Deciding on railway investments – a comparison of the decision making process in Sweden and Norway#

ABSTRACT

Research has shown that there is a link between deregulation and rail performances, and between infrastructure investment levels and rail performances. However few studies have discussed the mechanisms at work in a thorough way.

This paper draws on the results from a comparative research project investigating the developments of the rail sectors in Sweden and Norway. Sweden has invested more in absolute terms, but Norway has invested substantially more per track km. Considering the direction of investments Sweden has focused more on building new lines and Norway on upgrading old railway lines. The deregulated Swedish railway industry has succeeded in winning market shares and in creating new railway services – fast regional trains and intercity high-speed trains – to a greater extent than the Norwegian railway industry.

In this paper we look into the relationship between deregulation of the railway market and prioritisation of infrastructure investments. We investigate how infrastructure investments are financed and organised, and how the decision making processes differ in Norway and Sweden. This is done by looking closer at some major investment plans and projects in the two countries.

The paper concludes by pointing at the higher influence of cost benefit analyses in prioritizing between projects in Sweden, as a possible explanation for the difference in investment direction.

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Introduction

For more than two decades the European railway sector has experienced a variety of changes and regulatory reforms aimed at increasing competition and private sector involvement. Important elements of this reform process include separation and divestment, the introduction of intra-modal competition by means of tendering and other procedures, and sometimes privatization of railway industry firms or business activities.

The majority of European countries have implemented some kind of reform in the railway sector, although these reforms differ broadly in terms of their dates of implementation and their degrees. The political rational of the reforms is their alleged ability to clarify roles and to improve cost effectiveness. Despite huge subsidies and considerable efforts in recent years, public transport modes are however still struggling to increase their market shares all over Europe [1,2,3].

In this paper we study the relation between some of these structural changes and investment levels in railway infrastructure and the performances of passenger rail services in Sweden and Norway. Despite the many socio-economic similarities between the two countries, differences in jurisdiction, organization and financing of passenger rail services have led to the development of two distinctively different ways of serving the markets. While both countries have created a complete institutional separation between infrastructure and transport operations, train operations has been deregulated in Sweden, with competition on the tracks for long distances, and competition for the track on regional lines, in contrast to the public monopoly in Norway. This relate not only to dissimilarities in service quality and patronage growth, but also to infrastructure decision-making and investment levels.

The aim of the article is to analyse how and to what extent the regulatory features of, and the actors involved in, train operations affect the prioritising of infrastructure investments in Norway and Sweden.

This paper starts with a section on background both analytical conceptual and empirical; this is followed by a comparison of the regulatory frameworks, then there is a description of the two different systems for allocating funds for railway investment and a description of major investment processes that has taken place after 1990. This forms the background for our discussion of the observed differences and finally the conclusion.

Background

Analytical background

Several studies have analysed the efficiency of European railways [4]. Research on the impact of regulatory reforms on European railway effectiveness is however rare and many of the findings remain ambiguous and indecisive [5]. The experience so far indicates that in reality, competition between alternative rail operators in most countries is low, at the same time as the European countries
differ broadly in the way they have managed their vertical separation and liberalization of train operations. When narrowing it down to deregulation of train operations in terms of competitive tendering, general findings suggest that deregulation of train operations is related to reduced public grants and lower operating costs [6,7]. Tendering is indeed further related to improving performances in terms of patronage growth and service reliability, but empirical analysis seems to conclude that performances are more akin to the infrastructure investments coinciding with tendering rather than the regulatory reforms themselves [6,8]. This nevertheless suggests that regulatory reforms and infrastructure decision making procedures are interlinked, calling for further research on the interconnections between deregulation of train operations and infrastructure decision making procedures.

Existent research on the impact of regulatory reforms on infrastructure priorities is rare and almost nonexistent in the world of railways. Findings from the local bus industry however suggests that deregulation was related to a shift in the decision making process and priorities away from social policy to increased focus on cost savings, efficiency gains and value for money objectives [9]. Similar results has been found by Knutsen and Boge [10] and Welde et al. [11] studying regulatory set ups and priorities and use of CBA in road construction.

There has also been some resent research looking at the utilization of CBA in the decision making process of transport infrastructure investments. The recent study by Welde et al. [11], compare experience from Sweden and Norway. In Sweden Eliasson and Lundberg [12] looked into the use of CBA in the selection of projects in the new Swedish transport plan. This is the first Swedish plan where both road and rail are subject to comparable CBA analysis. Earlier contributions include Nilsson [13] who based his study on Swedish road data, Odeck [14,15] using data from Norwegian road investments. This data was also used by Fridstrøm and Elvik [16] who focused on the internal priorities within the Norwegian National Road Authority including the use of CBA. A different approach was used by Nyborg and Spangen [17] who focused on the use, understanding and perception of CBA by members of the Norwegian parliament. A common feature of all these earlier studies is that they all utilize data from the road sector. Looking more generally at decision-making processes in major investments Olsson [18] utilize examples from Norwegian railway investments together with public investments in other sectors.

Conceptual framework

In this article we look into infrastructure investment decisions and processes in Sweden and Norway as an example of two countries where both have complied with EU regulation, with respect to separation between infrastructure and train operation but differ in respect to competition and procurement of passenger transport.
Table 1. Integration and regional passenger transport procurement [7]

<table>
<thead>
<tr>
<th>Regional passenger transport</th>
<th>Infrastructure and transport</th>
<th>Separated model</th>
<th>Integrated model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional procurement</td>
<td></td>
<td>Finland</td>
<td>France</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nederland (K)</td>
<td>Italy (K)</td>
</tr>
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<td></td>
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<td>UK (K)</td>
<td>Switzerland</td>
</tr>
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<td></td>
<td></td>
<td>Sweden (K)</td>
<td>Germany (K)</td>
</tr>
<tr>
<td>National procurement</td>
<td></td>
<td>Denmark (K)</td>
<td>Belgium</td>
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<td></td>
<td></td>
<td>Greece</td>
<td>Ireland</td>
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<td></td>
<td></td>
<td>Norway (k)</td>
<td>Luxembourg</td>
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<td></td>
<td></td>
<td>Portugal (k)</td>
<td>Austria (k)</td>
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<td></td>
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<td>Span</td>
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</tbody>
</table>

In table 1 we illustrate how a selection of European countries can be categorized with respect to how they organize the railway sector. Integrated and separated model relation between the rail infrastructure manager and the train operating companies. The distinction between regional and national procurement of regional passenger transport services illustrate how Sweden and Norway represents two different models both with respect to procurement of local/regional passenger services but also with respect to competition. "K" indicate that there is competition, either in the form of competitive tendering, franchising or on the track competition, “k” indicate that there has been experiments with competition for passenger rail services in the country in question.

Empirical background

In most contexts Sweden and Norway are comparable. However looking at the 17 year period from 1995-2012 we can see that passenger rail has been much more successful in Sweden than in Norway. This is both the case in terms of absolute numbers but also in terms of market share. However, not only is the market share in Sweden higher but it is also growing. In Norway it has remained (table 2).

Table 2: Railway passenger volumes and market shares in Norway and Sweden

<table>
<thead>
<tr>
<th>Sweden</th>
<th>Norway</th>
</tr>
</thead>
</table>

Transport production in passenger km increases substantially:

1995-2012: 6.8 → 11.8 billion passenger km (+87%)

Market share: 6.1% → 8.4%

Transport production in passenger km increases but market share remains:

1995-2012: 2.3 → 3.1 billion passenger km (+36%)

Market share: 4.1% → 4.1%

There are obvious differences between Sweden and Norway both with respect to population size and topography. Still in both countries rail has been high on the agenda for infrastructure investments.

In this article we look further into these developments and factors that can help to explain them.

We have shown that a possible explanation to these differences between Sweden and Norway is that Sweden conducted its deregulation process earlier than Norway.

**Comparisons**

Looking at passenger rail, both Sweden and Norway separated infrastructure from operations over a decade ago. Sweden did this internally within Swedish state rail (SJ) already in 1985, followed by the vertical separation of the track infrastructure organization to a separate rail infrastructure authority (Banverket) in 1988. In Norway, vertical separation occurred in 1996. Norwegian rail is still characterized by NSB as an almost monopoly supplier. Some core features of the regulatory framework of long-distance passenger transport services by rail are provided in table 3.

<table>
<thead>
<tr>
<th>Vertical and horizontal separation</th>
<th>Sweden</th>
<th>Norway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical separation in 1988</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From 1 to 14 organizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-privatized infrastructure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partly privatized service providers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical separation in 1996</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From 1 to 11 enterprises</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration, cooperation, acquisitions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-privatized infrastructure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-privatized service providers</td>
<td></td>
<td></td>
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</tbody>
</table>

1 This section draws on [19].
Financial support of infrastructure

<table>
<thead>
<tr>
<th>Financial support of infrastructure</th>
<th>Mainly state funding</th>
<th>Solely state funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low charges for track access</td>
<td>Rolling stock owned by operators and regional public transport authorities</td>
<td>Zero charges for track access</td>
</tr>
<tr>
<td>Rolling stock owned by operators and regional public transport authorities</td>
<td>Rolling stock owned by operators</td>
<td></td>
</tr>
</tbody>
</table>

Market competition

<table>
<thead>
<tr>
<th>Market competition</th>
<th>Local, regional (county) and non-commercial inter-regional lines are competitively tendered</th>
<th>Monopoly supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition on the track since 2011</td>
<td>Exception: Competitive tendering of one regional line in 2004</td>
<td></td>
</tr>
<tr>
<td>No further plans for competitive tendering</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Regulatory framework of passenger railway operations in Sweden and Norway
Source:[19].

The state clearly has very important roles to play in both countries. One of the most important is to provide the appropriate rail infrastructure and the related funding. Track access charges are relatively low in Sweden and set to zero in Norway and the operations, maintenance and investment of rail infrastructure depend therefore almost entirely on state grants directed to Trafikverket and Jernbaneverket, respectively.

The Swedish system

Banverket (the Swedish National Rail Administration) was created in 1988 and took over the responsibility for the Swedish railway network from the Swedish State Railways (SJ). Early on it was decided that Banverket should take care of supplying a socio-economic evaluation model and handle the bulk of the planning process [20]. This was followed by several decisions to increase the rail network investments (figure 1). Five major infrastructure plans have been conducted since 1988. They covered the periods 1991-2000, 1994-2003, 1998-2007, 2004-2013 and 2010-2021.

The 1991 railway plan

In April 1989, the Swedish government asked that Banverket should issue a plan for the Swedish railway network. The starting point of the plan should be the goals and guidelines that were presented in the Transport Policy Act of 1988. The course of action was to safeguard an all-embracing overview and use a socio-economically founded prioritization of the objects [21].

The socio-economic model consisted of an application to the railway sector of the convention model used for decades in the road planning sector. It had been adjusted to handle railway specific factors such as capacity and delay calculations. Values for accidents and time savings were developed in cooperation with road authorities. In the model the net costs and benefits were compared with the necessary
implementation costs and a net value ratio calculated. In the costs were included the train operator costs and benefits. The biggest contribution was the obtainable time saving [20].

Based on the socio-economic calculations the plan gave priority to adapting the railway lines between Sweden’s three biggest cities to higher speeds and the main line from Stockholm to northern Sweden. The guiding vision in the plan was that inter-regional railway transport should increase much more than local and regional railway transport [21]. The regional lines – Mälarbanan and Svealandsbanan – connecting the cities around lake Mälaren to Stockholm were consequently given a low priority. Work on these lines should start gradually and in the case of the southern line – Svealandsbanan- at the end of the planning period. These lines were given a much higher priority through agreements between the government, local and regional political actors and other stakeholders.

A new tunnel through the Hallandsås ridge was given a high priority despite a fairly low net present value ratio of 0.6. A double track tunnel was estimated to cost 960 million SEK. In 1991 the project started with a budgeted cost of 1060 million SEK. Due to technical problems the project was halted in 1997. It restarted in 2003 and the first train will travel through the tunnel in 2015. Total costs were in 2010 estimated to be 10.5 billion SEK at 2008 price level [21, 20, 22].

The 1994 investment plan

According to the 1994 plan the investment planning procedure looked as follows. On a general level relationships were identified between traffic planning, infrastructural planning and economic planning. Traffic planning was linked to infrastructural planning and included items such as traffic concept, timetable concept, timetable plan and current train timetable. Infrastructural planning was then linked forward to the economic planning of Banverket. One key factor was infrastructure feasibility study whose purpose it was to clarify realistic alternative solutions as well as their costs and benefits based on the freight and passenger traffic concepts envisaged [20].

To aid in the selection process Banverket used the socioeconomic evaluation model outlined above that aimed at “describing the total consequences of various railway infrastructure changes to society as a whole” [20]. In this plan Banverket developed three alternative strategies that mixed different investment levels for different railway lines. The strategies were labelled “Regional balance”, “Concentration” and “Accessibility and environment”. The Concentration strategy had the highest net present value ratio but the Government opted for a slightly changed “Accessibility and environment strategy”. Time savings had a much higher impact than any other factor, it accounted for 70 to 80 per cent of the net gains for improving or building railway lines [20]. In the Concentration strategy they amounted to nearly 69 billion SEK which were 15 billion SEK more than in Regional balance strategy. They clearly explained most of the differences in the calculated net present value ratio. No major new lines were included in the plan.
The 1998 railway plan

In the planning process the government pointed out a number of projects that should be included in the plan. These projects included a new tunnel through central Malmö, the building of four tracks from central Stockholm to the suburb Årsta, and the building of the Botnia railway line, a 191 km new railway line in northern Sweden [23]. The so-called Göta landsbanan from Stockholm to Gothenburg passing through Jönköping was not included in the plan.

The 2004 Future plan

The starting point for Banverket’s Swedish plan for the future of the railway system 2004-2015 was the Government bill “Infrastructure for a long term sustainable system of transport” from 2001 [24]. Banverket and other state agencies such as the National Road Administration and the county administrative boards got separate instructions based on the Government bill.

The overall goal of the plan for the future was to increase the share of the transport market of railways and other rail technologies. This was the case because these technologies were considered to be superior to road transports as regards safety and environment.

To prioritize between different activities and building of new or upgrading of old railway lines Banverket had to take into consideration both a CBA and the political goals for the transport system. In case two measures were considered equally attractive to achieve the political objectives the measure with a higher socio-economic benefit was to be selected. The socio-economic evaluations were based on an overall forecast or in some cases individual project forecasts. The result of the socio-economic evaluation is given in the form of a net present value of investment. However, it was considered that the socio-economic evaluation didn’t capture all the salient effects as it was restricted to the effects that could be quantified and valued in monetary terms. Therefore, it was deemed necessary to complement the socio-economic evaluation with a description of other effects.

Of the planned investment level of 101.5 billion SEK for the twelve year period nearly 60 per cent was already allotted before the work with the plan started. After a first selection process Banverket identified projects at a total value of 250 billion SEK. Excluding the already decided 60 billion SEK resulted in a budget of 40 billion SEK to select from the need for investments of 190 billion SEK. Banverket analysed the selection problem in the following way. The railway is a system that demands strategic planning to elaborate a long term plan for action. This means that investments need to be carried out in a specific time sequence to enable the system to function at an acceptable level. For the 2004 plan this meant that the most important measures were to improve capacity around the three major cities in Sweden – Stockholm, Gothenburg and Malmö – and to carry out the follow-on investments to the Botnia railway line.

The 2004 plan reflected on some major new projects similar to the comparison made in the 1994 plan. At this time Botnia new line was already being built and
sections of the North link from Gothenburg to Oslo were already built. The first sections of the new Götaland line was included in the plan, the work was planned to start after 2010 [24]. Two completely new lines were to be built in Northern Sweden, mainly to improve the rail freight, the Haparanda line and the Norbotnia line. In Stockholm a new railway tunnel and new railway stations called Citybanan became the most important new national railway project and in Malmö a tunnel under the city centre was to be built. Work on both these projects started a few years later.

Source: Banverket (BV) and Trafikverket’s (TV) annual reports.

**Figure 1. Banverket and Trafikverket's infrastructure costs 1989-2011**

The figure is constructed using two data sources. The annual reports of Banverket and Trafikverket. The difference between the observations in the same year is probably due to the Bothnia line which is included in Trafikverket’s way of calculating but not in Banverket’s. Also Trafikverket has excluded administration costs from operation and maintenance.

**The plan for the period 2010-2021**

In 2009 a new plan for the whole Swedish national transport system was developed. In the elaboration of this plan, four state agencies in the transport sector interacted:
Banverket, Sjöfartsverket, Transportstyrelsen and Vägverket² These agencies with the exception of Transportstyrelsen merged in 2010 to form Trafikverket. In the plan the administrations took a wider approach to the transport system and changed the focus from one transport infrastructure to the whole journey or the transport. One goal of the plan was to shorter the travel time for the traveller. By adjusting the socioeconomic analyses and other relevant effects earlier conducted in the different administrations the plan arrived at a better comparison of investments in the different transport systems [25]. For the railway sector this turned out to be a major acid test. The railways share of the transport infrastructure investments fell substantially and no new major railway line was included in the 2010-2021 plan. However, some major lines under construction were to be completed in the planning period, for example Citytunneln, Citybanan, the completion of the tunnel under the Hallandsås ridge, a connecting line to Botniabanan and continued work on Haparandabanan. The planning of the Götaland line was discontinued as well as the Norbotnia line [26].

Despite the exclusion of new projects infrastructure costs remained high reaching a top in both nominal and inflation adjusted terms in 2010. In 2012 the Swedish government decided to build the commercially most viable sections of the Götaland line.

**Passenger and rail freight developments in Sweden**

When the first effects of the upgrading of the Swedish railway network started to be felt, in the early 1990s, the railway system transported 6 billion passenger kilometres and 17-18 billion tonne kilometres. 20 years later the system transported 11.7 billion passenger kilometres and nearly 22 billion tonne kilometres.
Most of the gains appeared in the market for local and regional trains. An important reason for the rapid increase of the regional travel was the completion of the two new lines in the bigger Stockholm region: Svealandsbanan and Mälarbanan. Both these lines were decided on parallel to the first major railway plan in 1991. These lines and most of the new lines investigated by Banverket were promoted by regional interests that in some cases promised to co-finance the new line. These regional interests often carried out the first socio-economic evaluations and launched the idea of the new line in the media. Generally speaking the regional interests included more benefits to the projects than Banverket and the other administrations normally do when they conduct a CBA.

**Conclusion: the Swedish system**

Sweden has used at least four approaches on how to carry out its decision making and CBA in the planning of railway investments after the deregulation process started in 1988. In a first stage decisions were taken on new lines without letting the socio-economic evaluation dominate the decision process. This was the case from 1988 to 1994 when the decisions were taken to build Mälarbanan and Svealandsbanan and upgrade the most important railway lines to allow speeds up to 200 km/h after the introduction of X2. In 1994 Banverket bundled together different objects in three strategies that the politicians could chose between. In 2004 Banverket used a vision strategy with two different time horizons to differentiate between projects. In the shorter time perspective measures to improve the railway network surrounding the three big cities in Sweden as well as some follow-on investments were given priority. In the longer time perspective new major lines were included. In the 2010 plan Banverket together with other state administrations compared the socio-economic and other relevant effects of new transport infrastructure investments. The result was that the most important major new projects already under construction were continued while no new major line was included in the plan.

In the ranking of projects it is evident from looking at the material in the last four plans that the best chance of getting more funding for a major project is that the project already has started. Other reasons that often are mentioned are: 1) increased accessibility to the major cities; 2) increased capacity; 3) higher speeds on a railway line; 4) projects that the Government has decided shall be part of the plan; 5) regional interests that demonstrate a willingness to share the costs of the project; 6) improved freight traffic on rail; 7) projects with high net present value according to CBA; and 8) missing links projects.
The Norwegian system

While deregulation of passenger rail transport in Norway has been recent and limited to only one line (Gjøvik line from 2006), the process of planning and decision making for rail investment has been changed, quite similarly to the changes in Sweden. However, the actual financing of rail investments in Norway are still restrained by annual national budgets, and the process of decision making involves several stages of prioritizing and political influences beyond the point of the rail authority’s prioritizing.

The number of major railway investment projects in Norway is limited. Since 1991, however, the numbers have increased and there have been some major investments, mainly on the intercity-lines around Oslo, on the regional/local line of Stavanger-Sandnes, and the building of the airport express/Gardermoen-line. Figure 3.

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3 Longva et al. [27] analyses this.
Figure 3, JBV’s infrastructure costs 1990-2012 (million SEK, 2008 prices)

The investment decision making framework was changed by the introduction of the national transport plan (NTP) in 2001/2002. NTP replaced all the earlier sector specific plans with a single cross sector coordination plan. The NTP is a ten year plan which is made/revised every four years. NTP introduced a more significant role of CBA in the planning of investments project.

Before NTP (National Transport Plan)

Before the introduction of NTP, each transport sector had a sector specific plan. These plans included development trends, different future scenarios and sector specific issues and proposals for major investments specific to their sector. For rail this was called “Norsk Jernbaneplan” (Norwegian railway plan). The last railway plan was for the period 1998-2007.

These plans were seen as a guide, not a binding document. Each project needed to be included in the annual Government budget. This inclusion was made by political priorities. Most of the investment projects mentioned in “Norsk Jernbaneplan”, were given a cost estimate, and a benefit estimate in the form of new travel time and capacity, these benefit estimates were as a rule not monetized. However in the documents for specific projects CBA were used. Also in the railway plan 1998-2007 there were mentioned the use of CBA for the projects included in the plan [28], but there is not a ranking of projects based on CBAs. When the Gardermoen line was planned, this was integrated in the decision to build a new airport at Gardermoen, and was not included in the ordinary rail investment plan [18].

NTP (National Transport Plan)

The NTP is a common ten year plan for all transport sectors and the chronological successor of the earlier sector specific plans. These plans are made/revised every four years. NTP was introduced in the parliament session of 2001-2002 and the first NTP was for the period 2002-2011 [29]. The plan includes an overview of the political priorities, trend developments, project budget allocations, policy objectives and prioritized corridors. CBA is utilized in the selection of projects to be included in the plan.

In the preliminary work with the plan, each sector is given a predicted budget, based on the economic outlook, and the Government’s priorities. Within this budgetary framework the ministry of transport asks for a project portfolio that maximizes net present value. In addition to this portfolio, a “recommended” portfolio is also to be presented, including political commitments but within the same budgetary frame. This process is similar in all transport sectors [30].

But as in the case of the earlier railway plans, funding is still a political process, and several of the projects in the plan will not materialize and other projects will be postponed. However the NTP is the Governments plan for the transport sector and projects will generally be implemented according to the plan documents [30].
The decision making phases

According to Jernbaneverket\(^4\) (JBV), the Norwegian National Rail Administration, the decision making processes involve several stages of prioritizing between projects beyond the result of the CBAs. In short, we may distinguish between three decision making stages: (i) the JBV list of projects to be included in the NTP work, (ii) the list of projects to be included in the final NTP, (iii) the decision to finance a specific investment projects through the annual national budget negotiations.

If we follow a specific project along the road from planning to building, the guidelines given by the ministry of transport and communication (MTC) require JBV to put forward two lists of alternative plans, one based on CBA, the other on overall transport policy objectives. The process for a single project starts with a feasibility study, as the planning gets more detailed, a CBA analyses is done. If the project has a high CBA ratio it will be placed high upon the list with other projects with a high CBA, if not it may still be included on the list of projects that are made based upon overall transport policy objectives. Hence, while projects with low CBA scores may be excluded from the CBA list, they may still be included on the list sent to further NTP-planning based on overall policy objectives.

The next step is to be included in the final version of the NTP. In the NTP process the different sectors have to negotiate and prioritize based upon the funding available, in the budget forecasts and the political guidelines laid for the allocation of founding between the sectors. Which projects that finally gets included in the NTP, as presented to parliament, is up to the MTC that make the decision based on political and overall transport policy objectives.

Finally, before building, each project has to receive funding through a parliamentary decision and pass an external quality control that includes a new CBA. Except for the Gardermoen-line, all investments projects since the 1990s have been funded through the annual national budgets.

Major investments projects in recent years

Over the last three decades there have not been many major, completed rail investment projects in Norway. Completed and partially completed projects are included in table 2:

<table>
<thead>
<tr>
<th>Line</th>
<th>Network</th>
<th>Size</th>
<th>Building period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gardermoen</td>
<td>Airport express, but also, local regional and long distance</td>
<td>8.3 bill (1998 nok). [31] 52 km (64km including extention to Eidsvoll) [18].</td>
<td>1994-1999</td>
</tr>
<tr>
<td>Vestfold</td>
<td>Regional</td>
<td>140 km total</td>
<td>1993-</td>
</tr>
</tbody>
</table>

\(^4\) Personal communication with Frode Hammer and Gunnar Markussen dir. at jernbaneverket (2011).
Table 2: Major new railway investments in Norway

Transport volume developments

The main trend in Norwegian rail transport from 1993 onwards is growth, in the number of passenger kilometres and tonne kilometres (figure 4). However if we look at passenger kilometres for different market segments the statistics point in the direction of stagnation for local traffic and growth for regional and long distance traffic.
Figure 4. Output from the Norwegian railway system.
Source: Statistics Norway, Jernbaneverket[35].

Conclusion for the Norwegian case: The role of CBA in investment decisions

There seems to be a very unclear relationship between CBA and specific rail investment projects. A priority list of projects is produced after their CBA ranks, but there are also several layers where political concerns and interests of other stakeholders influence investment decisions. In short, we may distinguish between three decision making stages which all involve considerations beyond the rankings of the CBAs: (i) the JBV list of projects to be included in the NTP work, (ii) the list of projects to be included in the final NTP, (iii) the decision to finance a specific investment projects through the annual national budget negotiations.

As part of the NTP framework major investment projects have to go through CBA at more than one stage in the planning process, both prior to the NTP work and during the NTP-planning process. While CBA may play a role in excluding the projects with the poorest CBA scores, the linkages between the initial CBA rankings provided by the JBV and investment projects finally decided upon are weak. These findings are similar to the findings from CBA in the road sector [30]. However there are not as many railway investment projects as in the road sector to examine the relation of the CBA scores and the political decision making.

Discussion

If we look at the evolution of infrastructure spending it is evident that while Norwegian infrastructure funding has had a more or less steady increase over the whole period (when we exclude the investment in Gardermoen line) Sweden has had two periods of extreme increases (1993-95 and 2001-2007) and a rather long period of decline in-between. The first period may be explained by the heavy investments initiated during the recession of the early 1990s combined with the need to facilitate the introduction of the tilting high-speed train X2000.

Although a brief look at the numbers may suggest that Sweden has spent substantially more than Norway over the whole period, the picture gets more complicated if some additional factors are weighted in figure 6. Firstly, the total length of tracks in kilometers in Sweden (9921 km in 2007) is about 2.4 times the corresponding value for Norway (4114 km). Secondly, about 29% of this line length carries double tracks in Sweden, compared to about 5% in Norway. If we also take (fluctuating) exchange rates into account a somewhat preliminary result would suggest that per track km (with double tracks counted as 1.8 the length of single
tracks), Sweden actually only invested more than Norway during four years of the period: 1994 and 2005-2007.\(^5\)

Figure 6. Rail infrastructure spending (operation, maintenance and investments) in Sweden and Norway 1990-2011 (2008 prices, PPP adjusted and track length adjusted) Gardermoen line included.

Figure 6 illustrate that when more factors are taken into account some of the obvious differences between the Swedish and Norwegian rail infrastructure spending disappear. Looking at spending per track kilometer, using these corrections Sweden has only spent more than Norway in four years, within this period. Still this is only part of the picture. Looking at the composition of the expenditure it is clear that the investment share is higher in Sweden compared to Norway, and that operations and maintenance has a higher share in Norway. The only time period when the Norwegian investments are higher than the Swedish is when the Gardermoen line is being built (1994-1999). In other words Sweden is investing in new lines while Norway is maintaining the old. Still it might be possible to argue that some of these numbers are not all that comparable as the Swedish figures include re-investment, while the Norwegian does not separate between new investments and re-investments.

One of the main differences in railway infrastructure investment 1990-2012 between Sweden and Norway is the fact that in Sweden the counties in some cases have contributed to the financing, in Norway this has not been the case. This can

\(^5\) Looking at investments per track km is a method used by for example CER and UIC to make it easier to compare figures from different countries.
be seen in the context of the counties in Sweden being responsible for purchasing regional rail transport, while this is only done at a national level in Norway [7].

Looking at Norway, in the only case where competitive tendering has been awarded in the period, Olsen et al. [6] point out that although infrastructure investment has not been linked to the tendering contract, there are indications that this rail line has attracted more political attention. Still the only major investment on that line has been justified primarily with the needs from freight traffic, on a section of the line which has mixed traffic. It is therefore most likely unrelated to the needs of the tendered passenger traffic.

The main difference between Sweden and Norway, when one looks at rail investment seems to be that the projects that has been completed in the period we have studied, to a greater extent benefit the densely populated regions in Sweden. In contrast, Norway has mostly invested in the intercity network, and spread the investments on more, but smaller projects. Several of these completed projects has so far only had very limited effects on the total traffic of the line in question, as there still are bottlenecks in the Norwegian intercity network that needs to be removed before the full benefit of the projects can be realized.

One possible explanation for this is that the politicians in Sweden have listened to local and regional interests groups that have advocated the building of new regional railway lines while CBA has been used to select between incremental projects.

This would also be in line with the findings in Longva and Osland [9], that point at the fact that privatization in public transport is associated with a focus on measurable success, in particular the ability to attract more passengers. This again results in a more centralized service. Thus the different types of infrastructure investment activities being carried out during the period we have studied, when the Swedish rail operation to a greater extent than the Norwegian rail operation have been de-regulated, supports our hypothesis. Namely that increased deregulation is associated with investments in infrastructure that can generate more benefit in terms of attracting new passengers. An interesting fact is that the most recent Norwegian projects (finished after 2008), to a greater extent than the earlier, has focused on removing bottlenecks. These projects were also started after deregulation had begun in Norway, thereby adding support to our hypothesis. However this may not be the only possible conclusion, as the data set is limited.

**Conclusion**

In this paper we have studied the use of CBA and other socio-economic calculations in the selection process of new railway infrastructure investments in Norway and Sweden. The two countries utilize different approaches to CBA and have changed the use of CBA over the last two decades. The differences seem to be relatively smaller today as both Norway and Sweden use a system in which the socioeconomic value of a railway infrastructure investment is compared with competing
investments in other transport sectors. In addition in both countries political interests directly influence the ranking of the projects which effectively decreases the importance of the CBA.

Sweden has over time invested more in railway infrastructure projects than Norway but if we adjust for track length Norway has spent more. Sweden has built more new lines and upgraded more lines to higher speeds than Norway. Sweden has built more than 400 kilometres of new railway lines while Norway has built 130 kilometres. Sweden has also built a number of regional railway lines near the biggest cities – the most important are Arlanda line, Mälardalen line, Svealandsbanan and the Öresunds bridge. This is in contrast to Norway, where only one major new line has been built, the 64 km Gardermoen line, the rest of the newly built track is mostly capacity and speed improvements on the intercity networks, in essence building new lines parallel to the existing lines. The full benefits of which will not be realized until the entire network is improved. There are still significant bottlenecks.

Our data suggest that Norway has spent more on rail infrastructure than Sweden, when we compensate for the difference in total track length. However when we differentiate between investment and operation and maintenance, we find that Sweden has invested more, also when we compensate for differences in track length. This would suggest that the change in the Swedish regulatory system has resulted in different projects being prioritized than in the Norwegian system.

When we compare the outcomes, in terms of market shares and transport volume, it is clear that Sweden is more successful. The obvious explanation is that a large part of the Swedish investments has gone to improving capacity in the largest cities and providing new links. In addition, despite the well-known project with the tunnel underneath Hallansåsen more Swedish projects have been completed in such a way that they bring more benefit to the traveller than the case is in Norway.

Underlying this observation is several explanations: 1) That the projects are chosen for different reasons. While comparing CBA’s play a significant role in which infrastructure projects are chosen in Sweden [12, 11] these analyses play little or no part in which projects are chosen in Norway [11]. The output from the railway sector suggests that this is also the case in this sector. 2) Geography, in general Sweden is less mountainous than Norway, in general this would suggest higher construction costs in Norway. However as most of the construction in Norway has taken place in the wider Oslo area one can question the relevance of such arguments. As the original railwaylines were built from 1850s and onwards without extensive use of tunnels and bridges. And that these cost driving features is more related to political priorities rather than difficult topography.
References

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