on short haul markets. If at least some short haul markets can be operated by trains, this would free slots for long haul services, and would also constitute an adequate response to a rising fuel cost.

Such an undertaking would have beneficial sides for the passengers: improved coordination between modes, increase in number of destinations. The effect on prices depends on fuel costs (trains being more energy efficient), and on market power. The outcome, indeed, with respect to competition is not clear: merging is a way to increase market power. Competing airlines could be discriminated against in the short haul (rail) markets. This increase in market power could lead to higher prices for passenger, and a decrease in their welfare.

Finally, in order to take into account the effects on the environment, one has to weigh the decrease in short haul flights (replaced by rail services, with a better environmental record), with a potential increase in long haul flights (re-allocation of short haul slots to long haul flights).

Whatever the outcome concerning social welfare, it is likely that rail deregulation will be at the origin of transport firms that do not see their business as “one mode only”, but will build multimodal transport networks for passengers, as others have already done for freight.



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