Using Public-Private Partnerships to create high-speed railway networks in Europe – prospects and pitfalls

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ABSTRACT

One effect of the regulatory reforms in the transportation sector is that private companies increasingly participate in the investments in new transportation systems. These investments may amount to very large sums in the coming 10-year-period. There are several different ways to categorise these projects, but with a common name they may all be viewed as Public-Private Partnerships (PPPs). Some PPP projects may be very long-term, including new infrastructure investments as in concessions and Build-Operate-Transfer projects, while others may be more short-term, concerning reinvestments only – and sometimes even limited to the task of operating a finished construction. The overall goal of PPP projects is to find solutions to problems in which the advantages of the private sector (such as financial assets, efficient management, propensity to innovative and entrepreneurship) are combined with the advantages of the public sector (such as social and environmental concern). When done right, PPP projects can be very powerful tools to quickly construct new infrastructure facilities and operate them efficiently. However, experience has also shown that they may sometimes go wrong, creating transportation systems that are inefficient, under-used and loss-making. In several European countries, steps are taken to invest in the upgrading of old railway lines as well as in the construction of new railway lines, with the common goal to allow for more high-speed train services. This development is partly originating in the perceived needs of the national railway markets, but it is also an important part of the creation of a more competitive European international railway network. In several current cases, such as the new high-speed line Amsterdam-Rotterdam-Brussels and the Swedish so-called Östgöta link, PPP arrangements have either been applied or are considered as probable options. In this paper, we will look into the typology of PPPs, the experience of different PPP arrangements in the transportation sector, and consider the possibilities for PPP solutions to become an important element in the creation of more high-speed railway lines in Europe. In order to develop some of the arguments for PPP projects, we use the aforementioned Östgöta link as a case study in the latter part of the paper.
Introduction

For more than two decades the expansion of high-speed train networks has lagged behind the plans of the European Union. The development of high speed trains holds, according to their advocates, many promises for the future of Europe. Some of the most important factors are: 1) they are seen as a mean to restrict and in some cases avoid congestion in the crowded air space over Europe’s biggest cities, 2) they limit the emissions of green house gases by moving travel from cars, buses and airplanes to the railways, and 3) they provide opportunities for regional development by enabling people to travel faster from remote regions to capitals. However, critics have pointed out that high-speed trains transfer resources from much needed investments in public transportation in big cities and that they reinforce the increasing demand for travel which is one of the principal sources of green house gas emissions.

In this paper we assume that high-speed trains and high-speed train networks are beneficial from a socio-economic point of view and that they probably alleviate the major environmental disadvantages of cars and airplanes. Starting from these premises we look into the typology of private-public partnerships (from now on abbreviated PPPs). We look at the advantages and disadvantages, as identified in the literature, of using PPPs to construct new high-speed railway lines. We relate the experience of some PPP arrangements in the transportation sector, and consider the possibilities for PPP solutions to become an important element in the creation of more high-speed railway lines in Europe. One case where the PPP option has already been applied is the new high-speed line Amsterdam-Rotterdam-Brussels (Van de Velde, 2005).

The possibility for an earlier launch of a project is one advantage with a PPP arrangement that is explicitly or implicitly recognised by researchers that analyse PPPs. In addition to the generally recognised factors, we develop the timing issue in more detail, seeking to trace all the relevant public advantages (disadvantages) of starting a project earlier. This is done by means of a case study of the projected Swedish high-speed line called the Östgöta link.

Typology of PPP-projects

PPPs refer to contractual agreements formed between a public agency and private sector entity that allow for greater private sector participation in the provision of a public service –
for example a transportation system. There are numerous ways to categorise PPP-projects. While some scholars argue that “true” PPPs always involve private infrastructure investment and ownership, Benett, Grohman and Gentry (1999) describe PPPs as a spectrum of cooperative relations between private and public organisations directed towards the supply of infrastructure services. Some PPP projects may be very long-term, including new infrastructure investments as in concessions and Build-Operate-Transfer projects, while others may be more short-term, concerning reinvestments only – and sometimes even limited to the task of operating a finished construction. Estache och Serebrisky (2004) identify four principal types of PPP contracts: 1) divestments of public property or businesses to the private sector, 2) greenfield investments, for example the building of a toll motorway, 3) service contracts that can include promises on investments, and 4) concessions, licenses and franchise agreements, which often have a life span of 10-30 years and include detailed provisions on investments and service levels.

In Figure 1, abbreviated from a US Department of Transportation document, we find a classification that categorises PPP projects in terms of the varying degree of public and private sectors ownership and commitments related to the projects.1 In a Design-Tender-Build project a public agency pays for a building project that can be carried out by either public or private firms. A tendering procedure for a service contract may lead to the entry of a private firm that operates a transport system that is publicly subsidised. In a Design-Build project the private firm accepts the responsibility for the design, the construction and the operation of a transport system. In a Build-Operate-Transfer project a tendering procedure decides which company that will build and then operate a transport system. After a long time-period, for example 30-50 years, the transport system is handed over to the public sector. In a Design-Build-Finance-Operate project the private sector accepts all responsibility for the project. This type of transport project was tested in Great Britain in the early 1990’s. Road projects that use shadow tolls or privately owned roads financed with user charges may use this model.

1 http://www.fhwa.dot.gov/ppp/
PPP projects in the transportation sector

In several European countries, steps are taken to invest in the upgrading of old lines as well as in the construction of new railway lines, with the common goal to allow for more high-speed train services. This development is partly originating in the perceived needs of the national railway markets, but it is also an important part of the creation of a more competitive European international railway network.

One effect of the regulatory reforms in the transportation sector is that private companies increasingly participate in the investments in new transportation systems. These investments may amount to very large sums in the coming 10-year-period (Estasche & Serebrisky, 2004).

PPPs have been used or tried in a couple of high speed train projects in Europe. The most famous example is the Channel tunnel that connects the French high speed railway network with the British high speed railway to London.\(^2\) This project has not been economically successful, mostly because of lack of foresight of the management team that negotiated the debt of the Eurotunnel company. The managers accepted to lock-in the interest rate on the

\(^2\) This project is described by Noulton (1999).
historical interest rates for a fifty-year period rather than renegotiating the debt at decided time intervals. They were effectively banking on continued high inflation in Great Britain and France that would enable the Eurotunnel company to raise prices as fast or faster than the interest rate. This didn’t happen and the shareholders have lost all but a fraction of their investments.

Another unsuccessful PPP was the high-speed railway link from the channel tunnel to London. The construction project lost many years while private firms and the British state negotiated how the private sector could get a return on its investment. When the discussions started some actors thought that building permits and shopping facilities in the vicinity of the railway line would entice the private sector to accept the investments. These incentives proved to be insufficient considering the magnitude of the investments and the uncertainties surrounding both the number of trains and the value of the properties that could be built as part of the agreement.

The Swedish Stockholm-Arlanda airport link was eventually constructed and “financed” by private capital in a PPP. In this project, that was negotiated later than the Eurotunnel deal, the Swedish state used a tender to find the best private partner. However, as the project moved towards decision, the state had to accept bigger and bigger costs to make the private investment attractive. The state financed and constructed a longer part of the line than initially planned and also offered a loan of one billion SEK to the winning consortium. Despite of this, the privately-controlled railway services from Stockholm to Arlanda are loss making and the ticket prices are extremely high by Swedish standards, seemingly resulting in a low modal market share for the trains, at least when compared to similar services like the Heathrow railway shuttle.

**Advantages and disadvantages with PPPs**

The overall goal of PPP projects is to find solutions to problems in which the advantages of the private sector (such as financial assets, efficient management, propensity to innovative and entrepreneurship) are combined with the advantages of the public sector (such as social and environmental concern). When done right, PPP projects can be very powerful tools to quickly construct new infrastructures rapidly and operate them efficiently. Experience has also shown that they may sometimes go wrong, creating transportation systems that are

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3 This project is described in Alexandersson & Hultén (1999) and Hultkrantz et al (2006).
inefficient, under-used and loss-making. We will now take a look at the advantages and disadvantages in some more detail.

According to a Canadian report, a PPP presents numerous advantages to the public partner, for example improved service quality, more value for the invested capital, lower project costs, lower risk, improved innovativeness, faster construction, better budget fulfilment and increased revenue. The private partner benefits from increased economic activity, higher margins, entry to new markets, and long-term revenue streams. The US Department of Transportation lists six reasons for the public sector to enter PPPs. They include: 1) accelerating the implementation of high priority projects by packaging and procuring services in a new way, 2) the provision of specialised management capacity for large and complex programs by the private sector, 3) enabling the delivery of new technology by private firms, 4) drawing on the private sector expertise in accessing and organising the widest range of private financial resources, 5) encourage private entrepreneurial development, ownership and operation of transport systems, and 6) allow the public agency to decrease in size. Most observers agree that private actors – for example construction firms, vehicle manufacturers, operators and banks – in the future will become more active in transport projects through PPP projects. The most important advantages of PPP projects compared to projects managed and operated by the public sector are: 1) The management of appropriate risks. Private firms are better than the public sector to manage certain types of risks – construction and market risk and project time - if they are in charge of a project. For example a private firm exposed to a market risk will act vigorously to safeguard the profitability of the project. However, some risks like weather, natural disasters and policy changes are better managed by the public sector. Our analysis diverges from the views of the US department of Transportation that finds most risks, including policy and political constraints, can be shared or handled by both the public and the private sectors. In table 1, on the next page, we outline which actor – public or private – that is best suited to manage a certain type of risk. 2) The majority of infrastructure projects can be carried out more efficiently if they can be planned and completed as a whole from the start to completion and operation. 3) If the public sector is unable to finance all the projects that are considered to be beneficial from a socio-economic point of view then the private sector can participate in the financing of some projects organised as PPP projects. Thereby, the positive effects of an infrastructure investment may

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5 http://www.fhwa.dot.gov/ppp/
6 http://www.fhwa.dot.gov/ppp/
arrive earlier than if only public financing is available. 4) The private sector may in a rather uncomplicated way add its competence to the development of public services through a PPP project solution.

We have also identified some problems and disadvantages that may arise in a PPP project: 1) Long-term PPP projects may lead to lock-ins and a low future competitive pressure in the project structure. 2) A private partner in a PPP project may be exploited by other private partners. The most typical example of this is the Euro Tunnel project, in which the company that owns the tunnel is forced to pay very high interest rates to the financing partners. 3) The costs of planning the PPP solution may be very high compared to the perceived gains from increasing the involvement of the private sector. One way to handle this type of cost and risk in PPP projects is to develop competencies in the national education and innovation system, for example by means of a knowledge centre. 4) The advantages with increased private involvement in infrastructure projects may deter by badly designed contracts that may either include way too high or way to low compensation to the private actors in comparison to their efforts and bearing of risk.

Table 1. Appropriate partner for managing different types of risks in a PPP-project

<table>
<thead>
<tr>
<th>Public partner</th>
<th>Private partner</th>
<th>Public or private partner (varies from case to case)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political decisions</td>
<td>Market risks</td>
<td>Demand forecasts</td>
</tr>
<tr>
<td>Regulation</td>
<td>Construction risks</td>
<td></td>
</tr>
<tr>
<td>Weather</td>
<td>Project time</td>
<td></td>
</tr>
<tr>
<td>Natural disasters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The case of the Östgöta railway link

Introduction

The Östgöta railway link is the name of a planned new 150 km double-track railway for high-speed trains between Södertälje (south of Stockholm) and Linköping. In 2001 the municipalities affected by the line formed a consortium to support the realisation of the project. In 2003, Banverket initiated its investigation for the line. The link is often mentioned as a part of a much larger project, the Nordic Triangle, that seeks to connect the three major cities of Sweden by means of a modern railway network.7

The Östgöta link is mentioned in Banverket’s (the National Rail Administration) long term planning document, with an estimated time of construction start of 2010-2015. However, some initiatives have been taken by the national government in order to examine whether it is possible to bring this forward.8 In the following text, we will take a brief look at the arguments for an earlier construction start and the possibilities to organise the project as a PPP project.

Arguments for organising the Östgöta link as a PPP project

In a discussion of relevant arguments for organising the Östgöta link as a PPP project, it is important to realize that the arguments may be split into three main categories, partly related to each other. Firstly, we have the arguments on why this line should be built at all. Secondly, we have the arguments focussing on the gains to achieve from bringing forward the project. Thirdly, we have the arguments on the special gains that are related to the PPP solution – advantages that may be strongly related to how the PPP project is designed.

Arguments for the Östgöta link

Many arguments for why this line should be built are presented in the papers produced by the consortium supporting the line.9 The line would shorten the travel times considerably between the cities along the lines, and also to other nearby parts of Sweden. This main effect is supposed to form the base for a so-called regional expansion, with a number of spin-off

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7 Nyköping-Östgötalänken AB (2005b) och http://www.ostlanken.se
8 Nyköping-Östgötalänken AB (2005c)
9 http://www.ostlanken.com
effects. The idea is that shorter travel times will lead to an expansion of the local labour markets in a way that more towns get closer to Stockholm and its surroundings, resulting in increased possibilities for people to live further from their working places.

It is possible that the Östgöta link via regional expansion may also have a positive effect upon real estate and land property values in the towns close to the line. Thereby, the state may indirectly get increased revenues related to the taxation of such properties. (However, the newly elected government may change the current real estate tax into something similar to a poll tax.) Increased prices on land property may also lead to direct revenues to the state by means of privatisation of such properties (for example close to the railway stations).

In order to get a better understanding of what the Östgöta railway link may actually mean in terms of socioeconomic effects such as regional expansion, we have broadly studied the development of some parameters in towns and municipalities that have been affected (or not been affected) by other Swedish railway projects in recent years. The parameters studied are total rate of unemployment, tax base, and the development of taxation values and actual prices paid for small houses and homes. The studied period overall ranges from 1992-2006, but the start and end years varies to some extent depending on the availability of data for the actual parameters. Using statistics from SCB and AMS, we have created three categories of municipalities. The first category consists of the municipalities along the planned Östgöta link, the second of some municipalities along the Svealand and Mälar lines (upgraded from the mid 1990s), and the third contains some municipalities that lie along other (not upgraded) lines but in the same part of Sweden. We have also studied the same development in the three major cities of Stockholm, Malmö and Gothenburg and the average values from the aggregates “Svealand excluding Stockholm”\(^{10}\) and “Sweden excluding the three major cities”.

Total unemployment has generally gone from high levels in the mid 1990’s to lower levels in 2001-2002, then followed by an increase although not to the previous high levels. In the Östgöta link category of municipalities, unemployment typically reached a bottom level at 4.5-5.5% to be followed by an increase to 5.5-7%. In the Svealand and Mälar line category unemployment reached as low as 3-4.5% followed by an increase to 4.5-6%. Exceptions naturally exist, but overall it seems as if the latter group of municipalities faired a bit better when it comes to unemployment. In the third group, a few municipalities faired well (down to 4-4.5% and then up to 5.5%) while most never managed to go lower than 6% and today have

\(^{10}\) The middle part of Sweden called Svealand has been approximated as the sum of the counties of Stockholm, Uppsala, Södermanland, Värmland, Örebro, Västmanland and Dalarna.
reached as high as 7.5-9%. In the larger aggregates Svealand and Sweden, unemployment reached a low of 4.7% and 5.3% respectively to be followed by an increase to 5.8% and 6.3% respectively. In general, Svealand has only had an unemployment rate of 0.5 percentage units lower than Sweden as a whole when the three major cities are excluded.

The tax base has increased in all the studied municipalities over the entire period. For the Östgöta link municipalities the increase is 150-160%, while the Svealand and Mälar line municipalities have fared a bit better (150-170%) also when compared to the third group of municipalities. Both Svealand and Sweden as a whole have enjoyed a similar development (160%).

Finally, when it comes to real estate and land properties, it appears that statistics on taxation values are generally very difficult to use for comparisons, since the development has been strongly affected by some large changes during those specific years when major revisions of real estate taxation properties have been carried out. Data on the average prices paid for small houses and homes shows a smoother development. Almost all municipalities along the planned Östgöta link and the Svealand line and Mälar line have experienced higher increases than the third group of municipalities.

All in all, this brief overview of the development of some parameters shows that there are notable differences between municipalities that have enjoyed large railway investment and those that haven’t, but they are not extremely strong. Consequently, this analysis has not provided an unambiguous confirmation of a regional expansion effect – at least not in terms of the studied parameters. It is an undisputed fact that travel times have been reduced and that people thereby get more freedom to live further away from their working places, but the importance of spin-off effects is uncertain. In other reports on the Östgöta link, it has been argued that the regional expansion effect from infrastructure investments is considerable, but what is actually shown is that regions with large populations tend to outperform less populated regions in terms of productivity (although there is clearly not a linear relationship).11 It may be the case that other differences between municipalities have a stronger effect and therefore offsets any positive regional expansion effects. Moreover, it is very difficult to really get a proper estimate on what would have happened if the railway investments had never been made at all. Several municipalities along the Svealand and Mälar lines were viewed as localities of crisis in the mid 1990’s, and this is clearly not the case anymore. In summary, the conclusion is that our comparison is not enough, but more detailed
case studies are probably needed in order to evaluate railway investments and regional expansion effects.

It should also be mentioned that the Östgöta link is a true high-speed project, with possible speeds up to 300 km/h, and it will be a line closely linked to the national railway network. The investments related to the Svealand and Mälar lines resulted in maximum speeds of 200-250 km/h and the lines are primarily used for local and regional journeys.

**Arguments for bringing forward the Östgöta link**

The primary argument for bringing forward the Östgöta link is of course that the related positive implications will have the possibility to come into effect earlier. In a way, this means a recycling of the very same arguments as was used for investing in the line itself. However, it is also possible that some effects coming from the construction of the Östgöta link will be more pronounced if the project is brought forward or even presupposes an early finalisation. In order to affect or offset certain trends, such as migration or business cycle dependent parameters, the actual point in time for the completion of the project may become particularly important.

Some local and regional companies may have specific needs that presuppose a fast completion of the Östgöta railway link. The new line will include a connection to the airport Skavsta. This airport has the potential to become the much discussed major airport south of Stockholm (an important complement to Arlanda). However, such an expansion may be dependent on that a fast railway connection to Stockholm is completed within a few years time rather than later. Otherwise, other airport locations may be necessary to consider, but these alternatives may turn out to be costly. Moreover, if Skavsta quickly comes out as the only alternative, it would become possible to close the Stockholm city airport Bromma, making way for new homes and working places in a rapidly growing part of Stockholm. The time aspect is critical here since the current concession for Bromma ends in 2011.

For a number of airline flights a fast train connection to Skavsta would make this airport a suitable alternative to Arlanda and Bromma, since the flights would be shortened 10-15 minutes for southbound journeys. This may result in considerable environmental gains by means of reduced emissions, as can be shown with a simple calculation model. Every passenger kilometre with a modern aircraft (MD90) results in an additional 27 grams of consumed fuel, 86 grams of carbon dioxide emissions and .37 grams of nitrogen oxide.

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Nyköping-Östgötalänken (2005a)
emissions. A typical southbound flight is assumed to be about 120 km shorter if it takes off from Skavsta instead of Arlanda. If the cabin factor is 90% the estimated effects of moving 1 million, 2 million, and 3 million journeys, respectively, from Arlanda to Skavsta, are presented in Table 2 below. If we count every journey as a return trip the outcome doubles. In addition to this effect we may of course add the more traditional environmental advantages of having more people travelling by train rather than bus or taxi to and from the airport.

Table 2. Estimated environmental effect of moving flights from Arlanda to Skavsta*

<table>
<thead>
<tr>
<th>Number of passengers</th>
<th>Number of passenger km</th>
<th>Aircraft fuel consumption</th>
<th>Emission of carbon dioxide</th>
<th>Emission of nitrogen oxide</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 million</td>
<td>120 million</td>
<td>3.240 tons</td>
<td>10.320 tons</td>
<td>44 tons</td>
</tr>
<tr>
<td>2 million</td>
<td>240 million</td>
<td>6.480 tons</td>
<td>20.640 tons</td>
<td>89 tons</td>
</tr>
<tr>
<td>3 million</td>
<td>360 million</td>
<td>9.720 tons</td>
<td>30.960 tons</td>
<td>133 tons</td>
</tr>
</tbody>
</table>

* Assumptions:
1) The flight journey is 120 kilometres shorter to and from Skavsta compared to Arlanda airport
2) The same type of aircraft is used and the cabin factor is 90%
3) Every passenger kilometre uses 27 grams of fuel and results in emissions amounting to 86 grams of carbon dioxide and 0.37 grams nitrogen oxide
4) Fuel consumption and emissions stay the same for connecting journey (by car/bus/train) to and from the airport

The estimated values in the table are considerable, but yet rather low when compared to the total environmental effect of the airline industry. According to an environmental report from the traffic authorities, the industry’s emissions in Sweden in 1999 amounted to 1.6 million tons of carbon dioxide. If as much as 3 million return flights were moved from Arlanda to Skavsta, the reduced emissions of carbon dioxide would amount to 62,000 tons, i.e. about 4% of the industry total.

12 The figures have been collected from a database on emission calculations provided by LFV Group Swedish Airports and Air Navigation Services at [http://www.emis.ffa.se/lfv/swe/val1.lasso](http://www.emis.ffa.se/lfv/swe/val1.lasso)
Arguments for organising the Östgöta link as a PPP project

The arguments for organising the Östgöta link as a PPP project draw from the earlier described general advantages of PPP projects. For the Swedish state, the regions and the municipalities this means possibilities for better service quality, better returns on the invested capital, lower project costs, lower risks, strengthened innovativity, faster accomplishment, better budget management and increased revenues. A recurrent argument is also the possibility to bring forward the project by means of a PPP solution, compared to the otherwise estimated project start in 2010 or even 2015. To what extent all these advantages are possible to fulfil will naturally depend on a lot of factors, not least how the project is designed and in what context, but such a discussion is beyond the scope of this paper.

Conclusions

It used to be the case that European governments could use the ordinary budget to spend money for a new railway line. Under the budget constraints of today’s European countries, this is rarely possible. For example, many European countries that would love to build new high-speed lines are limited by the EU’s 3 percent deficit rule. Italy, France, Germany and Great Britain seem to belong to this category of countries. In other countries, the limitations are not that severe, but there are still reasons for proceeding with caution.

In both these cases, PPPs may be a possible way forward. Like ordinary companies, the state must often finance new railway projects by means of loans from banks or other financial institutes. Consequently, in the end the very same private capital may be used as if companies were responsible for the investment. This means that the borderline between private and state investments has become blurred.

In our view, following from the case study of the Östgöta railway link, the main critical advantage of a PPP project compared to a public project is the possibility to start and finalise the investment earlier. When this is paired with the insight that timing of some investments has become increasingly important, the organisation of a project as a PPP arrangement appears to be a very favourable one for infrastructure investments. We suggest that a methodology is developed to evaluate the importance of bringing forward certain investments.

Typical infrastructure project have been designed in a way that either the state bears the whole investment or the private investors bear the whole or almost the whole investment. One way
to increase private involvement may be to divide large projects into several smaller ones, in order to locate where the involvement of private capital investments would be most realistic. Critics will argue that this would only lead to private capital investments where risks are low and prospects for profits high, but we believe that such models should nevertheless be considered, especially if this is what is needed to get the last amount of capital necessary to complete a larger investment.

References

Printed sources


13 We do consider a number of these issues in Hultén and Alexandersson (2006).

**Web links**

http://www.emis.ffa.se/lfv/swe/val1.lasso

http://www.fhwa.dot.gov/ppp/