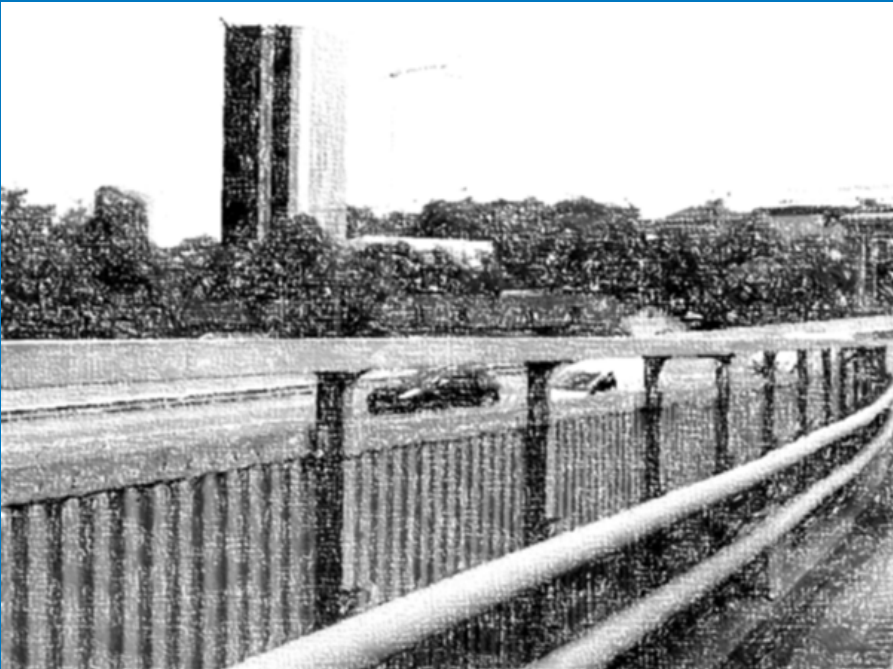


Government's Role for Transport Infrastructure

Theoretical Approaches and Historical Development

BJÖRN HASSELGREN



Doctoral Thesis in
Planning and Decision Analysis
Stockholm, Sweden 2013



**KTH Architecture and
the Built Environment**



**KTH Architecture and
the Built Environment**

Government's Role for Transport Infrastructure

Theoretical Approaches and Historical Development

Doctoral Thesis

Björn Hasselgren

KTH Royal Institute of Technology

School of Architecture and the Built Environment

TRITA-SoM 2013-05
ISSN 1653-6126
ISNR KTH/SoM/13-05/SE
ISBN 978-91-7501-765-5

KTH Royal Institute of Technology
Department for Urban Planning and Environment
SE - 100 44 Stockholm
SWEDEN

Academic dissertation which with due permission of the Royal Institute of Technology (KTH), is submitted for public examination for the degree of Doctor of Philosophy on Monday, August 26, 2013 at 9.00 a.m. in F3, Lindstedtsvägen 26, KTH, Stockholm.

© Björn Hasselgren
Coverpicture: Björn Hasselgren

Printed by: Universitetsservice US-AB

"Och se jag trodde icke mer att Universums gåta var löst, men jag gick ut, ibland i ensamheten, ibland i sällskap för att tänka över Den Stora Oredan, i vilken jag dock slutligen upptäckte ett Oändligt Sammanhang.

Vill du följa mig, vägvandrare, så skall du andas friare, ty i min värld råder Oordning, och det är frihet."

Strindberg, A. (1896) *Sylva Sylvarum*

("Behold I did not any longer believe that the mystery of the Universe was solved, but I went away, sometimes alone, sometimes in company, to consider The Great Disorder, wherein finally though I found an Infinite Coherence.

If you wish to follow me, wanderer, your breath will be free, since in my world there is Disarrangement, and that is freedom.")

(Free translation.)

Table of Contents	Page
PREFACE	7
0 ABSTRACT	9
1 INTRODUCTION	11
1.1 Scope of the thesis	11
1.2 Purpose and objectives	11
1.3 Some delimitations	14
1.4 Outline of the thesis	14
2 METHODOLOGY AND CONCEPTS	17
2.1 Methods, sources and the research process	17
2.2 Some perspectives on transport infrastructure	23
3 THEORETICAL APPROACHES	29
3.1 Introduction	29
3.2 Neoclassical theories and welfare economics	33
3.3 Institutional theory and organizational focus	38
3.4 A co-evolutionary development approach	42
4 MAIN FINDINGS	47
4.1 The traditional arguments for government intervention and the challenges to these arguments	47
4.2 Transport infrastructure chronology 1939-2010, a co-evolutionary perspective	50
4.2.1 1939-1963	51
4.2.2 1963-1988 and further 1989-present	55
4.2.3 Conclusions	57
4.3 Marginal cost controversies – a financing and incentives dilemma	58
4.3.1 Financing principles	58
4.3.2 The government's dilemma and Coase's view	58
4.3.3 A marginal cost controversy in Swedish transport infrastructure policy?	62
4.3.4 Reasons for the change in principles	63
4.3.5 Incentives for efficiency changed?	65
4.4 Strategic transport infrastructure planning – knowledge and coordination	66
4.4.1 Knowledge and coordination	67
4.4.2 The spatial dimension	72
4.4.3 Current trends in the EU and the US	73
5 REFLECTIONS AND POLICY IMPLICATIONS	79
5.1 Reflections	79
5.2 Policy implications	85
5.2.1 Future challenges for the government	85
5.2.2 Possible future development	86

INTERVIEWS	93
FIGURES	96
LITERATURE	98
APPENDED PAPERS	106

PREFACE

Transport infrastructure systems are important for any society. Roads and railroads are the focus of this thesis since they are the dominating physical transport infrastructure systems. The more specific question in the thesis is the government's past and future role for transport infrastructure, and the future balance between public and private provision of these systems. With a background of more than 25 years' experience in the (central) government sector in Sweden, whereof more than 15 years in management positions, I have studied these questions in practice for a long time. My view on organizations and on the functioning of the government sector comes close to the (new) institutional economic perspective, with a classical liberal interpretation of society and the economic system.

The thesis project started partly as a reaction to work I carried out in 2009-2010 as Regional Director in the wider Stockholm area in the former Swedish National Rail Administration (Banverket). Along with another colleague I was responsible for investment planning in that particular geographical area.

During this period, I was also national coordinator for investment projects with alternative and additional financing (besides government financing). In that role I coordinated the Administration's work in the different regions and also reported on these projects to the Ministry of Enterprise, which was responsible for the overall planning of investment projects.

My experience was that the actors in the sector in general were paying only limited attention to organizational aspects, such as how to design efficiency-supporting incentive structures. In my view there was also only limited attention paid to issues of how different financing arrangements would affect coordination and resource allocation at large. My interest in these issues inspired me to get a deepened theoretical understanding of these and related issues. This is the personal motivation of this thesis project.

Acknowledgements

The research project has been financed by the Swedish Transport Administration (*Trafikverket*), where I am currently employed. The thesis work has been supervised by Professor Göran Cars (head supervisor) and Professor Hans Lind (deputy supervisor), both of whom are at the KTH Royal Institute of Technology. The Transport Administration has received full information about the project but has not influenced the academic freedom of this thesis project.

A number of my colleagues and friends, as well as many of those interviewed, have contributed to the refinement and development of this thesis. In particular I would like to mention Andreas Bergh, Fredrik Bergström, Emil Ems, John Hultén, Lars Hultkrantz, Daniel Klein, Fredrik Lagergren, Jan-Erik Nilsson, Thomas Marmefelt, Richard Wellings, Jan Ottosson, and Gabriel Roth, who have all contributed with deep insights, suggestions for additional reading, and often with critical and justified remarks on earlier versions of the text, or with general remarks on my approach.

As a by-product of the research process we have had a number of interesting discussions in my family around roads and railroads, the public and the private sector, and research in general. In this way, I hope, this has been a common learning journey for my family and I into interesting aspects of societal life and economic realities. If I have inspired any of our children to consider a research project of their own at some time in the future, this would be a great outcome of my thesis project.

Very special thanks goes to my wife Marie Rudberg, who has been so courageous all through the research project. Marie is my nearest friend, my most critical adviser and my strongest supporter. Thanks for all.

0 ABSTRACT

This thesis analyzes and discusses the development of the Swedish government's role as owner and financier of roads and railroads from the 1930s until the 2010s. The influence on the development of the government's role from two main theoretical paradigms is discussed and analyzed. These are:

- a) neoclassical and welfare economics; and
- b) new institutional economic theory with an organizational focus.

The thesis shows that there has been a shift from an institutional view on the organization and financing of the road and railroad systems following the nationalization in the 1930-40s, to a view more based on welfare economics from the 1970s.

Technology, economics and politics are three important factors influencing the development of the transport systems and of the government's role. In the thesis these factors are covered in a co-evolutionary approach applied for analysis of the historical development. This approach connects to a dynamic view on organizations and firms in institutional theory.

Over time there have been shifts in the strength of the factors (technology, economics and politics) influencing the development. There have also been controversies around financing principles and contradictions between different elements in the policies actually pursued over time. One such controversy has been whether to aim for full cost coverage or for marginal cost coverage.

The thesis discusses how planning and coordination in the transport infrastructure sector can come about. A centralized public sector planner mode is contrasted towards a private sector spontaneous ordering mode. It is argued that it is difficult for a centralized planner to collect the necessary information and transform it into deepened knowledge in order to coordinate. A decentralized spontaneous ordering mode might though allow for including the necessary knowledge.

The thesis illustrates a number of trade-offs that must be taken into consideration when discussing a possible future development for transport infrastructure and the government's role. The following aspects are discussed:

- the balance between public and private as the basic organizing principle;
- the balance between government and regions/local governments when it comes to
- the geographical division of responsibility; and
- the balance between the national and EU levels for strategic transport infrastructure planning and coordination, also in relation to spontaneous coordination and centralized planning.

The government has acted reluctantly and pragmatically and gradually developed its ownership role and the general policies in the sector. The government's emphasis on market failure as its basic assumption has become stronger over time.

The thesis brings a deepened understanding of the long-term development of the government's ownership and policy formation in the transport infrastructure sector in relation to the two theoretical paradigms. This combination of a historical view with the theoretical economic background gives new insights into the past and future of the government's role for transport infrastructure.

1 INTRODUCTION

1.1 Scope of the thesis

This thesis analyzes and discusses the Swedish central government's role as provider of transport infrastructure systems, with a focus on roads and railroads. The thesis is concerned with the questions of how the roads and railroads can be efficiently owned, organized and managed to meet the challenges of the future to the current organization and financing model. The government's current road and railroad systems are the focus of the thesis, in other words the national transport infrastructure systems. Maritime- and aviation-related infrastructure systems are more or less left out of the analysis.

It could be argued that roads and railroads are two systems that are too different to be discussed in the same analysis. This is true in many ways; however, the decision to include both of the systems in the thesis is based on two arguments.

Firstly, the starting point and main study of the analysis is the government and its role in the transport infrastructure sector, not primarily the transport infrastructure systems as such. Secondly, the Swedish government's decision, right or wrong from a theoretical perspective, to merge the former Road and Rail Administrations in 2010 to form the Swedish Transport Administration (*Trafikverket*), is part of the political and organizational environment in Sweden where transport infrastructure is concerned.

Over time the government has incorporated a large number of roles in the transport infrastructure sector such as regulator, financer, and owner with responsibility for construction and maintenance. The government has also in many cases been and still is involved as owner of the organizations carrying out transport services. In this thesis, however, the *transport infrastructure system*, as a subset of the entire transport system, is the focus while transport services are more or less left out.

Dating back to the time of the modern industrial revolution in the mid-19th century, there has been a long-lasting controversy around the appropriate model for providing and financing transport infrastructure either through market organizations or through the public sector. The nationalization of roads and railroads in Sweden during the 1930-40s, the prevailing government ownership of these systems, and the future challenges of the government's role are among the basic issues studied in this thesis.

1.2 Purpose and objectives

The purpose of the thesis is thus to discuss and analyze the *development of the government's role for the transport infrastructure system* and *the challenges for the future for the government in the system*. An overriding question is: *what kind of organizational change or response from the government to meet the challenges to its current role would give the best prospects for a future dynamic development?* In the thesis, it is argued that such a response must take into account how openings for increased experimentation, innovation and learning in the sector can arise. Customer orientation and a focus on the division of responsibility between different actors in the private and public sector, as well as between actors at different spatial levels, are other important aspects to include in the response to the challenges.

The analysis is partly based on a description of the historical development of the government's role in Sweden's transport infrastructure systems. The analysis is carried out in relation to two major theoretical approaches in economic sciences and organizational research.

On the one hand there is a neoclassical paradigm, including basic assumptions such as rational actors with stable preferences. This paradigm is connected to micro-economic-oriented equilibrium analysis rather than the analysis of dynamism and change. It is also connected to welfare economics and methods such as social cost-benefit analysis. Organizations and their functioning are generally not the main focus in this paradigm, even if applications with this purpose have also been developed.

On the other hand there is an institutional paradigm, including a focus on organizations, the institutional design surrounding these, and the existence and functioning of markets for the provision of systems like roads and railroads. Actors are supposed to be learning over time with changing preferences as learning takes place in contrast to neoclassical theory with its more stable view on preferences. Financing principles and their effects on organizational incentives is one of the studied themes. Transaction costs and their effect on organizational design is another field of interest connected to this paradigm, where the focus is more on dynamism, change, learning, and entrepreneurship than on equilibrium analysis.

The overriding question in both of these paradigms is how coordination of resources in the economy comes about. Lacking coordination, resources are spent and used in ways that could be altered in order to receive additional benefit or gain with the same resources, or similar benefit and gain with less resources used. In this regard, coordination is closer to different concepts defining efficiency, even if efficiency might also be seen as a more static concept than coordination.

Coordination can be reached either through spontaneous actions of independent actors at a de-centralized (dispersed) level in the economy, for example through the price system. Coordination can also come about through some sort of planned action, such as hierarchies/organizations or through government intervention and organization. The balance between these two modes of coordination is at the core of the focus of the thesis.

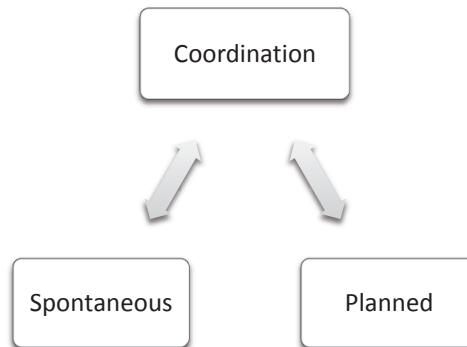


Figure 1

Coordination through spontaneous ordering or planned action

Examples of spontaneous coordination can be found in day-to-day road traffic. The spontaneous coordination of cars that is often seen when transport flows from two or more roads merge could be one example. Driving to the right (or left) is generally regulated in law but

still depends on uncoordinated collaboration and coordination by myriads of drivers in order to work in real life.

Planned coordination in the transport sector comes about, for example, when the Infrastructure Minister calls the actors in the railway market to meetings in the Ministry of Enterprise to decide and coordinate how the coming winter season, and its challenges for railroad traffic, should be met through coordinated action between different actors to keep trains running when snow falls. (This is an actual example of coordination efforts that took place in Sweden during the fall of 2012.) Planned coordination is also practiced in capacity planning for railroads and in investment planning for roads and railroads.

Over time, there have been a number of trade-offs for the practical formation of transport infrastructure policies that have affected the government's role in the system. Many of these are connected to the two theoretical paradigms, generally with a somewhat stronger connection to either one of them. Some of the central trade-offs are presented below in Figure 2, as a suggestion for a possible classification of these in relation to the two theoretical paradigms.

The trade-offs discussed here relate to issues such as the financing of transport infrastructure, planning ideals, and views on information and organizations. Here, the examples of the differences between the two paradigms are described in their theoretical or idealized form. This is to say that modern applications of neoclassical theories also, discuss situations with less than perfect information available for actors in real life situations.

Area	Neoclassics	Institutional
Financing	General tax revenue	Direct link user/provider (e.g., ear-marking)
Planning	Centralized, expert	Decentralized, polycentric
Spatial level	Large scale, centralized	Decentralized, polycentric
Information base	Perfect	Bounded and limited
Organization principle and view	Market failure stance, government intervention, the organization as a production function	Government failure stance, market orientation, dynamic organizational orientation

Figure 2

Some trade-offs in transport infrastructure policy and organization, connected to the theoretical paradigms

An underlying assumption for the analysis in this thesis is that over time the government must adapt to a number of exogenous changes affecting the transport infrastructure systems. These changes affect both the territorial basis for the government's activities and the functional aspects of the road and railroad systems.

The territorial aspect refers to the division of responsibilities between the international, national and regional/local levels. The functional aspect refers to the technological and organizational dimensions of the transport infrastructure systems and how these tend to set the rules of the game when it comes to ownership, financing, responsibility for construction and maintenance, regulation, and inspection/evaluation and so on.

Different organizational alternatives for the provision of roads and railroads are analyzed and discussed based on a view where the efficient use of available resources is the focus. An efficient use of resources can be valued either in terms of a more narrow cost

reduction perspective and/or from a perspective where dynamism is the focus, and other values like political influence, stakeholder influence, and the openness for a deliberative or communicative orientation of the wider planning and management of roads and railroads are also included.

Here, economic and organizational aspects are the primary interests in the analysis rather than aspects such as participatory and communicative processes, however these processes might be organized. This does not imply that these aspects are of lesser value or interest in the analysis here. Markets and spontaneous orderings that are an effect of market processes are, to a large extent, communicative in their character, which makes communication important. However, this aspect is not studied as such in this thesis.

A basic view in the thesis is that the road and railroad systems can be managed in a more efficient way than today, which could be achieved by allowing for experimentation and entrepreneurship to a larger extent than what is currently the case. If the government allows for more flexible organizational forms and is prepared to change the financing principles such a development might be in reach.

This thesis finally aims to provide a theoretically-based analysis of how transport infrastructure systems have been organized and financed over time. The varying models used in Sweden and in other countries for financing and organization, and the different roles governments have taken, will be described in order to show the possible variety of organization and financing of roads and railroads.

1.3 Some delimitations

The focus of this thesis is the road and railroad systems, not primarily the maritime and aviation systems. The government's role in these systems, with an historical development perspective, is a further study object.

As discussed above, the historical development is presented and analyzed against the backdrop of two theoretical paradigms: neoclassical and institutional theory. A framework for the analysis of the historical development is a co-evolutionary approach that will be presented later in the thesis.

This thesis is concerned with the development from the 1930s to the 2010s. Some historical perspectives are drawn further back in time to the 19th century.

1.4 Outline of the thesis

The thesis is organized with this text as a concluding and comprehensive text discussing the themes in focus of the analysis of the government's role in transport infrastructure. This summarizing text is based on five appended papers. The intention of this text in chapter 1-5 is to connect the different findings in the separate articles and present a coherent analysis of the development of the government's role in transport infrastructure. The purpose is that the text will give a good overview of the research project and a summary of the most important findings and aspects of the analysis.

The five papers that provide the empirical basis of this text and analyses of separate issues are:

- The Reluctant Infrastructure Manager, 70 Years of Government Ownership of Transport Infrastructure in Sweden
- The Swedish Government as Owner of Transport Infrastructure. Policy formation from the 1930s to the 2010s

- Pricing Principles, Efficiency Concepts and Incentive Models in Swedish Transport Infrastructure Policy
- Marginal Cost Controversies in Swedish Transport Infrastructure Policy
- Strategic transport infrastructure planning – centralisation or decentralisation?

These papers cover:

- the historical development and background to the government's current role;
- the formation of the government's ownership policy since the 1940s;
- the controversy in Swedish transport policy around pricing policies applied for the use of the transport infrastructure; and
- the dilemmas connected to centralized strategic transport infrastructure planning with a comparison of the US versus EU

The methods used and the theoretical background of the analysis is presented in Chapters 2 and 3. Chapter 2 also includes a presentation of some basic concepts that are used throughout the thesis to describe and analyze transport infrastructure systems.

The main findings in the thesis are presented in Chapter 4. It details the nationalization of roads and railroads, the development of the government's ownership role based on a co-evolutionary perspective, the controversy over the pricing and tax-based principles, and the discussion of the strategic planning issues with an international comparison.

Chapter 5 reflects on the theoretical paradigms in the thesis and on the relationship between planning and coordination: how coordination can be achieved in a spontaneous ordering setting and in a more centralized model is discussed. Other themes discussed include different kinds of coordination and the issue of knowledge as a prerequisite for coordination.

The concluding chapter also summarizes the challenges that the government faces in the future in transport infrastructure. Based on this picture some implications for the future policy formation and the organization and financing of roads and railroads are discussed.

2 METHODOLOGY AND CONCEPTS

2.1 Methods, sources and the research process

Methods and sources

Three different comparisons are made when analyzing the government's role for transport infrastructure and the development of the role over time. These comparisons are: a) over time; b) between different geographical levels and; c) to some extent between different infrastructure sectors. The thesis is based on empirical data gathering from four different sources:

- Reports from government committees and the government's proposals to the Swedish Parliament for decisions to be taken. Also studied were reports from Parliament's different standing committees for transport infrastructure issues.
- Official documents from governments and parliaments in other countries, mainly the US, UK, Germany, Finland, Norway, Denmark, and the EU.
- Reports (academic and other) covering different issues in relation to transport infrastructure from Swedish and foreign public and private institutions and organizations.
- Interviews with senior officials in Sweden's government ministries, from the responsible transport agencies in Sweden and abroad, and with a large number of officials from other countries and the EU.

An extensive number of reports, government bills and proposals, and parliamentary documents have been studied during this project, primarily in the Parliamentary Library in Stockholm. These documents cover the time from the late 1800s to the 2010s. A complete literature list covering these sources is included in the first of the appendend papers, Hassegren (2013 d).

The two main theoretical paradigms introduced earlier, and the other theories described in Chapter 3, have been used as a guide and starting point when sorting the empirical data for the analysis. These theories are also the basis for the co-evolutionary approach described in Chapter 3.

The intertemporal comparison provides a historical perspective primarily on the development of the government's role in the road and railroad sector in Sweden, but also to some degree of the infrastructure system as such. Here, the starting point is the decision processes in the late 1930s and early 1940s when the government nationalized locally- and privately-owned and managed rural roads and railroads. The focus is to clarify which arguments were used and most influential in the nationalization process and whether they are still relevant today. With regard to railroads, these issues have been studied by many. Alvfors (1977), Andersson-Skog (1993), and Ottosson (1997) provide interesting insights into the processes in Sweden and in relation to other countries. Blomkvist (2001) is one of the scholars who has analyzed the growth of the modern road system since the early 20th century.

As a background to the analysis references are also made to earlier time periods. For example, the growth of the railroad system is described with references to the decisions in the mid- and late 19th century by the Swedish government and by its Parliament. Kaiser (1994) is a helpful source for this description.

The development of transport infrastructure systems in Sweden is contrasted by similar processes in other countries and at a supranational or federal level in the EU and the US. Here, both historical and present comparisons are made. Bogart (2009), Chandler (1977, 1990), Clifton et al. (2011) and Millward (2005, 2011) are examples of valuable sources for some of these issues with regard to the US and European developments. Levinson (2002) and Roth (2006) provide valuable insights into many of the issues around private sector engagement in the road sector in the UK and the US.

Another comparison made to some extent is between transport infrastructure and other infrastructure systems such as telecommunication, energy/electricity, the financial sector, and postal services. These sectors have also been dominated by the government as owner or by different regulations. However, during the last 30 years a change in ownership, regulation and geographical scope has altered the organization and development of these sectors in the direction of deregulation and liberalization. The current debate in many countries following the financial crisis has been going in the direction of questioning some of the deregulation decisions taken in more recent decades. Government involvement and regulation is clearly something that shifts over time.

In a recent report, Ottosson and Andersson-Skogh (2013) provided an overview of regulation policies in a broad set of infrastructure sectors in Sweden. This is a good complement to this thesis in many ways. Alexandersson (2010) has described the deregulation of bus and railway sectors in Sweden in the last decades, which gives an interesting parallel to the discussion around the government's role and its policy formation.

The development over time of the road and railroad systems and the government's role is discussed with a basis in a co-evolutionary approach. According to this approach, the development can be interpreted and understood as being influenced by technology, economics/organizational aspects and by politics/socio-culture. The hypothesis is that these factors have influenced the development over time to a varying extent and led the government to have different views with regard to whether to provide transport infrastructure as part of the public or private sector.

The international comparisons of strategic transport infrastructure planning are guided both by economic theory, theory around planning in general, and more specifically urban/spatial planning. The situations faced in different countries while planning for infrastructure and the approaches taken when it comes to financing and ownership of transport infrastructure is analyzed with the use of theories about how coordination can be achieved. The discussion is widened through the application of aspects from classical liberal economic theory and political economy.

The interviews have been carried out with senior officials, politicians and experts/scholars. These have been centered round a number of themes covering the historical development of the government's role over time, the use of cost-benefit analysis and other welfare economics-based methods for prioritization and analysis. The current and future development in the EU and the US transport infrastructure policy and the future challenges of the government's role have been further themes for discussion in these interviews. The interviews are used as a general background to the analysis and descriptions and have not been used for explicit references.

The thesis is mainly based on qualitative data, including areas such as politics, management and organization, including incentives and contractual structures/transaction cost settings in general. In the part of the thesis describing the arguments before the decisions to nationalize roads and railroads were taken, there has been an attempt to structure the arguments according to the co-evolutionary model. This is a part of the work where a more structured use of the data has been applied.

There could of course have been a more explicit use of quantitative analysis in the thesis; however, much of the available data does not easily allow for quantitative analysis. Firstly, there is a general lack of long-term data series covering spending on infrastructure and maintenance in many countries. This is partly due to the traditional vertical integration of infrastructure and transport services in large organizations where separate data on infrastructure as such is not easily available. This is a general obstacle in the railroad sector. Secondly, there is the varying spatial division of responsibility, primarily in the road sector in different countries, which often makes comparisons difficult.

The large number of reorganizations that have taken place in many countries, especially in the railroad sector, also makes comparisons of this type between countries difficult. Comparisons of productivity and cost-efficiency of transport infrastructure systems are published from time to time in both a European and US context. In general, however, conclusions are difficult to draw when the organizational aspects are taken into consideration. Short and Kopp (2005) have made similar observations with regard to cross-country studies throughout the member countries in of the Organization for Economic Co-operation and Development (OECD) in relation to infrastructure planning. A cross-country discussion on the efficiency of transport infrastructure systems can, however, be found in a report from the OECD/International Transport Forum (2008).

In 2009, Merkert published a quantitative analysis that focused on transaction costs in the railroad sector wherein the transaction costs of the British, German and Swedish railroad systems are compared. The conclusion is that transaction costs are measurable but that they seem to be lower than anticipated with reference to the discussion on these topics. This is an ambitious piece of research showing the potential of quantitative approaches. However, it does not take the more general institutional or political settings in the different countries into consideration.

As previously mentioned, Millward and others have presented cross-country studies exemplifying the development of public and private enterprise in different infrastructure sectors, which gives a broad overview of many of the comparative perspectives.

The organizational and institutional aspects of the government's role, which are the focus areas of this thesis, are often difficult to capture in a quantitative analysis, partly since they deal with the qualitative realm to a higher degree than the quantitative. There are, however, a number of possible extensions of the analysis into the quantitative field. The structure for a further analysis of the government's future role in the transport infrastructure sector suggested in Chapter 5 could be a starting point for structuring data in order for such analyses to be carried out.

The historical background and the description of the development over time of transport infrastructure systems and of the government's role in this thesis are described with a basic assumption that there is an objective reality that can be described. Furthermore, this reality (to a necessary degree) can be captured by reading and analyzing the official documents from different time periods.

Whether there is a connection between government decisions and actual measures implemented and carried out can of course be questioned. There are a number of possible difficulties connected to this view as detailed in, for example, public choice theories. One thing is that the government in practice might not actually have supported exactly those aims of transport infrastructure policy stated in the proposals. One reason might be that the government does not reveal its full or final bargaining position in order not to weaken its bargaining position in the early stages of the negotiation process around nationalization with the private railroad corporations in the 1930s.

Moreover, the government agencies might, in line with many studies of the functioning of the public sector, not have wanted to act in line with the government's decisions. This can be seen a number of times throughout the history of Swedish transport infrastructure policy, as the transport agencies seem to have continued following previous transport policy decisions rather than more recent decisions.

The research process

The research project has been divided between PhD courses taken in the areas of planning and decision theory, economic theory, industrial economics, political science/sociology, and institutional theory for the economic and social sciences. Courses have been attended at the KTH Royal Institute of Technology, Stockholm School of Economics, Copenhagen Business School, and Lund University/School of Economics and Management.

An individual reading course covering transport economics, public finance, planning theory, Austrian/liberal economic theory, and a large number of academic articles related to the research area has also been part of the theoretical studies. A major part of the reading has focused on texts discussing the divide between public and private orderings in society and the concepts of government failure and market failure.

As part of the research project papers and reports have been published reflecting on international aspects and comparisons of transport infrastructure systems. A first paper was published as an annex in the report on transport infrastructure co-financing, which was presented by a government committee in 2011 (SOU 2011:49). A report was presented in 2012 and published by the Chamber of Commerce in Stockholm, Sweden (Hasselgren, 2012 a). This report focuses on the historical development of the government's role, current development in a number of countries in the field of financing, and organization of transport infrastructure management. Finally, a number of suggestions for reform of the Swedish transport infrastructure sector were presented.

In April 2011, an article outlining some of the basic concepts of the research project was published in *Ekonomisk Debatt*, the journal of the Swedish Economic Association (*Nationalekonomiska föreningen*) (Hasselgren, 2011 b). In May 2011, at a research conference arranged by Södertörn University College and the Stockholm Institute of Transition Economics, a similar article was presented on privatization and liberalization focusing on network industries and Eastern Europe (Hasselgren, 2012 b).

Another integral part of the research project has been the preparation of a report to the government's Expert Group for Public Economics (ESO) during 2012-2013 (Hasselgren 2013 a). The report was published in June 2013. It covers the historical development of transport infrastructure financing and organization based on the co-evolutionary model, which is also part of this thesis. The ESO report also includes an international overview of current developments in six other countries and at the European Union level.

In parallel to the research project a report focusing the good transportation market and the prospects for increasing efficiency in the transport infrastructure systems supporting these services was studied in a report for the Transport Group (*TransportGruppen*, an umbrella organization for associations and companies in the transportation sector in Sweden). The report was published in June 2013 (Hasselgren, 2013 c).

A number of articles in relation to the research project have also been published in major Swedish newspapers, reflecting on the organization and financing of transport infrastructure systems and the government's role. Furthermore, a number of presentations have been given with regard to the research project in the Ministry of Enterprise's Transport Policy Department, the Swedish Transport Administration, Transport Analysis (the Swedish agency for analysis of transport policy), and at the annual Swedish Transport Research Con-

ference (2011, 2012 and 2013), which is arranged by the Swedish National Road and Transport Research Institute (VTI). Presentations in relation to the research project have also been given in a number of other major Swedish transport-related conferences and seminars, for example the First Swedish National Conference on Transport Research held in 2012.

A review of a recent book discussing different planning ideals by Tore Sager (2012) has been prepared for coming publication. Another review article covers Richard E. Wagner's recent book *Deficits, Debt and Democracy, Wrestling with Tragedy on the Fiscal Commons* (2012). The review was published in *Ekonomisk Debatt* in May 2013 (Hasselgren, 2013 b).

The table below presents in what way the different appended papers and texts in the thesis correspond with the different areas of analysis and study in the research project.

These current chapters 1-5 in the thesis comprise the comprehensive analysis and discussion around the thesis topic, and it is based on the five appended papers. To begin with, these include a text discussing and analyzing the more detailed historical development of the transport infrastructure policy area in Sweden and the development of the government's role (Hasselgren, 2013 d).

A shorter version of this paper was presented at the US Transportation Research Board's Annual Meeting in Washington, D.C. in January 2012 (Hasselgren, 2011 a). A preliminary version of a slightly extended version of this article was presented at a research seminar at the Ratio Institute in Stockholm in February 2012. A revised version of that article was published in the May 2013 edition of the *Scandinavian Journal of Public Administration* (Hasselgren, 2013). The article discusses the decision process around the nationalization of roads and railroads in the 1930-40s and the arguments used in the debate leading to the nationalization. The strength and influence on the development of different arguments is also discussed. The following development of the government's ownership role is analyzed using the co-evolutionary approach, which is presented in Chapter 3 below.

Analyzed issues in the thesis:	Nationalization	Policy development	Financing principles	Future government role
Chapter 1-5	X	X	X	X
Appended papers:				
“The Reluctant Infrastructure Manager – 70 Years of Government Ownership of Transport Infrastructure in Sweden” (Hasselgren, 2013 d)	X	X	X	
“The Swedish Government as Owner of Transport Infrastructure. Policy formation from the 1930s to the 2010s.” (Hasselgren, 2013 e)	X	X	X	
“Pricing Principles Efficiency Concepts and Incentive Models in Swedish Transport Infrastructure Policy” (Hasselgren, 2013 f)		X	X	X
“Marginal Cost Controversies in Swedish Transport Infrastructure Policy” (Hasselgren, 2013 g)		X	X	
“Strategic transport infrastructure planning – centralisation or decentralisation?” (Hasselgren, 2013 h)			X	X

Figure 3

Outline of thesis - appended papers and covered aspects

The discussions and controversies connected to the government's financing principles for transport infrastructure, developed partly in line with a number of articles by Coase (more on these below), are reflected in two articles by Hasselgren (2013 f and g). The articles compare a view of transport infrastructure financing based on a welfare economics perspective with a view based on an institutional or organizational perspective. The former perspective favors marginal cost-based pricing, while the latter favors a perspective where the total costs of the transport system should be covered by fees or taxes. The shift in policies in Sweden regarding these different views are discussed and analyzed.

Earlier versions of the articles were presented in June 2012 at a seminar at the Stockholm Institute for Industrial Economics (IFN). Another presentation was given in August 2012 at Aalborg University, Denmark, at a major Danish transport research conference, Trafikdage 2012, and later at an internal meeting at the European Bank for Reconstruction and Development in London, in December 2012. A revised version of the article is consi-

dered for publication in the peer-reviewed conference documentation from the Aalborg University conference (Hasselgren, 2013 g).

A further revised version of the article has later been presented at the yearly research conference arranged by the Swedish National Road and Transport Research Institute (VTI), Transportforum 2013. Following a peer-review process this article was published by VTI in May 2013 (Hasselgren, 2013 f).

Finally, the article discussing the strategic transport infrastructure planning and development in the EU and the US in relation to the TEN-T system and the Interstate Highways is appended to the thesis, Hasselgren (2013 h). This article was presented at a research seminar at the Ratio Institute in Stockholm in January 2013, and it is currently under consideration for publication in Delft University of Technology's *European Journal of Transport and Infrastructure Research* (EJTIR). This article discusses the need for coordination of resources in the transport infrastructure sector in order to arrive at a situation with good resource utilization and an efficient, or at least pleasing, allocation of resources in the economy.

Based on different theoretical underpinnings, the strategic planning measures in the US and EU in the transport infrastructure area are discussed and reflected on in the article. The balance between public sector and market coordination, as well as between centralized and decentralized public sector planning and coordination, is also discussed.

2.2 Some perspectives on transport infrastructure

The transport system – functions and temporal perspectives

When analyzing the transport infrastructure system it is important to make a clear distinction between:

- the physical transport infrastructure systems, represented by assets, here mainly roads and railroads; and
- the functional use of the transport infrastructure systems for carrying out transports services.

It is of course reasonable to question whether the two concepts can be separated in a meaningful way from an economic point of view. Roads and railroads, as physical assets, have a market value or book value that can be traced back to the cost of construction less depreciation plus the remaining value of reinvestments and maintenance. Without actual transport services being carried out on the physical network, the economic value of roads and railroads is rather the net value of the physical assets such as rail (iron), signaling cables (copper), and sand and rock-filling in road and rail embankments.

Lately, due to high prices of iron and copper, some theft of rails and cables have been reported by the Transport Administration in Sweden, signaling the existence of such a basic residual value. Normally, one could expect the physical assets to have few alternative uses. The market value of the physical assets in a situation without any transport services carried out is therefore generally limited.

Following this reasoning the normal thing could be to expect the infrastructure and transportation would be seen as one combined functional system. This would also be an argument for vertical integration, with both transport operations and infrastructure management in the same organization, such as the way classic railroad corporations in Europe used to be organized and many railroad organizations are still organized.

However, analyzing the transport and transport infrastructure sector we find that the opposite is often the case, that is disintegration. Historical incumbent railroad agencies have been disintegrated in many countries. Airports and harbors are other examples of infrastructure assets that are often organized as separate entities from transport services in the respective sectors.

Electricity networks are also to some extent organized separately from electricity corporations. Networks for telecommunications and data transmission (in a wide meaning) are other examples of separately provided infrastructure systems, as are platforms and infrastructure for securities trading in the financial sector, for example.

Road systems have not been integrated like railroads. This is due to the fact that road systems are open, which makes traffic planning unnecessary, except for in congested areas or in the relatively rare situations when technical standards like bridge capacity constitutes barriers that make planning necessary. For railroads, which is a closed system, capacity planning is crucial for safety and optimization of capacity utility. The need for capacity planning and rationing could be one of the reasons that makes integration between infrastructure and transport services justified.

The business of and risks connected to organizing and managing transport infrastructure systems are often drastically different from those of transport services. While transport infrastructure has a long-term perspective, transport services are generally more short-term oriented and more directly influenced by short-term relative price changes. Every single transport customer and transport can be seen as new in this perspective, while roads and railroads are rather stable systems. The business risks connected to transport infrastructure have more to do with fairly slow changing patterns of travel and transportation demand, connected to the regional development at large.

Over time, there have been numerous examples where it has been possible to implement systems where the users must pay for the use of transport infrastructure systems. There are examples where such systems have been in use for a long time. Toll road financing existed in the 19th century (Levinson, 2002) and railroads also have to a large extent been financed through direct user fees from the outset. The development of technology to enable payments as, GSM-based tolling systems, which has further separated transport services and the transport infrastructure system, has created an argument for transport infrastructure as a separate system more and more realistic and important. This possible separation between infrastructure and transport services, though based on the understanding that there are close connections between the physical and functional system, is one of the backdrops and inspirations of the thesis.

The transport system can also be discussed and managed with a focus on different time perspectives. In the short run the main focus is to manage the current system with as limited resources as possible at any given service level and outreach of the system. Since roads and railroads are primarily managed by government agencies in Sweden the revenue focus in the operations is often limited, which would be a prioritized focus area for a private corporation managing these systems.

In the medium term, allocation of resources for maintenance and reinvestment, which is a major task when it comes to roads and railroads, is the focus. Here, the perspective is often influenced by both allocative and distributive/regional aspects, more so than in the short run. The geographical allocation of scarce resources and whether allocation should follow some regional redistributive policy or focus on adaptation to transport volume is generally one balancing point in these considerations.

In the long term, the development of the road and railroad systems has to do with extensions to the systems, while roads and railroads are less frequently taken out of use. With

this time perspective, and also to some extent in the short and medium term, cost-benefit analysis, a tool based on welfare economics and equilibrium style analysis, is in widespread use. The internal and external effects related to the transport system (both infrastructure and projected transport flows) are estimated and cost measures and revenues, or cost reductions are calculated. The net of these social costs and revenues are compared to the construction cost, discounted to present value, and a net present quote is the outcome of the calculation. Today, this method is the dominating tool to base decisions on allocation of resources for new construction and reinvestment in roads and railroads in most countries.

Functional roles and spatial dimensions

Transport infrastructure systems can be analyzed both from a functional perspective and from a spatial dimension. The functional perspective entails roles such as financing, ownership and regulation, while the spatial dimension represents the different levels of government. There are normally public sector entities at a national, regional and local level in most countries. The division of responsibility between these levels differs according to historical reasons and the degree of centralization in different countries.

Sweden has a mix between a fairly nation state-oriented policy setting, with a long-standing tradition of independent local governments. There is also a formally independent regional level in Sweden. Both the local and regional levels have the right to raise income tax independently from the government, but within financial limits set in specific legislation. Transport infrastructure is divided between the central, regional and local levels in the public administration, though with a relatively large national road system compared to many other countries.

The Swedish government has over time taken on a role that is complex, since it includes both many roles at a horizontal (functional) and vertical (spatial) level. This can be displayed in a schematic figure, see Figure 4.

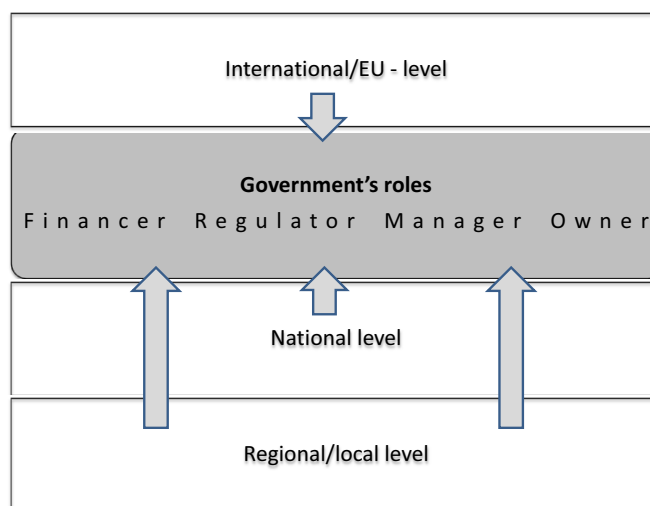


Figure 4

The government's functional roles and the spatial levels of transport infrastructure

The government thus acts as financier, regulator, manager, and owner of the transport infrastructure system. Financing has to do with raising funds for the financing of the systems but also with the amortization or depreciation of the assets' value. Regulation entails both the legal system and setting in general, and when it comes to areas such as competition regulation and transport related legislation and regulation. Management of the system is generally carried out through the transport agencies but can also be organized through the ownership of corporations or public utilities.

Furthermore, the government is active at the international, national and regional/local levels in the system. The government thus is influenced by and must collaborate with actors in a spatial setting where actors at the international, national and regional/local levels have direct access to the government. This collaborative dynamism in the transport infrastructure sector is not a unique situation for the government in Sweden. It could perhaps be argued that the collaboration is particularly dynamic in this sector since the actors at the other levels have such important and independent roles and mandates. Therefore, the government is involved in a vast number of projects and collaborative situations where management skills and decisiveness are important.

The cross-section of functional roles and spatial levels results in a number of possible roles and role conflicts between the different roles and goals at the different levels in the system.

To separate roles that might come into conflict is something that is generally emphasized when good governance practices in the public sector are discussed. A number of reorganization steps have also been taken in that direction in Sweden, where, for example, supervision and inspection have been separated from the operational agencies in the sector. This has taken place in relation to the decision to merge the former Road and Rail Administrations in Sweden in 2009, and the formation of a separate transport regulatory authority, the Transport Agency (Bill 2008/09:31).

Another potential conflict lies in the resource planning and coordinating functions of the government agencies, especially for railroads. As competition has been introduced in the railroad system for both passenger transport and freight transport, a number of new prioritization conflicts become apparent, as the new operators' requests for availability and capacity in the railroad network must be mediated. It is vital that the government, as long as it controls resource planning, treats all operators in a neutral way. Of course, the present situation, where the government owns both the two major rail transport corporations (SJ and Green Cargo) and the Transport Administration, might lead to suspicions from non-government actors that the neutrality of the resource planning is not upheld.

The present situation also makes the government's role complicated with regard to the different levels in the system. The growing importance of transport policy at the EU level makes it necessary for the government to focus more on these issues and to formulate national transport infrastructure strategies. These are necessary both in order to compete with other member states for resources and in order to influence the policy development in the EU in a way that is favorable for Sweden.

Growing powers of regions and local governments in Sweden make the government's presently fairly active role at these levels (via the Swedish Transport Administration) ambiguous, for example when it comes to the government's role in urban regeneration in relation to rail and road projects in cities. Should the government act as a provider of a functional system focusing on the system's internal efficiency, or should wider social aspects be included in the role? A widening of the government's role in these situations has been a dominant theme during the last few decades. A number of related issues, both at the national and supranational levels, are discussed in the theoretical field named "multi-level

governance", see Peters and Pierre (2004).

In these cases the government administrations might become involved as commercial counterparts to local governments and other actors, and as system providers. In many other sectors in Sweden, the government has chosen to leave similar active roles at the regional and local levels in favor of evaluator and supervisor roles. This is true for national general spatial planning and the public education system (excluding universities), which was transferred to the local governments in the 1990s. In other areas the government has recently strived for stronger inspection and evaluation of local government's activities. This could be seen as a sign of the government's reregulation.

Most of the former government-owned public utilities in sectors like energy, telecommunication and transport, of which today a majority have been transformed to corporate structures, also had objectives set by the government for their regional and local operations. Today, these are mostly transformed to corporations where the government does not generally control the day-to-day operations of the businesses but influences some of the services by inspection or regulation. One of the main reasons for this change has been the view that the government should stay out of situations where goal conflicts of this kind might evolve, based on a subsidiarity view also expressed in Sweden's constitution act (*Regeringsformen*) (1974:152). The transport infrastructure system still entails a number of complexities that have been reduced in many other sectors in the economy.

3 THEORETICAL APPROACHES

3.1 Introduction

In this chapter, the theoretical paradigms discussed in the thesis as well as a co-evolutionary approach are described in greater detail. Throughout this thesis project a stationary, or equilibrium-oriented, view has been contrasted against a more dynamic or emergent view on the economy and societal processes. It should be noted that the dichotomy between the neoclassical paradigm and the new institutional paradigm presented earlier is outlined here with the perspectives sketched as ideal types more than representations of the actual current standing in each of the two paradigms, where these to some extent tend to blend in practical applications. It could, be argued that analysis based on neoclassical theory is also open to the existence of less than perfect information and bounded rationality. And equilibrium-oriented analysis is often applicable when organizations, rather than social or welfare economics guided allocation, are the focus of the analysis.

Milgrom and Roberts (1992) and Laffont and Tirole (1993) are examples of scholars who have applied more formal models to organizational and incentive-centered problems. Williamson is a scholar whose analysis, though framed within the institutional paradigm, sometimes comes close to neoclassical style theorizing. In many of Williamson's analyses, economizing behavior in a more stable environment is the basis of the organizational approach and conclusions.

The discussion concerning the two dominating theoretical paradigms in this thesis is to a large extent based on the theoretical discussion in academia at about the same time as many of the studied processes actually took place. The nationalization of roads and railroads during the 1930-40s is an example that is discussed partly in relation to the theoretical discussion at that time. It is also apparent that new economic theories were generated in relation to the introduction and growth of railroads and roads in the late 19th and mid-20th centuries, respectively.

Figure 5 summarizes some of the core elements in relation to the view on goals, organizations, actors, information, and so on in the two paradigms.

Feature	Neoclassical paradigm	Institutional paradigm
Overriding goal	Optimized outcome	Satisfactory outcome
Actors' goals	Individual utility maximizers with given and stable preferences.	Individually maximizing individual goals and learning over time with different preferences as a starting point and result.
Information	Perfect information. Objective	Bounded and limited information. Subjective
Role of prices	Transfers information on the resource use in the economy based on a utility view.	Transfers information on production and transaction costs as a basis for decisions and learning.
Transaction costs	Negligible	Important for understanding how the economy and market functions. Varying over time and between markets.
Organizational view	Non-reflected view or seen as unimportant and/or rational view.	Organizations a tool for handling transaction costs. Critical view on the rationality of organizations.
Government intervention	Rational view. Government intervention as a tool for adjusting market imperfections.	Bounded rationality. Government action problematic either for a rent-seeking behavior, lack of representation, or since markets are seen as better tools for learning and evolution than government organization.

Based on Klein (1998) and Huerta de Soto (2010)

Figure 5

Neoclassical and institutional theories – some features

It is probably right to say, even if tendencies for synthesis are apparent, that one strand of economic theory is leaning towards a neoclassical view, where optimization and formal description in microeconomics mathematical models are more at the forefront. Another strand in economic theory where organizations and a broader set of factors in society (such as the wider institutional framework) are focused more than formal theories and equilibrium analysis is represented by the institutional paradigm.

This divide when discussing the economy and societal processes is described by Wagner (2007) as two realms where people live. Wagner argues that there is often a tendency to overemphasize the welfare economics aspects on the functioning of the economy underestimating the dynamic and emerging aspects of public policy and the government's functioning. According to Wagner, since most people live in multiple and evolving public spheres, such as the market and the public sector, the Pareto efficient stable state analysis found in neoclassical welfare economics would generally not suffice as analytical tool.

The view that intentionality and personal/private aims often affect decision processes, such as in the case of theories of entrepreneurship and innovation, principal/agency theory or in relation to contract/transaction cost theory, is besides the neoclassical/institutional divide an important part of the theoretical approach in this thesis. This self-interested behavior model has been the starting point for many theories around societal processes and individual behavior. In the discussion around the scientific approach, literature such as Her-

nes (2008), which presents a number of views on organizations and change “in a tangled world”, entails a number of helpful sources with regard to the relation between individual actors and organizations. Medema (2009) describes the evolution over time of theories connected to the view on self-interest and its relation to societal interests.

Public-choice theorizing, in accordance with scholars like Buchanan and Tullock (1962), has, been focused on understanding the functioning of political systems based on a view with individually maximizing actors in and outside the political system, as well as in bureaucracies as the core model. Public choice theorizing is one useful tool when analyzing important areas in governments' activities like transport infrastructure. This is true both for discussions around decision-making concerning resource allocation in general and issues related to financing. The balance between fee models and tax-based systems, with or without earmarking specific areas, is one such question that is discussed by Wagner (1991/2011).

Another theoretical area that lies at the heart of this analysis is *planning theory*. For the government to be a better owner and manager of transport infrastructure than lower levels in the public sector or market actors, there must be a belief that sectors like transport infrastructure must be managed and controlled at higher and central levels in the system. For this to be possible there must be enough capacity to collect and make use of information and knowledge about the system, the needs of users, and the appropriate measures to take.

Here, the rationally functioning ideal government model is contrasted against a likewise perhaps idealistic view on the market's ability to achieve spontaneous ordering in many systems. Hayek (1944) provided a classical basis for a critical view on government-led planning in his book *Road to Serfdom*, which has been one inspiration for the view on planning in this thesis. Hayek criticized government planning based on Second World War experiences and with references to Marxist-inspired Soviet Union style planning systems. Schumpeter (1942, 1950) gave a similar concerned picture on the future of the capitalistic system, but with a view that the “march into socialism” (p. 415) was more or less inevitable as a result of the strong driving forces for large-scale production and loss of individual and personal ownership in the centralized structures connected to modern capitalism.

Examples in the same tradition, where a critical classic liberal approach to government intervention is followed, can be found in Pennington (2011) and Klein (2012), both with examples from transport infrastructure and land use planning. Pennington (2004) has also discussed the balance between communicative planning methods, as inspired by Habermas, and market-based systems, exemplifying the pros and cons of the two perspectives with a preference for the market model. A well-developed defense for communicative, or critical planning theory, has been presented recently by Sager (2012). Sager argues that communicative-based planning methods are, without question, superior to the neo-liberal planning view, as he prefers to name market-based models.

Another angle in the literature connected to the neoclassical versus institutional divide is the tradition discussing *the balance between market organization and government intervention*. The broad historical perspectives in the thinking around self-interest and the public interest are outlined by Medema (2009). Medema argues that a discussion on the need to limit the force of self-interest is traceable at least back to the ancient Greek philosophers. The general view, according to Medema, has been that self-interest must be limited in order to achieve a good societal outcome. Only through the thinking of Adam Smith and a number of later scholars has the pursuit of self-interest been seen as consistent with a pleasing overall outcome for society.

More specific discussions directly related to transport infrastructure and government handling of the provision of public goods based on regulation can be found in Coase's articles from the late 1940s (1946, 1947) around the financing principles primarily for roads and railroads and the 1960 article *The Problem of Social Cost*.

The combined message in this literature is that there has been a long-standing discussion on the balance between market and government and the individual interest in relation to the public interest. All of the scholars mentioned above in the liberal tradition strive for an understanding of the effects individuals' limited perception might have on the prospects of planning and government intervention.

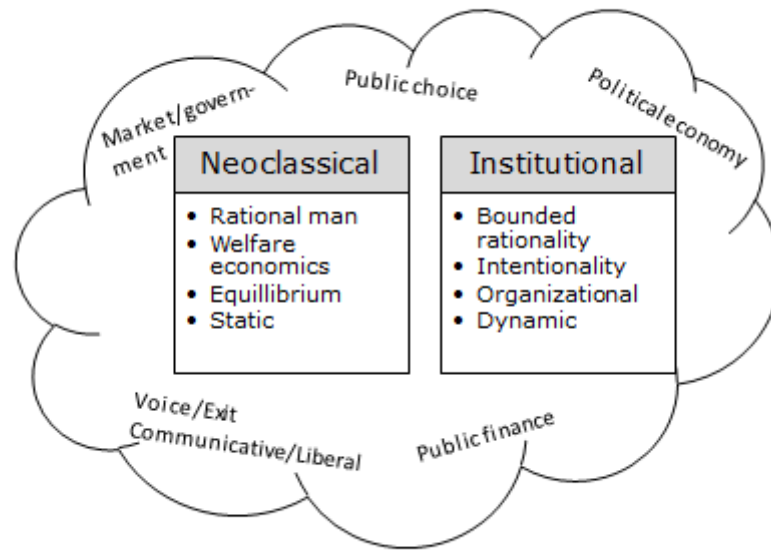


Figure 6

Theoretical approaches – “the core and the cloud”

Another theoretical area of interest is of course *public finance* with its theorizing around fiscal practices of the public sector. Gruber (2011) is a good example from this theoretical field, providing a number of analyses from different sectors. In public finance the view on the government as an entity that has the right, and should, act in order to overcome deficient market practices or outcomes is often contrasted against views where the influence of public intervention should be limited through, for example, claims on the relevance of “Wicksellian” decision rules such as absolute majority voting rules as guides for tax policy (Blankart and Fasten, 2011). The government can within a public finance view either be seen as a unified hierarchical organization that influences the surrounding economy to achieve specified goals or, alternatively, as a process or flow where different interests compete in a polycentric process to attract influence and power over different processes. In this latter form the government is less clear as a distinct actor in the economy (Wagner, 2007).

A summary of the theoretical approaches in the thesis is presented in Figure 6. The two main paradigms at the core and some of the more practical applications of these in transport infrastructure such as financing principles, is presented in Figure 7 below. Throughout this thesis, it is argued that the two paradigms and their applications have influenced the historical development of the government's role and other theories related to them in the

economy. These are more or less eternal questions related to major societal systems and organizations. We will find both of the paradigms and their applications in most sectors and that they still affect the current discussions. And the balancing between the perspectives is part of the management of transport infrastructure systems.

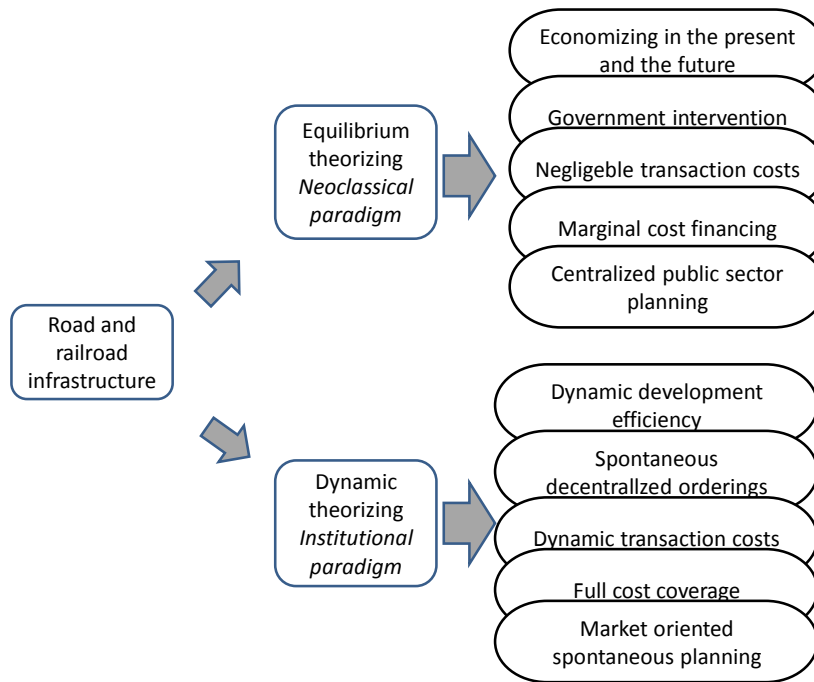


Figure 7

The theoretical paradigms and applications of these in transport infrastructure

3.2 Neoclassical theories and welfare economics

Natural monopoly theory

Transport infrastructure systems represent major physical assets with a considerable value. This makes it vital to consider the efficient use of these assets through good management routines and working processes for the planning, construction, maintenance, and utilization of these assets.

Efficiency measured in this respect concerns the amount of resources used for constructing or maintaining a given asset in the road or railroad system. Higher efficiency is reached when lesser resources are used to deliver any specified asset or service, and vice versa lower efficiency when more resources are necessary in order to achieve the same asset or service.

Among the basic problems discussed in classic economics are how to make the best use of scarce resources and how available resources are allocated to different purposes within the transport system and wider within the economy at large. The way production of fixed

assets or the maintenance of these are organized is not generally the core interest in classical economy. According to this perspective, the organization is often viewed as a simplified production function (Williamson, 2000). An example of such an approach in transportation economics is with McCarthy (2001).

The development of welfare economics with an origin in the neoclassical paradigm, which have been applied in the transport infrastructure to a large extent through the late 19th and 20th centuries, has been described by Ruggles (1949). A number of scholars such as Marshall, Wicksell, Pigou, Hotelling and Lerner contributed to developing a view where consumers' marginal utility connected to different choices of goods and services should be the basis for the analysis of resource allocation in the economy. This also led to the development of a view where government intervention was seen as justified from a theoretical standpoint. Pigou was one of the scholars who developed this view. Hotelling (1938) published a well-known article where this view was applied to transport infrastructure systems, arguing for government intervention and subsidies in order to alleviate market failures.

Part of the same view is that decreasing-cost industries, such as roads and railroads, could be expected to be run as nationalized or regulated monopolies in order to avoid inefficiencies. In these cases only marginal costs should be charged for the use of the products or services. The unfinanced part of the costs, which are not covered by marginal cost pricing based revenues, should, according to the same line of reasoning, primarily be paid for by the government and funded by tax revenues. Blaug (2007) describes the development of this line of reasoning as the starting point of the growth of the view (also named the second welfare theorem), that deficits resulting from marginal cost pricing, in transport infrastructure systems should be covered by lump sum taxes, distorting consumption decisions as little as possible. Following such initial corrections of the distribution of wealth in the economy markets should in principle be left to function according to the ideal market economy model. This view is still today among the cornerstones of neoclassical thinking around transport infrastructure.

Closely connected to the view that only few providers of systems like transport infrastructure are likely to prevail has been the theoretical assertion that transport infrastructure systems can normally be seen as natural monopolies.

Mosca (2008) presents a historical background to the concept and the use of natural monopoly theories. J. S. Mill used the term in 1848, the French economist Walras applied it explicitly to railroad networks in the 1870s, and the late 19th century economist R.T. Ely even named an article by using the phrase "Natural monopolies..." Marshall discussed the same concepts but proposed that they be discussed as indivisible industries rather than natural monopolies.

A more recent and influential application was given by Samuelson in the 1950s. In his 1954 article on the pure theory of public expenditure, Samuelsson divided the economy between goods provided on markets and goods provided by the public sector. This theory was later developed by Buchanan (1968).

The general deficiencies of payment systems opening for free riders have been furthered as support for the idea that there are in fact goods, such as transport infrastructure, that are preferably, and will likely be, provided by the public sector. These ideas have been strengthened by the existence of economies of scale and scope in the systems (implying diminishing marginal costs and positive network effects). All of these factors have according to the same view made the introduction of markets for the provision of transport infrastructure less viable.

The difficulties in introducing fee systems have been part of the motivation for the existence of non-excludability of marginal users in transport infrastructure systems. This is

to say that public goods are difficult or impossible to deliver only to separate or excludable customers. A large proportion of free riders are thus likely in these systems. Another feature is that one user does not necessarily exclude another user from using the road, a phenomenon which has been discussed under the term non-rivalrous. This phenomenon is generally true but less relevant in congested areas such as cities and for railroads, where there is often a conflict around access to the available capacity.

The existence of external effects, which are difficult to price, has been another line of reasoning, arguing for the necessity to treat roads and railroads as something special in the economy, underpinning the natural monopoly view.

Even if the welfare economics view of natural monopolies has been influential and is often reasonable as a metaphor, it can at the same time be argued that natural monopolies are not stable over time and are challenged by technological developments, economics and political changes. This is further discussed in a section below. Technological development represents one of the challenges to the view that natural monopolies exist and for the government's current role in transport infrastructure.

A dichotomy of failure and success

The dichotomy between public and private goods, and possible organizational models for the provision of these goods, are presented in Figure 8 below. Public goods can, according to Samuelson and others, be expected to be provided by a private or public monopoly. Private goods might though be provided either in markets or by the public sector.

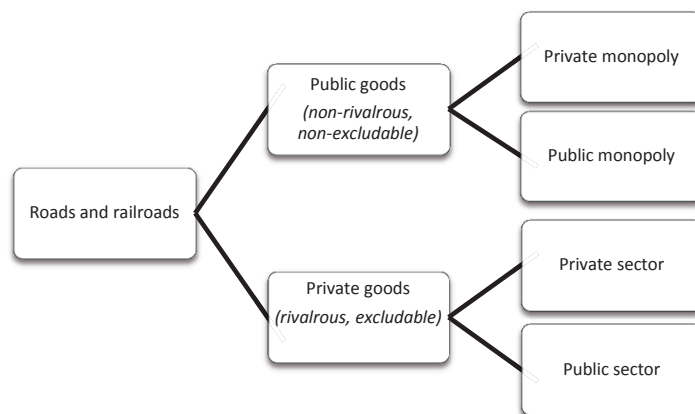


Figure 8

Public and private goods and models for provision of these services and goods

A voluminous discussion has been developed around the (possible) dichotomy between public and private goods, or in parallel the boundaries between government and private sectors of the economy. One objection towards this focus is that the dichotomy has shifted the attention away from concerns about institutional arrangements to concerns of general resource allocation. Furthermore, most empirical investigations show that the boxes in figures such as the one above are almost impossible to fill out without running into difficulties with definitions (Wagner, 2007). This can be seen as an example of a criticism that has focused on the perhaps oversimplified modeling in neoclassical economics with the economy split in

different blocks: market and non-market. In real life there are examples of both the private provision of public goods and public sector provision of private goods, which is exemplified in Figure 8 above.

Connected to both public and private goods provision is the view that failures in relation to the provision of the goods and services might occur. Governments might fail both in the provision of private and public goods. Markets and private firms might in the same way fail when providing private or sometimes public goods.

Neoclassical theory and market failure views

Another aspect of the neoclassical theories is the discussion around what role the government should take and what role the market and individual actors should preferably have. Welfare economics-based theorizing, such as Pigovian arguments, focus on achieving an optimal use of resources in the economy. By applying a yardstick, often Pareto criteria, redistribution of resources can be organized in order to arrive at the optimal outcome. Market failures, however, call for government intervention.

Intervention in order to rectify the spontaneous outcome of market processes can be implemented as regulations of the market to prohibit the use of technology with high emissions, to improve competition, enhance information sharing or through direct price adjustments through taxes, for example. Compensatory payments to groups that have been negatively affected by other parties' actions are a part of these possible government actions. Ruggles (1949) points to the unanimous advice by scholars like Samuelson and Arrow that such compensatory payments should be made "if an economic policy is to be advocated on the basis of the criteria established by the new welfare economics" (p. 39).

Analyzing the more recent transportation economics literature such as McCarthy (2001), it is apparent that the analysis of transportation-related themes based on microeconomics and welfare economics have been further developed along the line of the theories brought forward during the 1930-40s. A number of classical microeconomic aspects on the producing firms in transportation, the demand functions, and markets operating under perfect competition or less than perfect conditions are discussed by McCarthy.

Furthermore, the analytical dilemmas related to government regulation of transportation and infrastructure under different assumptions with regard to the market structure and the cost functions are analyzed. This also includes an analysis of investment decisions and issues such as congestion charging and concepts like first-best and second-best pricing of assets like transport infrastructure. In one chapter in McCarthy's 2001 textbook, the theoretical foundations and preconditions for a pricing and tax structure reflecting marginal costs for road charging, while also fulfilling a full cost financing requirement, is outlined. Under certain conditions such charging, in congested areas and primarily for roads, can cover the full costs of transport infrastructure.

Winston (1991) discusses efficient pricing rules for transport infrastructure investments from a marginal cost-based pricing system, but adds that the government in general should add components to the marginal cost that include social cost elements, to give a correct price signal, for new investment. New capacity should be provided until the marginal benefit equals marginal costs. According to Winston, within such financing urban roads with capacity shortage should also meet the financing requirement. Rural roads would though need additional charges to "attain a balanced highway budget" (p. 120).

A common theme in this tradition since the 1930s, where McCarthy is a good example of theoretical accuracy, is the assumptions generally underpinning neoclassical theoretical work: perfect information, free entry and exit, perfect or constrained competition, and utility maximizing consumers with stable and comparable utility functions among dif-

ferent actors. The producing organizations are primarily seen as cost functions, following the maxims of profit maximization. Government intervention is justified whenever such intervention is seen, from a theoretical basis, to improve social welfare or an efficient resource allocation in the economy. The functioning of the government and the public sector at large with less than perfect information as seen from a principal agent or political economy point of view is generally not reflected on.

Even if there are more dynamic decision problems, such as the choice between capital and labor or the market dynamics between competing transportation modes (also discussed by McCarthy), the more overarching dynamics in markets and the economy around entrepreneurship, innovation and the functioning of the producing organizations are more or less left outside the discussion.

Another example of the neoclassical tradition is Parry and Bento (2001). They discuss the possible allocative efficiencies inherent in a theoretically interesting setting, where revenues from congestion charging could be used by the government in order to reduce taxes on labor. This would more than offset the negative supply effect connected to the introduction of congestion charges and, argues Parry and Bento, increases the efficiency of the user charge by more than 100 percent, while the congestion charge would still be equal to a Pigovian tax. This example also displays a limited interest for the government as a rather complicated actor and different public choice related problems. It comes close to what Coase has named "blackboard economics".

Newbery (1990) discusses congestion charging with the question of whether some kind of earmarking principles should be applied to the revenues from road charges in order to direct them to the "highway budget" (p. 2). Newbery argues that there is no "logical reason" for this, echoing insights from classical public finance theorizing. Earmarking might be a vital aspect in any organizational system in order to raise or achieve efficiency, as will be discussed below. A number of difficulties connected to implementing user charges in a public sector setting are discussed by Wagner (1991/2011) from a classical public choice perspective, where user charges in public sector setting might lead to suboptimal solutions.

Since the qualifications for an efficient equilibrium to result from spontaneous market activity according to the neoclassical model, are difficult to meet, a large number of market failures are likely to be found, as has been exemplified above in the transportation policy literature. This opens for activism from the government's side. Pennington (2011) points to the fact that this view allows for a range of services "from the supply of public parks and lighthouses to the control of industrial pollution" to be "improved through targeted government action" (p. 20). A long history of government interventionism motivated by the believed inferior outcome of individual action and self-interest is also presented by Medema (2009). Beside ancient Greek philosophy and medieval scholasticism, Medema also traces the concern towards self-interest to liberals like Mill and socialists like Marx.

A parallel can also be found in the discussion on the origins of the accuracy of both marginal cost-based pricing and government intervention. The growth of large organizational units, such as those in transport infrastructure, is generally explained by the scale effects based on the introduction of new technology like railroads or capital intensive machinery and production processes. Hayek (1944) and Schumpeter (1942) pointed to this development as an important sign of the development of the capitalist system of the 20th century. Both of these remarks were made close to the time when transport infrastructure assets were about to be nationalized in many countries in Europe.

While Schumpeter described the growth of organizational size as a more or less inevitable process where nothing outside the "big concerns" (p. 142) will prevail, Hayek, however, discussed the growth of large-scale organizational units as a result of deliberate

government action. Governments had participated in either shaping large units of organization through trade tariffs (US) or protected the spontaneous cartels that private market actors had formed (Germany) (pp. 92-93). Thus, governments, by fostering larger organizational units in the economy, can be seen as underscoring the perceived need for more activist government policies, including marginal cost pricing. More on this in Chapter 5.

3.3 Institutional theory and organizational focus

If neoclassical theory as applied to transport infrastructure focuses on finding optimal use of available resources and is open to government intervention in order to correct or improve the outcome of the market, institutional theory is more focused on the balance between market settings and organizations or hierarchies as a means of delivering and managing resources, taking into account transaction costs. The focus is, compared to neoclassics, to a higher extent set on development and dynamic processes, where organizational learning and the role of spontaneous activity in the economy is at the forefront. Emergent processes and learning are other concepts that are discussed in relation to this more dynamic approach. Nelson and Winter (1982) are among scholars who have introduced such evolutionary elements into theories around organization and learning. Some of the major contributions to a dynamic or evolutionary orientation of economics also came from scholars like Schumpeter, who introduced the creative destruction view but also theories of growth and business cycles during the early 20th century.

Zappia (2001) describes the major efforts during the 1920-40s by scholars like Lindahl and Hayek to understand and describe how neoclassical equilibrium analysis could be connected to dynamism and change. Zappia argues that Lindahl focused on how expectations are changed during development processes, while Hayek was more concerned with actors' behavior in different institutional settings, but also in a dynamic perspective. This might be seen as examples where the focus is set either on the individual actors, dynamic adaptation to change or alternatively on the institutional environment as such. Keeping his interest for dynamism and change in the economy, Hayek (1984) presented a view on economics and the economic system as ever-changing and dynamic, rather than stable and in equilibrium.

North (1990) and Ostrom (2005) have analyzed institutional development and factors influencing institutional growth in an historical perspective, and with regard to spontaneous decentralized orderings. A focus on values like ethics and moral sentiments as explanatory factors behind successful growth periods, rather than on formal institutions, is a central feature in some of the works of McCloskey. In her recent book *Bourgeois Dignity: Why Economics Can't Explain the Modern World* (2010), the tendency for a majority of the bourgeoisie to encompass values like the search for new knowledge and the creative destructive power of that knowledge in transforming societies is brought to the forefront in understanding change and growth.

This latter view might be seen as pointing in the direction of different layers or aspects of factors that explain growth and change in societies. A model where different such levels of societal systems and their connection are displayed has been discussed by Williamson (2000). Four levels are included in the model presented by Williamson. These range from: (1) slowly changing cultural factors like customs and tradition; (2) the institutional environment, with judicial systems like property rights; (3) governance; and (4) most rapidly changing, resource allocation dilemmas facing most organizations, such as pricing and incentives. The model also entails interrelated loops between the different levels, pointing at the dynamism of the institutional perspective.

Institutional theory and its application in the transport policy sector have been discussed by Rietveld and Stough (2007). They point to the importance of property rights for the spread of road systems financed with tolling. Transaction costs connected to borders can explain why cross-border trade has been smaller in size than otherwise could have been expected. The size of trade and lack of economic integration between Sweden and Denmark in the Öresund region, as an example, have been discussed in these terms.

For the future, Rietveld and Stough single out institutional settings that support a development in line with claims for sustainability, the further regulatory reform to strengthen institutions that support efficiency, and the prospect for successful Public Private Partnerships (PPP) projects as important. Rietveld (2012) has also later commented on cross-border aspects of transport from an institutional perspective.

Transaction cost theory is part of Williamson's model and an area that has been developed for analyzing the boundaries of organizations and the balance between markets and organizations/hierarchies. These theories can be applied to the transport infrastructure area to deepen the understanding of how and why different organization models are chosen. One such attempt has been presented by Hasselgren (2011 b), while Mokyr (1990) discusses the importance of technological creativity and change in a development perspective.

One of the themes in institutional theory has been the existence of transaction costs representing friction in the economic system, which can explain how and why different organizational solutions are chosen. Transactions costs can be analyzed in the short run as being stable, while in the long run are more flexible and dynamic. As mentioned above, Merkert (2009) presented a major analytical application of transaction cost theory to the railroad sector.

Stable and dynamic transaction costs

For one of the purposes in this thesis, which is to discuss the balance between public and private sector provisions of transport infrastructure systems, transaction cost theory is one possible analytical tool. The transaction cost approach was introduced by Coase (1937) and developed by Williamson (1981). The original theories, which were developed for private sector organizations, have later been adopted for public sector organizations by Williamson (1999) and further by Ruiter (2005).

The basic characteristics of transactions in Williamson's presentation are the asset specificity, uncertainty and frequency of transactions. In relation to public sector services, Williamson also introduced the attribute probity, which stands for the specific soft values of loyalty and rectitude common in some public sector services. The characteristics of specific transactions can, according to Williamson, explain whether a complete contract can be made up and markets will prevail, or whether incomplete contracts will be the general situation and hierarchies, here possibly as part of the public sector, are more efficient.

In circumstances when expected efficiencies of scale and scope, together with the incentives for more effective resource utilization originating from private ownership as compared to public sector ownership, override deficiencies of private sector provision, the private sector/market model should be applied. This can be adjusted, according to Williamson, if the reasons for public sector provision are strong enough. Risks of poor quality and high costs related to the administration of private monopolies, as one of the major deficiencies connected to private sector provision, naturally have to be considered in this discussion.

Aspect	Hierarchy	Market
Asset specificity	High	Low
Uncertainty	High	Low
Frequency	Few	Many
Probity	Important	Less important

Source: Williamson 1981, 1999

Figure 9

Transaction costs and cases for hierarchy or market organization

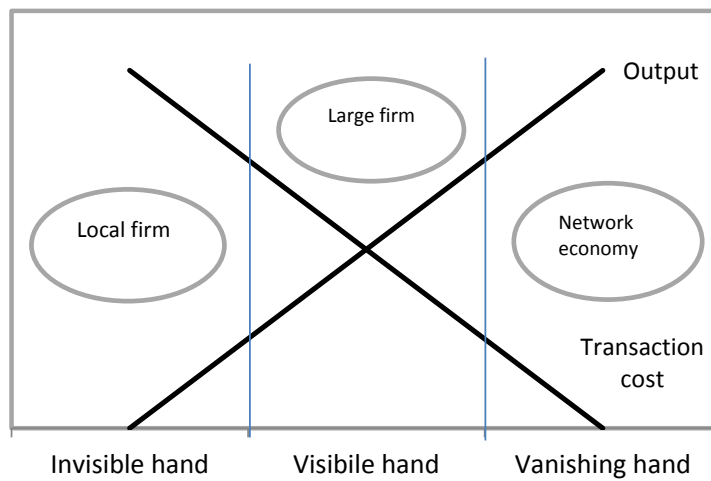
Figure 9 indicates that a number of the factors in the transport infrastructure sector seem to call for some kind of hierarchical solution to the organization of the systems. Assets in road and railroad systems are rather specific, there is generally a high degree of uncertainty around the construction and actual use of any single road or railroad section as it is completed. Road and railroad projects are often rather unique, which is why the learning related to construction and management can generally be expected to come closer to the “few” rather than the “many” characters in the figure. Furthermore, this calls for hierarchy rather than for market solutions. Though not clearly pointing in the direction of public sector responsibility.

The last of the aspects in Figure 9, probity, might be the one that most clearly speaks in favor of market solutions. Neither in the construction or management phases of transport infrastructure systems might probity be seen as an important value, which should speak in favor of hierarchy and public sector involvement. This is one of the aspects that does not speak in favor of necessary government intervention in transport infrastructure systems.

A more dynamic view on transaction costs has been forwarded by Langlois. An application of this view has been discussed by Langlois (2003), where diminishing transaction costs, in network industries, as studied by Chandler (1977, 1990) when it comes to railroads in the US railroad sector, are discussed in relation to the total output and thus wealth in an economy. As the total income level increases and transaction costs generally fall, the room for, or need for, managerial structures and hierarchical structures might diminish.

What interests Langlois (1992) is the process by which short-run transaction costs turn into long-run variable costs and the factors that explain this process. Langlois emphasizes learning that makes transactions cost to diminish. This learning occurs through the repeated transactions and evolution of norms of reciprocity and cooperation. The way the short- and long-run are connected is through the capabilities of the firm, which in turn is made up of skills, organization and technology. Here, Langlois quotes Nelson and Winter (1982). On the one hand firms are seen as pools of resources, and on the other hand the importance of routines is the focus.

In the long run, as transaction costs diminish, Langlois also argues that governance costs diminish, when relationships turn more and more routine-based. This would speak in favor of market solutions rather than hierarchies in the long run, since capabilities of the firm should be expected to diffuse into the market.



Source: Based on Langlois (2003), adjusted

Figure 10

Three eras of managerial practices over time

This might imply a view wherein economies develop from pre-industrial invisible hand settings through industrialization's managerialist visible hand settings to post-industrialized vanishing hand settings. This third era would then represent a situation where transaction costs have become small in absolute terms and part of total output or wealth, which is also a parallel to the results in Merkert's (2009) analysis of transaction costs in a number of railroad organizations in different countries. This might be why organization/hierarchy or management is no longer a crucial aspect of production systems. In this respect the post-industrialization era's tendency for network-based production systems would call for less hierarchical systems and organizations. It could perhaps be argued that large-scale industries represent an earlier era in the industrial development, the value of which might be reduced in the future, while small-scale and network style systems might become more important.

Hybrid organizations – the middle way?

Ruiter (2005) introduces hybrid forms between market and hierarchy to analyze transaction costs in public sector settings, which seems appropriate to bring into the discussion. In one step of his analysis, Ruiter defines three different modes for the organization of public sector governance:

- Full privatization
- Regulation
- Public agency

Out of the three models, the hybrid model with private actors, that supply goods and services to the public sector according to contracts, combined with public sector functions in regulation and supervision is an example of a deregulative step taken in many other sectors (e.g., telecommunication). Since the government reasonably still will have important roles as regulator and financier it seems less realistic to arrive at a situation where transport

infrastructure could be provided solely on markets with full privatization. Public Private Partnerships (PPP) in this respect might also represent one possible middle way between government and the market.

Even if new financing and a new organizational setting called for a new organizational set-up, the arguments in favor of large-scale organizations, which will allow for efficiencies of scale and scope, are still strong. A large-scale organization often leads to monopolistic tendencies, which makes regulation defensible in order to avoid monopolistic behavior. Perhaps the suggestion Langlois seems to make, in combination with Ruiter's assertion, points to possible future organizational models with fewer vertically integrated structures as transaction costs seem to be relatively less important. Public/private cooperation and smaller size rather than larger might be a way forward, if these theories should be followed.

3.4 A co-evolutionary development approach

The discussion and analysis in this thesis is concerned with the long-term development of the government's role for the transport infrastructure system. An analysis is facilitated if it is guided by a theoretical approach that allows for understanding change over time and where a number of factors that influence the development are included. Since one focus area in this thesis is to explain and understand the balance between government and market provision of roads and railroads over time, this aspect is included in the approach as the outcome at every time during the development. Over time, transport infrastructure systems have been and are still organized in the private or in the public sector.

The co-evolutionary perspective discussed here is related to a dynamic view on organizations. In this way the co-evolutionary perspective is connected to institutional theory. The evolution, even if not in biological terms, of organizations and firms over time is of course interesting to a broad historical overview and analysis like the one in this thesis.

A number of theories have been put forward to capture the evolution of societal systems such as transport infrastructure, where technology, economics and institutions like political systems interact to shape the development. These factors are important in shaping institutional environments. The basic evolutionary concept goes back to discussions based in ecology in the 1960s, according to Berg and Stagl (2003). A central point in this view is that co-evolution has to do with the interaction between different kinds of systems/institutions. Nelson and Winter (1982) has provided an evolutionary perspective on economic change, which, as described earlier, is based on a dynamic view on the development of routines over time. Routines in specific organizations or firms determine, according to this view, what a firm does as a function of external variables and internal variables. Here is another example of a co-evolutionary view.

Kaijser (2004) points to interesting aspects of the development of infrasystems, specifying them as socio-technical. Kaijser thus considers the institutional frameworks and the system culture, as well as technology. This reflects a co-evolutionary stance with regard to development over time.

Following North's (1990) view on institutional change, both the organizations and the single actors or entrepreneurs in the organizations are active in shaping institutional change. North thereby focuses on the entrepreneur as an important agent in the development and change over time. Institutions, such as the economic and political systems, set the frameworks for the functioning and change of organizations and evolution of institutions. Important factors in this respect are the incentive systems and the transaction costs that are connected to different relations in organizations. Relative prices (and changes of relative prices) on markets are seen as driving forces for change, while change is seen to be conti-

nuous and incremental rather than revolutionary.

Tunzelmann (2003) connects technological change (or creation) with evolution of governance forms in organizations. This is described as a co-evolutionary relation that is facilitated by relationships between technology and governance in the form of institutions, power relations, incentives, and knowledge bases. Tunzelmann argues that his model can be used to bring a deeper understanding of how market failures and/or government failures are related to the interdependencies of governance systems and technology.

Transaction costs in different settings are discussed by North as an important factor to understand and explain institutional change. Transaction cost theory has been criticized from a number of angles, Leflavie (1996), is one example, to be too static, and not taking learning, agency or power structures into account.

Here, Langlois (1992), as discussed above, offers a line of thinking that aims to adapt transaction cost theories with dynamism and evolution. The development of large corporations and industrial segments over time has been described and analyzed by Chandler (1992), who argues that evolutionary theory with its interest for organizational learning and the development of capabilities explain (better than transaction cost theory) how successful corporations and structures evolve. Chandler thereby emphasizes the importance of good management exemplified by knowledge, experience and organizational design. Chandler also argues that such good management is at the core of the possibilities to reap efficiencies of scale and scope such as in large infrastructure systems, and why an evolutionary perspective is central.

A number of scholars have discussed the growth of public enterprises and public utilities, and the balance between public sector activities and private sector alternatives in Western countries. Many of these have been studying transport infrastructure systems. A broad exposé over the growth of public and private enterprise in Europe has been provided by Millward (2005), showing a large variety of development patterns in different countries, but over time within in a framework of gradual shifts between public and private ownership and management. Reasons for the choice of different organizational models and ownership in these sectors have been discussed by Clifton et al. (2011), who focused on regulation and deregulation patterns with regard to public utilities between 1830 and 2010, and by Millward (2011).

Bogart (2009) has analyzed railroad nationalization in a large number of countries focusing on reasons for nationalization but also differentiating countries according to legal traditions, for example. Andersson-Skogh (1993) and Ottosson (1997) are working with a similar institutional model when discussing the organization of railroads in Sweden.

In these latter examples, development is analyzed as dependent on economic factors such as natural monopoly tendencies, but also on political aspirations such as regional policy and distributive policies in general to be pursued through the management and ownership or regulation of utilities, for example. Bogart and Clifton et al. also point to the importance of military considerations for the governments' decisions on these matters. Here, the access to communication and other infrastructure systems was seen as crucial for the nation state to function. Millward on the other hand puts more emphasis on the promotion of social and political unification in general as an explanation of the public sector interest in these sectors. At the same time, Millward downplays the importance of traditional economic arguments based on natural monopoly argumentation.

Based on the views presented above, an approach has been compiled and is presented below in Figure 11, which includes the different factors influencing the development of transport infrastructure systems, a continuous evolution process and the balance over time between private sector provision and public sector involvement.

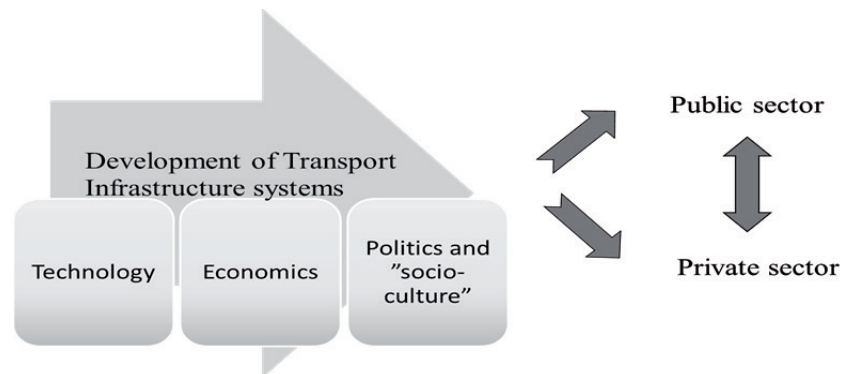


Figure 11

Development of transport infrastructure systems – a co-evolutionary approach

If the government decides to organize the system as part of the government sector it has, in line with Chandler's argumentation, a role to set the organization in a way that gives the best possible prerequisites for coordination and efficiency. If private sector provision is favored a proper institutional setting for promoting efficiency by market actors must be set up and fostered by the government. The government's choice between market and hierarchy will be made in an environment where technology, the prevailing transaction costs, the development of the market, and political factors play important roles.

It can of course be discussed whether transport infrastructure systems have been developed in a linear successive process, as suggested in Figure 11 above. A stepwise approach, with equilibriums that are punctuated, and subsequent moves to new phases seems to be a more accurate description of the development. The introduction of new technology such as railroad and cars represents two such development steps. The straight arrow in the figure might represent a continuous drive for evolution of the transport infrastructure system over time, and is therefore used for illustrative purposes here.

Technology, economics (here in a broad sense including a number of financial and organizational aspects), and politics are three important factors influencing the development, but not necessarily as distinct as they are depicted in the illustration. It is probably more accurate to see these factors as blurred and interdependent rather than separate and distinct. A classic take on similar issues is of course the Marxian view that the technologies shape the economic and organizational settings, which in turn has a relationship with and frames the functioning of the political system. Harvey (1989) discusses urban growth in the Western world economies based on Marxist theory, and discusses infrastructure development as one of the capital accumulation processes in such a view.

The different factors in the co-evolutionary model cover the following aspects:

Technology covers the physical networks of roads and railroads but also the rolling stock (trains) and vehicles, the technological evolution of which has often changed competitive relations between transport modes. Another important example in this category is traffic management systems: either manual or IT-based. Lately, Intelligent Transport Systems (ITS) technology, by which IT is used in order to improve traffic management in congested cities, has been developing as an area drawing a lot of attention, which could be seen as part of the technology factor.

Economics covers the organizational settings as such, but also economic phenomena and theoretical aspects on economic problems such as scale effects, competition, transaction costs, and the different views on pricing policies based on marginal cost versus full cost coverage.

Politics and socio-culture cover questions such as the balance between markets versus government intervention, the influence of other policy areas such as regional policy in the transport infrastructure area, and questions such as the view over time on economic equality and power distribution between local, regional, national, and international organizational levels.

Over time there has been interplay between the private sector actors, for example construction companies and technology providers such as Ericsson and Asea (Swedish forerunner of ABB), and the government agencies. This is represented by the interconnecting arrow between private and public sector alternatives in Figure 11. Kaijser (1994) discusses this interplay as a sign of a "Swedish model" for the provision of infrastructure systems in Sweden. This includes that the government sets up an agency that is responsible for the national infrastructure assets, while responsibility for regional and local networks are given to local governments and private sector actors. An informal cooperation between the actors and the lack of government supervisory agencies overseeing the different subsectors are additional aspects of this view on infrastructure systems.

Ottosson (1997) discusses Sweden's choice of a railroad organization as a midpoint between the centrist Prussian model and the more market leaning British organization model. Furthermore, this seems to be an example of a Swedish model between more single-sided market or government cases.

There is also an interest for the development of different governance forms between public and private sectors in literature discussing multilevel governance (Peters and Pierre, 2004). Osborne (2009) discusses the introduction of new management and collaborative regimes in the relationship between the public and private sector. The use of PPPs are among the issues raised by Osborne in this respect.

4 MAIN FINDINGS

In this chapter the main findings in the research project are reported. The chapter's sections present results related to the use of the traditional arguments for government intervention in the transport infrastructure systems, the main findings of the argumentation around the nationalization of roads and railroads during the 1930-40s, and the discussion around the formation of the government's ownership role from the 1940s to the 2010s. The controversy connected to different views on the financing principles and how these can be interpreted is dealt with next, while questions related to strategic transport infrastructure planning is the theme in the fourth section of the chapter.

4.1 The traditional arguments for government intervention and the challenges to these arguments

Transport infrastructure systems of different kinds have more or less always been an interest of governments. In Sweden, the government's interest in these systems has a long tradition from medieval times to the development of postal services in the 17th century and up to the modern industrial era, when transport volumes started to grow and technology made transportation cheaper and faster. The long tradition of government regulations around the construction and maintenance of roads are exemplified through the inclusion of these in the very first legal texts from the 13th and 14th centuries in Sweden (Bulletinen, 2012).

The industrial revolution increased the demand for transport infrastructure. Starting in the earliest industrialized country, Britain, and quickly spreading around the Western world new transport infrastructure was developed. Three phases in the development of transport infrastructure can generally be identified in most countries, according to Millward (2005, 2011). The first is the entrepreneurial phase where private corporations are active in shaping the first systems. Governments started to become more interested in the systems as they grew into large financial and influential systems with network effects that were vital to government control. Theories on whether governments should intervene in order to regulate both the provision of transport services and the price level were developed during the 19th century, as mentioned above. These theories have had a persistent influence on the views around transport infrastructure development, financing, regulation, and ownership.

A wave of nationalizations during the mid-1900s marked the next major phase in the development of transport infrastructure, according to Millward. Railroads and roads on the national level were brought under government ownership in many countries, partly as a response to the lack of profitability of railroads and a perceived need to economize in order to reap large-scale effects in the systems.

The third phase in this development came in the 1980s when a general deregulation and liberalization took place in many countries. This primarily included liberalization and market openings in transportation, while the organization and regulation of transport infrastructure was more stable. In some countries, and Sweden is a good example, a separation of the railroad system into infrastructure and transportation services was implemented, which was the start of further deregulation. EU policies in the transport policy area have also supported the further process of strengthening reform and deregulation in the sector. Only recently has there been a tendency for weakening momentum in these policies, as exemplified by Johnson and Turner (2007). Whether the sustained financial crisis in many countries in the EU will bring further or less EU-led coordination is still to be seen.

In economics literature there has been a discussion around transport infrastructure systems more closely based on the division of services and goods in an economy in the cate-

gories of public and private goods, as discussed earlier.

The prevailing strengthened role of the government in the transport infrastructure sector can also be discussed as an example of path dependency, which can be interpreted both in a broader and in a more narrow form, as suggested by Pierson (2000). The broader form views causality between present and earlier stages as fundamental. In contrast, the narrower view is more based on the presence of sunk costs, meaning that as a development starts it is costly to change to another development path or technology. The fact that government ownership of transport infrastructure has been essentially unchallenged might in this light be understood both as a consequence of the influence of economic and political arguments favoring prevailing government engagement and as an effect of the substantial investment necessary for any organization to challenge the government with competing systems.

Other reasons for the government to take on a more active role in the transport infrastructure sector have been a political interest in influencing regional development, distributional effects in general, and the government's interest to control land use and rights of way in connection to transport infrastructure planning and construction.

There has also been a view in political discussions that regional development and regional growth has been positively connected to transport infrastructure systems, and that transport infrastructure policy can be used as an efficient means of reaching the fulfillment of regional policy and growth objectives. An early example of this view is the doctoral thesis by Heckscher (1907), analyzing the importance of railroad construction in Sweden in the the 19th century for regional growth.

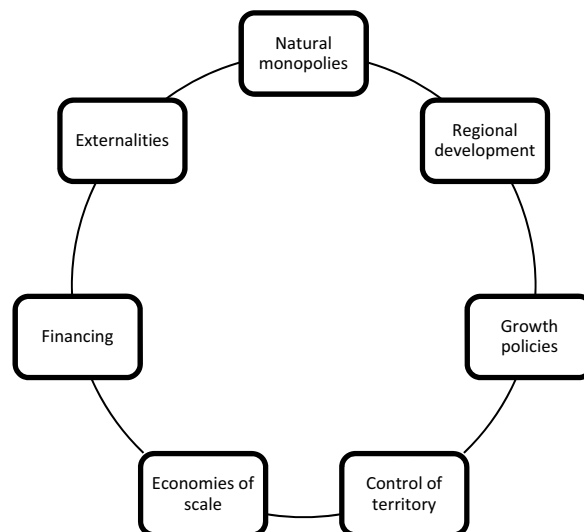


Figure 12

The traditional arguments for government intervention in transport infrastructure

In addition to this, governments have generally had an interest in controlling the territory (physically) via the transport systems, as a necessary means for the core functions of the government (police, defense, tax collection, education) to be carried out. These broad policy reasons for government intervention have often been included in the natural monopoly arguments without clear distinctions between the different arguments. A similar description

of arguments in favor of government intervention in many industries with parallel features has been presented by Bogart (2009) and Clifton et al. (2011), which has been discussed above. Clifton et al. have pointed to economic, military, redistributional, and social motivations for government intervention in the systems. Some of the arguments that are often raised in this discussion, arguments which have over time often been intertwined without clear separation, are depicted in Figure 12 above. The varying importance and strength of these arguments over time in forming the Swedish government's policies around transport infrastructure has been discussed by Hasselgren (2013 e).

Today, many of these arguments for national government intervention seem to be less relevant in the arguments for sustained government ownership and the financing of transport infrastructure. The possibility to introduce road and railroad pricing based on new payment technology solutions have made it less necessary to lean on taxation of fuel as the main source of funding of roads. On the one hand, this is a threat to the government's revenues from road related taxes; however, on the other hand it is a possibility. For railroads specifically, more developed charging for different users (operators) of the railroads can be introduced. There is also a possibility to add cost-based elements to the prices, whereby proxies for external cost effects of transport systems can be included in the pricing system. New technology has made the introduction of market structures in the transport infrastructure sector and the financing of private corporations in transport infrastructure more likely than before. This also weakens one of the core traditional arguments in favor of government intervention in the area.

Klein (2012) discusses technological change and its effects on government intervention such as measures used for the alleviation of the effects of natural monopolies. Klein focuses on the fact that technological development could weaken arguments for government intervention, as technology makes payment systems for roads possible to implement. Yet, it could be argued that technological development allows for increased government regulation and intervention. The government will simply be in a position to control and regulate more aspects of the economy as information collection and more effective control measures are developed. Klein suggests that technological change will also likely make the economy more complex. An example could be the development of Information Technology (IT), which has enabled the cheaper collection of information but at the same time made society and the economy more complex. The knowledge frontier seems to be a target that is moving all the time. Even if technology is improving there might, therefore, be good reasons to question the viability of government intervention.

The changing distribution of decision rights and competence between different spatial levels in most countries, with tendencies for strengthening local and regional levels, combined with more ambitious coordination at the international level in the EU has also challenged the government's role as infrastructure provider. Scale effects are of course still important in the sector, but it is perhaps more likely to find them now at the international level and perhaps also at the regional and local level than before. This development speaks in favor of a future challenge of the national level and the government.

It can of course also be discussed whether transport infrastructure policy is an efficient means of furthering regional policy and regional growth objectives. For example, is there anything other than (or wider than) time saving and quality improvement effects that could be connected to new investments in infrastructure and upgrading of the existing infrastructure through reinvestment? Growth and positive regional growth effects in relation to new infrastructure might also be more a case of redistribution between different locations than pure net growth effects. This has in fact been one of the criticisms towards local taxes such as local VAT tax, which is a means of financing transport infrastructure in

those countries where such measures are used. The counter-argument towards these new financing methods is that they tend to lead to limited net tax revenue since they primarily cover redistribution of economic activity in connection to infrastructure investments.

One aspect of the decreased strength of the arguments for prolonged government intervention is the decline of the center periphery model as a road map for the organization of institutions and the functioning of the state. This discussion was already raised in the 1970s by Schön (1971). There are more frequent threats to the traditional roles and settings of the central government and the regional and local parts of systems, which necessitates new governance practices in a number of areas of business life and in the public sector. This seems to echo Langlois's previously discussed third era with vanishing hands and network-style economies, but this is also a theme in relation to multi-level governance theorizing, more on this below.

Schön discussed the role of infrastructure as a means for the stable state to function in order to transport goods and people, but also for information flows to work. To control infrastructure was thus part of the (central) stable state's strategy to remain in power in the late 19th and early 20th centuries. However, since the late 20th century new information and communication channels were seen as threats to the stable state. The old systems might have become obsolete and the need for investments in the old physical systems might become too strong of a burden for the state.

Consequently, many of the traditional arguments in favor of government intervention seem to be questioned today. Whether this exemplifies a stronger challenge to the government's role than at many times before, or is primarily another example of a challenge that will be met by the government adjusting its role to the new situation, is still to be seen.

4.2 Transport infrastructure chronology 1939-2010, a co-evolutionary perspective

The article appended to this thesis discussing the policy formation and the government's ownership of roads and railroads since the late 1930s (Hasselgren, 2013 e) exemplifies that the co-evolutionary approach works as a basis for the analysis and further understanding of the development of the government's role as owner of roads and railroads up to the 2010s. The main findings in the article are summarized in Figure 13.

The shifting influence over time of the different factors (technology, economics and politics) on the government's role and its policy formation is presented in Figure 13. It is argued that there has been a long-term shift from a stronger influence from technology and economics towards a policy mix with more obvious and broader influences from economics and politics. Only over the last two decades have some measures to allow other organizational forms than government ownership in transport infrastructure been discussed and partly implemented.

The historical overview in the appended article covering these issues also shows that there have been only a few examples where the organization and management of transport infrastructure as part of the government sector have been put into question. There seems to have been a consensus in the political system, and also among most of the business associations (confederations, chambers of commerce, motor vehicle organizations) commenting on the proposals from the numerous government committees presented over time, that the nationalized system more or less functioned well. One of the main questions has instead been how to provide the system with additional financing and how to make the best use of the available resources in the systems, thus echoing a resource allocative stance, rather than a dynamic view.

Role of factor in the development	1939-1963	1963-1988	1989-2010
Technology (roads and railroads, rolling stock, vehicles, traffic management systems)	Strong influence	Widened use of existing technology	Growing Importance, ITS and new technology for low emission vehicles
Economics (organizational setting, scale effects, competition, transaction costs, pricing policies, marginal cost vs. full cost coverage)	Strong influence Cost responsibility and competition	Strong influence Growth of welfare economics	Strong influence Welfare economics
Politics (markets vs. government intervention, influence of other policy areas, view on distribution, local, regional, national or international)	No ideological push behind nationalization	Growing importance and broader political agenda	Strong influence Sustainability and deliberative processes
Public sector vs. Private sector	The government-managed market economy	Competition between transport modes	Preserved government ownership with some opening for alternative financing and privatization

Source: Hasselgren (2013 e)

Figure 13

Transport infrastructure chronology 1939-2010, a co-evolutionary perspective

Through adjusting its ownership role and policy content over time the government seems to have successfully accommodated the different influences from technology, economics and politics/socio-culture without opening a discussion concerning the ownership of transport infrastructure. On a number of occasions, proposals have been put forward by the political opposition or by government committees to expand the investment plans, mainly for roads, through the introduction of tolls or other forms of alternative financing. These proposals have, however, not led to any decisions in this direction, nor have they altered the government's role in any more obvious respect.

4.2.1 1939-1963

The nationalization

Turning back to the 1930s and the processes around the nationalization of the rural public roads and the railroads in Sweden, there was a gradually growing consensus that government intervention through nationalization could be a solution to many of the perceived deficiencies of the road and railroad systems. The fast growing road transport volumes put strong pressure on the road system. The organizations managing the rural public roads, the 170 road districts, were perceived to be lacking a professional management organization and appropriate and modern technical equipment for maintenance. The railroad system was oversized and ill structured, with a large number of local railroad corporations, in addition to the National Railroad Agency. This system was in need of a restructuring in order to organize to gain from large-scale efficiencies.

According to the official documents that were presented in relation to Parliament's decisions to nationalize the rail and road systems in 1939 and 1942, there were both diffe-

rences and similarities between the two decision processes (Hasselgren, 2013 e). The nationalization of rail can be seen as an example of a classical restructuring of an industry sector facing considerable economic difficulties due to high costs, a too fragmented structure and growing competition from the road sector.

Through the nationalization Sweden's railroad industry took a further step towards an organization accommodated to large-scale economies. With the fragmented organization of railroads at the time, scale economies had not been fully utilized. Government initiatives to intervene in the railroad business with grants, concessions and loans to private railroad companies that operated independently from the government had been part of the government's policy towards the rail industry in Sweden since the 1850s. A number of railroads had been taken over by the government over the years in an ongoing centralization trend as competition from road transport became stronger. In this respect the nationalization of railroads can be seen as logical step towards consolidation.

Parallel developments took place in most countries where railroad systems had been constructed during the 19th century. Schumpeter, in his book *Business Cycles*, argued that railroads were a business with extremely strong competition; however, following this developmental stage came a period with "consolidation, efficient administration, and sound finance" (McCraw, 2007, p. 263). Consolidation was surely not just a Swedish phenomenon as discussed by Millward (2005). Compared to railroads, roads had been part of the transportation system for some time. Roads had been built, financed and managed by landowners (and later also by local businesses) since medieval times to enable transport in the local environment and to allow for some transport flows in wider geographical areas. Organized as an activity that local actors were responsible for, and mainly based on already present older roads, the drive in development was even less coordinated than for railroads. As such roads show many signs of a bottom-up system, rather different from railroads, with its top-down structure.

Since the 1840s, the government had been taking different coordinating measures in the road system, working for a unified system as regards financing and organization etc. Yet, it was only during the 1920s that a more profound challenge to the local administration came. As for railroads, technology was clearly a strong driving force in the change process since the mid-19th century. The numbers of cars, buses and trucks grew fast and transport flows developed from mainly local flows to higher proportions of regional and national flows. In 1923, national vehicle and fuel taxes were introduced, which drastically increased the government's financial resources, (Liljegren, 1999). By the mid-1930s, financing had become dominated by the government and national coordinative measures had grown in importance in the early 20th century.

The government was, however, hesitating to get further involved in roads and railroads. Even if there were strong reasons based on technology, economics and organizational aspects to take coordinative measures, according to a number of government committees analyzing these issues from the late 1800s up to the 1930s, the government refrained at length (Hasselgren, 2011 a). A detailed report discussing the railroad nationalization (Alvfors, 1977) described the debates surrounding the nationalization question during the 1920s and 1930s connected to the nationalization. This shows that opposing views as to the appropriateness of government intervention were discussed at length during the decades before the decision on the nationalization was taken.

The government's reluctance to make the final decision might partly have had to do with the political resistance against changing the basic distribution of power between the central and the regional/local levels in the public sector. There were strong opponents, mainly on the regional and local level, towards any change in the power distribution. Natio-

nalization was believed to lead to a loss of local influence and flexibility. The risk of weakened innovativeness in a centralized railroad organization and the risk that the dynamism of the sector would be reduced were other arguments raised against the nationalization.

A parallel development can be seen in Sweden's present transport infrastructure system, as the actors are searching for new roles but where it is difficult to redistribute power in the public sector. Local governments have traditionally had a strong position in their different areas of responsibility and the view that local responsibility should be preserved (if possible) has been widely accepted. It has generally been easier in Sweden to transfer duties to local and regional levels than to reduce their mandates, even if there have been valid arguments for centralization in different sectors over time.

The most important reason for the decision to nationalize the rural public roads seems to have been the perceived need to improve the economic performance of road management and to equalize costs between different parts of the country, more than a clear political wish for centralizing authority and power. Finally, most clearly when it comes to roads, the perceived needs of stronger government coordination in times of world crisis and war gradually seem to have influenced the decisions other than the economic reasons. The processes in relation to the nationalization of the railroads have been studied by Andersson-Skog (1993, 1996), who made similar observations. The above-mentioned studies by Bogart (2009), Clifton et al. (2011) and Millward (2005, 2011) point in similar directions concerning nationalization in other Western countries.

There might also have been some interdependence between the two decisions: when the resistance towards nationalization of railroads was overcome in 1939 it might have been easier to go ahead with road nationalization in 1942. Still, the general impression is that the government waited a long time to make the final decisions, and, when it did, it was based more on pragmatism and economic rationality than on ideology or politics, which might have been expected to influence decisions of this kind to a higher extent.

The political or socio-cultural system at the local and regional levels was largely in favor of preserving the existing system more than for reform. The decision to organize transport infrastructure as part of the existing government agencies was at the same time consistent with the government's intention to foster coordination and economizing policies both for railroads and roads. Other organizational models, such as state-owned corporations or a public utility, could of course have been discussed, but they did not appear in the discussion, even if Alvfors (1977) points to the fact that a private sector restructuring alternative for railroads had been discussed at length up to the nationalization decision.

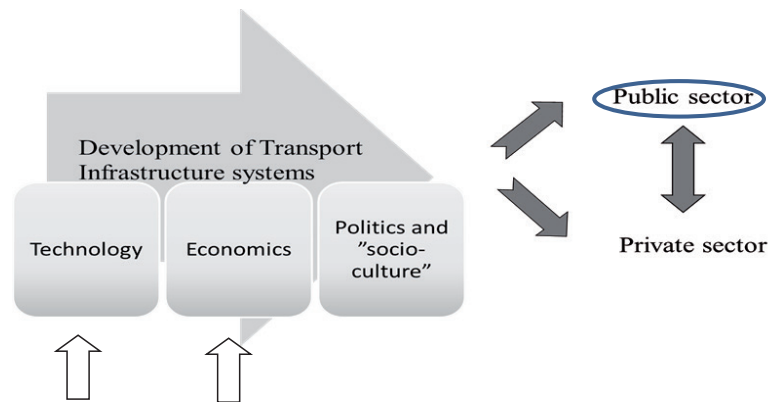


Figure 14

Push from technology and economic factors seem to explain the nationalization more than politics and socio-culture. A public sector organization was chosen.

Policy formation following the Second World War

Since the nationalization, the influence of technological, economic and political factors on the government's formation of its transport infrastructure policies and its ownership role have varied. For transport policy and transport infrastructure development, the period from 1945-1963, when the first major decision on transport policy was taken following the Second World War, is in many ways a history of the growing importance of the road transport system and the contracting railroad system. A main focus of the policy area, and for the government's ownership role, was how to frame the development of the road transport system in terms of a developed road planning system and coherent financing principles. For the railroad system the main focus was instead how to finance the growing deficits, which was an effect of the competition from road transport. The Railroad Administration was focused on reducing the railroad system or lobbying to increase government support for those parts of the railroads that were unprofitable.

From around the 1920s onwards, the railroad system in this respect resembles the role of a "reverse salient" (Hughes, 1987) in the transport system, representing the part of the system that was lagging behind from a technological point of view and that demanded financial support from the political system. At the same time, the road system had positive momentum with a strong growth and a number of supporting actors, such as consumers and producers of vehicles, and supporting services and the road lobby organizations (Blomkvist, 2001).

In terms of the co-evolutionary perspective, the development during this period seems to have been influenced by technology in terms of the strengthening of the motor transport technology. Economic factors were though even more important since there was a push to set a financing framework for the road network and in general to foster efficiency, with the application of the cost responsibility principle. This principle meant that the road and railroad sectors should cover their full financial costs with fees and taxes collected from the respective users of the systems. This principle, which had its origin in an earlier period in transport infrastructure policies, had an important role in limiting the growth of the investments in the sector.

"A dynamic development is rarely centrally planned. It grows as a product of, among other things, imagination and impulses among a multitude of business-men, who in mutual competition with varying success experiment without being prevented by anything than necessary regulations. Administrative dirigisme, implemented by ever so skilled public officers, will on the contrary inevitably largely build upon the present state. Dirigisme thus, in general, has a preservative effect."

The 1944 Transport Committee, (SOU 1947:85, pp. 52-53)

With regard to the balance between public and private sector provision, the policy, within a framework of government ownership, was relatively market-oriented, focusing on full cost coverage with positive values connected to entrepreneurial activity and competition between transport modes. The 1944 Transport Committee, as exemplified by the excerpt above, expressed a view on transport policy that was close to a stance inspired by Schumpeter and Hayek.

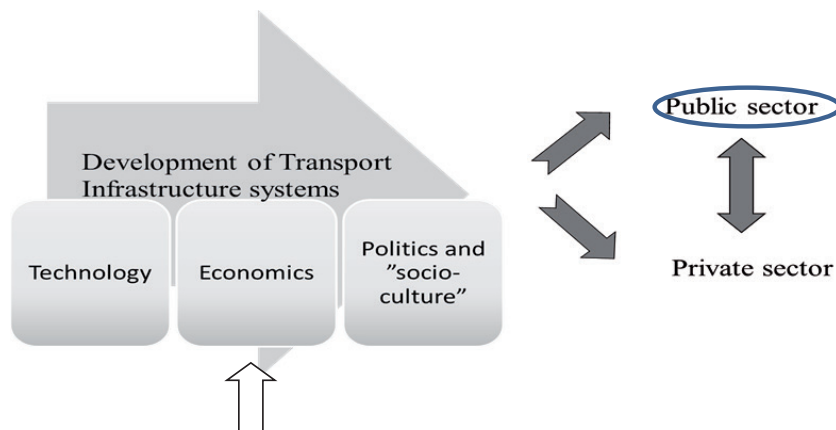


Figure 15

Postwar transport infrastructure policies were mainly developed based on a discussion around the available resources and the demand for new road capacity. Government ownership was not put into question.

4.2.2 1963-1988 and further 1989-present

The period of 1963-1980 was characterized by a prolongation of the postwar policies based on competition between the transport modes, but also with an increasing openness to welfare economics as a guiding framework, and as part of this social cost-benefit analysis. As a balance to this fairly market-oriented decentralized policy stance, a centralized expert orientation was seen as the modern way of handling societal planning in, for example, road sector planning (Hultén, 2012).

A growing criticism towards the expert orientation of the planning system and the perceived road transport friendly stance of the infrastructure policies during the 1960s led to a gradual reorientation of the policies. This also coincided with the successively developed use of cost-benefit analysis, in which wider political goals could be implemented in a formal structure.

“... the welfare economic objective has to be the basis for the continued development of transport policy.

The transport system has to be coordinated through an appropriate and continuous public sector traffic planning... consistent with guidelines... set by the government.”

1975 Transport Policy Committee, (SOU 1975:66, p. 44)

From the 1980s, there has been a stronger political influence over transport policy combined with market openings and deregulation. The shift as regards the basic view on transport policy is exemplified by the 1975 Transport Policy Committee excerpt above. Deliberative influences have been strengthened in physical and economic planning, as well as in the operations of the Road and Railroad Administrations, with cost-benefit analysis and a marked process orientation in both planning and operation of the systems as important signs. Thorsen (2011) makes a similar remark in a recent study into the use of cost-benefit analysis in transport planning. According to this study, the political influence has increased in the sector and cost-benefit analysis has been strengthened following the transport policy decision taken by Parliament in 1998. This decision was more openly political compared to earlier decisions on transport infrastructure.

During the same time period there has been a period when alternatives to government ownership and financing have been realized, for example privatization of some parts of the former Road and Rail Administrations' operations. In addition, more efficient procurement methods have been introduced and larger portions of the Administrations' construction and maintenance operations have gradually been transferred to external suppliers. Today, the Transport Administration has only limited in-house resources for maintenance and construction work.

Even if a general user charge system has not been a solution to the perceived need for additional financing of roads, measures have been implemented through which the use of government borrowing for financing of investments as an alternative to appropriations have been made possible. Congestion charging and lately some examples of user fees are other examples of a more open policy to these measures over the last 10-15 years.

Deregulation of rail transport with market openings for competition has also been a measure during this period, at first for freight transport and recently for rail passenger transport. The political system has thus been working for strengthened political goal orientation, while at the same time opening for alternatives to government's ownership of railroads and roads.

Sweden's entry into the EU in 1995 brought a higher degree of internationalization, but also supported the reorganization of the transport markets and transport infrastructure agencies in Sweden initiated in the 1980s. Part of the EU policy in this sector is to initiate stronger competition through liberalization and the opening up of national transport markets.

Recently, at the EU level there is an openness to private sector initiatives, partly as a result of weak public finances following the financial crisis from 2008-2012. Through different measures designed for supporting private sector initiatives, such as PPPs participation, the European Commission has strived for higher efficiency in the EU's measures and looked to boost available resources.

However, after a wide-ranging analysis of the EU's consolidated strategies on Trans-European Networks (TENs), Johnson and Turner (2007) note that the mar-

ket-friendly liberal strategy of the 1980-90s in many EU countries to some extent has been altered to lean more on the traditional incumbents, for example, when it comes to the spread of new technology or interoperability in different subsectors such as transport. In Sweden as in many other countries criticism towards privatization and PPPs has recently been voiced, partly as a response to the effects of the financial crisis.

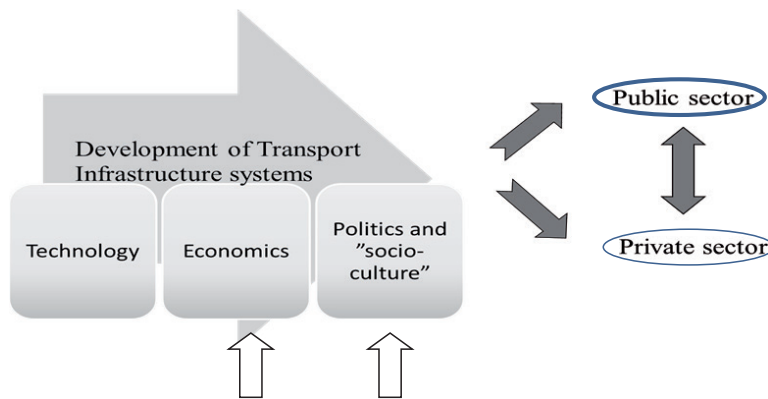


Figure 16

Transport infrastructure policies have become more and more influenced by welfare economics and politics since the 1970s. Government ownership has prevailed with some openings for alternative financing and private initiatives.

Technology has also regained some of its former influence during the last decade. Intelligent Transport Systems (ITS) with IT-based solutions have become more important for traffic management and control. Sustainability aspects of transport have also strengthened the focus on technology development of new vehicles, for example. Furthermore, new payment systems have become alternatives to tax financing, with congestion taxes and charges for capacity utilization for train operators as examples.

4.2.3 Conclusions

This section has outlined that the co-evolutionary approach used in this thesis gives an understanding and analysis of the development of transport infrastructure and the government's role from the 1930s to the 2010s.

The different factors in the model have had varying impacts during the period and affected policy decisions in different ways. The government seems to have been reluctant to engage itself as owner of the road and railroad system, and waited a long time to take these measures. As owner of the systems the government has acted pragmatically, and through gradual policy development and adjustment preserved its ownership of roads and railroads.

4.3 Marginal cost controversies – a financing and incentives dilemma

4.3.1 Financing principles

There are two different principles based on which assets like transport infrastructure could be priced: marginal cost coverage and full cost coverage. These two principles have varied in importance and influence in the Swedish transport infrastructure sector following the Second World War.

Over time successive investments in roads and railroads have led to the accumulation of a major asset base which, from an economic point of view, can be treated as sunk costs, as mentioned above. One reason is that even if the assets represent a considerable value they have few alternative uses. The cost of tearing down roads and railroads if there is no future transport need is also considerable.

The operation and maintenance of assets like pavement, platforms and signal systems are necessary for the use of roads and railroads; however, use leads to wear and tear of the assets. Combined these costs are more or less equivalent to the short-term marginal costs. This situation is a sound economic basis for charging users of the present road and railroad system only for these marginal costs.

If the depreciation of the current systems, as well as investment costs for reconstruction and new construction of roads and railroads are also considered, the cost basis is of course considerably much wider than what is represented by short-term marginal costs. In a system where all of these wider costs are covered, a full cost coverage concept is arrived at. Furthermore, if the external costs of the system, such as noise and air pollution, are taken into account a short-term (or long-term if so chosen) social marginal cost measure and cost coverage concept is available.

4.3.2 The government's dilemma and Coase's view

As the decisions to nationalize the road and railroad system had been taken in the late 1930s and early 1940s, the government had to decide on the future financing policies for roads and railroads and how to charge the users. The abovementioned financing principles of marginal or full cost coverage were a major part of the discussions around the financing policies in Sweden.

The starting point was a situation where both the road and railroad system were in need of considerable investments. Not only had investments been low during the Second World War, but transport flows also increased rapidly during the 1940s and 1950s. The government intended to both strengthen the infrastructure systems and preserve the macroeconomic stability, which was seen as threatened by too high demand aggregated over the war years for import of goods and investments in the domestic sectors. This situation made a discussion on how to finance the transport infrastructure system necessary.

Similar discussions were taking place in other European countries where large domestic industries, utilities and infrastructure assets had been nationalized. In Britain this discussion was brought to the forefront in a series of articles by Coase (1946, 1947) discussing the pricing principles for utilities and exemplified by railroads. The first of the articles was titled *Marginal Cost Controversies*.

Nationalization of transport infrastructure widened the scope for marginal cost-based pricing and also opened for more government redistribution and subsidies. This view had been fostered by the prominent British economist Pigou, who argued for government

intervention and subsidies to industries where a spontaneous market organization might lead to monopolistic tendencies and loss of consumer surplus. Coase argued that many of the theoretical ideas such as Pigou's, were lacking a full analysis of organizational and incentive problems and aspects. There was thus a pressing need to discuss these issues from a theoretical point of view.

Coase's 1946 article was based on the view that the spontaneous interaction of single actors in the economy has a much wider potential of leading to efficient solutions than the neoclassical welfare-inspired economists generally argued. Coase was reluctant to accept that the government could be in a position to access the knowledge necessary in order to correctly estimate the individual actors' demand. Coase argued that the government would not be able to mirror the allocation of resources between different purposes that a system with prices reflecting the full resource-use would bring.

Another point of criticism was that only resource allocation based on prices reflecting the full cost would foster social learning. According to Coase (1946, p. 176), in a situation where new investments were planned, the information inherited from the experiences of the viability of past investments, which have been put to the test of the market, should also be taken into account. In the case of organizations operating under marginal cost pricing this information would not be available. Estimation, and here Coase quotes Hotelling, must be carried out facing "not a historical, but a mathematical and economic problem" (p. 175).

Experience based on learning in Coase's model was contrasted against a deductive calculative method forwarded by welfare economics, which becomes more or less a necessity when following that view. When accessing the texts today it is also apparent that Hotelling was adhering to a rather formalistic approach, while Coase was primarily stating his case backed by a general organizational discourse.

The argumentation from the two sides echoed to some degree the disputes between Keynes and Hayek during the 1930s, where Keynes worked at a macro level and recommended government intervention as a remedy against lacking demand in the economy and unemployment, while Hayek argued for an understanding of investment and business behavior at a more individual level (Bas, 2011). The disputes from the 1930s around these issues were still at hand as the government formulated a financing principle.

As for incentives, Coase's argument was that markets without government intervention, where corporations are pricing the services to cover full costs, must be preferred to a controlled market situation, where the government in some way administers the prices. One of the reasons for this view was that there was a risk for overinvestment in transport infrastructure, which Coase suggested as one of the deficiencies with marginal cost pricing, as discussed earlier in this thesis.

Coase's arguments against marginal cost-based pricing (without full cost coverage) are condensed into the following arguments:

- Marginal cost pricing would lead to maldistribution of the production factors, since the full costs of these would not be obvious to the user.
- Marginal cost pricing would lead to income distribution from non-users to users and from taxpayers to users.
- Marginal cost pricing, if combined with tax subsidies, would lead to "other harmful effects" as the economy is more heavily tax-burdened.
- Marginal cost pricing would lead to a risk of overconsumption and lack of information on how to spend resources in the future, since price signals are distorted.

Coase presented four arguments in favor of an alternative pricing system based on multipart pricing, with separate payments to cover fixed and variable costs. With such a system the user would face the full cost of the resources that are used for the production of the good or service, which would confer a correct combined price signal. Besides the view that tax financing would lead to decreased allocative efficiency in the economy in general, Coase presented a number of arguments focusing on the positive effects of markets and the relation between customers and suppliers offering services at full price. It safeguards correct allocation of resources, learning and an incentive structure that gives a good basis for efficient management and operations of the supplying organizations. Coase's discussion emphasizes the situation of the producing organization and its relation to users or customers. The organizational view can be traced back to Coase's 1937 article *The Nature of the Firm*, where he discussed the arguments in favor of organizations in a world of loose relationships that often defined markets.

Coase returned to this discussion in a later article (Coase, 1970), arguing that the financing principle affects the organization of the businesses to a great extent. He argued that government subsidies, which is generally an integral part of the marginal cost-based pricing principle, would eventually lead to centralization to the government, as it would naturally be interested in controlling the organization it subsidizes. Coase argued that "some financial autonomy is a necessary aspect of efficient administration". This would indicate that a policy of marginal cost pricing "would be very bad because it would lead in the end to a complete centralization of the administration of public utilities." (p. 119).

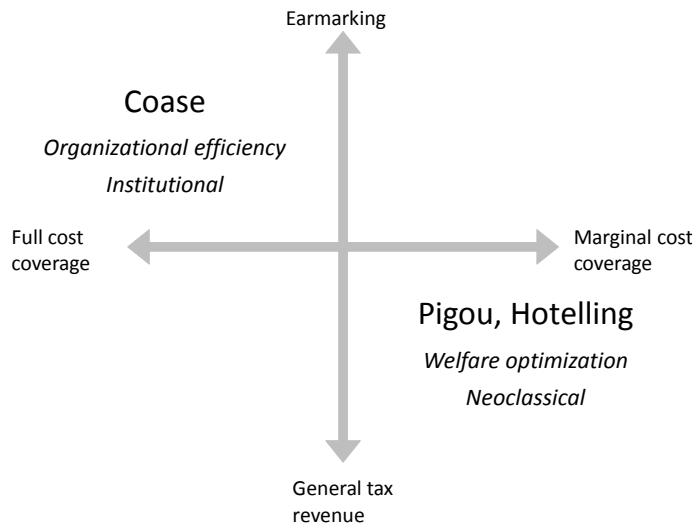


Figure 17

Coase and Pigou/Hotelling – different views on cost coverage and financing

The different perspectives are summarized in Figure 17 above. The horizontal axis represents the spectrum between marginal cost coverage and full cost coverage. On the vertical axis the dichotomy between earmarking (all revenues are directly allocated to the supplier) and the treatment of user payments as general tax revenues is displayed. Coase's model is placed in the upper left corner combines full cost coverage with earmarking (which is not explicitly stated by Coase but might be assumed from the general reasoning in the articles where the discussed positive incentive effects connected to full cost coverage signals a financing principle close to earmarking). The Pigovian welfare economics model, also represented by scholars as Hotelling, is displayed in the lower right corner, which combines marginal cost coverage with the treatment of revenues from taxes and fees as general tax income.

Lindsey (2006), going through the later development of economists' views on road pricing up to the 2000s, notes that the more institutional sentiment that Coase represents has not been the core element of economists' handling of issues on road pricing in general (p. 315). The view represented by Pigou has, since the 1940s, instead largely been dominant and further developed by a number of scholars such as Vickrey, Walters and Mohring. Pricing of road use based on short-term (social) marginal cost has been the basis for these later scholars' writing. Small, Winston and Evans, among others, according to Lindsey, have shown that under some assumptions congestion and road damage charges can pay for the costs of both capacity and maintenance (p. 312). This line of theorizing has also been possible to express in mathematics and in graphical form, which has probably added to the strength of this view among economists, and also to its impact on the public discussion of the pricing issues.

The institutional view, which was exemplified by road and railroad related themes in Coase's 1940s articles, have, according to Lindsey, not been widely developed with further applications in this sector of the economy. As an exception the writings of Gabriel Roth can be mentioned. Roth (2006) has edited one of the later works where a number of articles dis-

cuss the prospects and favors of a more privatized road provision. Roth has also published a number of articles and books in this field since the 1960s.

In another overview article covering the development of transportation economics through the last 30 years, Button (2010) presents a more or less similar view of the development of transportation economics. Even if a microeconomic and welfare economics tradition in transport economics has been developed in the dominant tradition, Button though seems to worry about the high abstraction level in microeconomic transportation economics, and thus the fairly low relevance to actual politics and policy problems. There is a frustration in this article that the highly developed theoretical models and analyses do not really make its way into the decisions. Button points to the need to include institutional theory and insights from political economy into the discussion in order to raise its relevance for policy.

A similar approach is presented by Winston (2010), who suggests privatization experiments be introduced as a means for addressing many of the problems of the US transportation system such as lack of innovativeness and resources, and slow productivity growth. The institutional view is obviously represented by contemporary scholars, even if the welfare or neoclassical bias is generally the stronger in discussions around transport infrastructure.

While Coase favored a system where roads and railroads were financed without government subsidies, the more recent institutional studies mentioned above seem mostly focused on an improvement and methodological refinement of the application of short-term social marginal cost-based financing models. By reducing cross-subsidies between different transport modes and striving for price setting that is more in line with real life marginal costs (including, for example, congestion induced costs), a higher level of efficiency could, according to this view, be achieved than in many present systems.

This seems to be a view where a move from weaker to more powerful incentives is sought after, while not necessarily meeting the requirements of Coase, aiming for full cost coverage. Even if short-term social marginal cost pricing could be expected to raise sufficient resources to cover the full costs of roads in urban congested areas, this would clearly not be the case in less populated areas. There would thus still be a need for substantial tax financing and cross-subsidization if these pricing models were fully applied. This is of course something that is even truer with regard to railroads, where marginal cost style user charges often only cover even lesser parts of the total costs than for roads.

4.3.3 A marginal cost controversy in Swedish transport infrastructure policy?

At least at the official policy level, which is the focus here, the discussion in Sweden around pricing and financing policies related to transport infrastructure can be seen as a controversy between the two different perspectives, as outlined by Coase in his 1946 and 1947 articles. The controversy seems to have been strongest during the 1970-80s, when a shift from a cost responsibility principle to a social marginal cost principle was discussed at length in the official documents in relation to transport infrastructure policy. Since that time the social marginal cost principle has been the dominant official policy, though often blended with more business economic-inspired contents. This development has been underpinned by an emphasis on this perspective in EU policies, where the same blend of marginal cost and full cost pricing policy is also apparent.

This process of gradual change from the full cost coverage policy to the marginal cost policy is described in more detail in two of the appended articles (Hasselgren, 2013 f, g).

Three periods are described in the article during which different financing policies were followed. These coincide relatively well with the time periods used in the discussion

above on the formation of general policies in the transport infrastructure sector. The three periods discussed with regard to the financing principles are:

- 1944-1978 The Full Cost Coverage Period
- 1979-1988 The Mixed Policies Period
- 1989-2010 The Social Marginal Cost Period

The period from 1944 until 1978 was marked by a policy that aimed for full cost coverage for each of the transport modes on a stand-alone basis. This principle was more or less strictly upheld during different time periods within the broader period, with a subsequent softening during the late 1960s or 1970s. In 1979, a new principle was set by the government based on welfare economics principles. The current or existing investments in roads in railroads should be seen as sunk costs and only short-term social marginal costs should be the basis for pricing and taxation.

Not until the late 1980s or early 1990s has a clearer move from this principle been implemented. As from 1979 when the formal policies were changed to be in line with these principles, they eventually turned out not to have been implemented. Then in 1988 the government decided that the decision in 1979 had gone too far and therefore made something of a compromise, bringing back some of the former principles with cost coverage and per-mode focus for financing into the official policies.

However, during the 1990s the short-term social marginal cost principle has gradually become more important, partly as a result of the split of the former Railroad Agency in operations and infrastructure as separate organizations. The merger of the former Rail Administration and the Road Administration in 2010 was also a sign of the government's intention to foster a multi-modal perspective in transport policy and transport infrastructure policy in general, a principle taking financing even further away from earmarking and a cost-responsibility view.

4.3.4 Reasons for the change in principles

The change in the financing principles that occurred gradually from the nationalization until the early 2000s can be seen as inspired or caused by a number of arguments and the general political development.

As Sannerstedt (1979) has shown there was widespread criticism towards the reduction of the railroad system in the public debate in the 1960s, following the 1963 transport policy decision. The parallel growth of road transport and the planning and construction program for roads was met with concerns over the perceived technocratic expert stance of the planning system. A general critique was that a single-handed focus on roads and car transport would lead to a society and urban development that was not desirable.

The critical standpoints were reflected in a debate book by a group of academics (Anell, Hedborg, Lönnroth and Ingelstam, 1971) critically discussing the effects of the expansion of the road system and arguing for a revised transport policy. One main point in the book was the perceived overly road transport-friendly stance of Swedish transport policy. Another key element of the critique was that road traffic in general did not pay for its full social cost, specifically claiming that negative externalities were not included in the calculations of the cost base that should be covered by tax and fees. Railroads, on the other hand, it was argued, had to pay their full costs, which rendered them at a competitive disadvantageous situation in relation to road traffic. The authors here almost argued for reversing the financing principle of the time, from alleged marginal to full cost for roads and from likewise alleged full cost to marginal cost coverage for railroads.

Another critical standpoint was raised by Bohm, a well-known Swedish economist at the time active in transport economics. Bohm argued that the government's 1972 Road Tax Committee was heading for the right principles of the future: short-term social marginal costs are the basis for pricing decisions (Bohm, 1973). The ministry officials and the prevailing transport policy could though, according to Bohm, be expected to work for a too strong focus on the principle of full cost coverage and "the single sided focus on business economic efficiency" (p. 326), which was the basis of the 1963 transport policy decision.

Bohm presented a number of articles and books at this time that argued for a stronger role for welfare economics principles in transport infrastructure planning and financing discussions. In 1974, Bohm et al. published a general and comprehensive critique of the 1963 transport policy and its effects. Here, the critical voices of the late 1960s and early 1970s, those specifically against road planning, were the starting point of the discussion. It was argued that through a wider use of cost-benefit analysis and welfare economics principles a redirection of the transport policy that focused more on welfare-based efficiency should be achieved.

Welfare economics-based theory, besides being theoretically backed, seems also to have allowed for more active policy and government intervention, which could be a political solution to the new situation with stronger political concerns voiced in the debate around transport policy. The fiscal interest in revenues from road transport-related taxes, which increased over time, might also have made the earlier strict connection between revenues and government appropriations less favored from a fiscal policy (Ministry of Finance) perspective. The income surplus from these taxes could be used for other purposes in a situation with growing public financing of different activities within the sector, for example coverage of growing deficits in railroads.

The academic support for a shift to welfare economics-inspired cost-benefit calculation, as a basis for prioritization in decisions on transport infrastructure spending, also seems to have fit well into a political system looking for a way to formalize the stronger interest in communicative planning processes for roads and railroads. Through the introduction of cost-benefit analysis there was a method for including external variables into the discussion without losing too much of the rationalist stance of earlier government infrastructure planning practices. Deliberative planning processes and formal cost-benefit calculations were methods that worked well together.

The government's interest in a more elaborated and wider scope for transport policy in order to include regional policy concerns, environmental concerns, and more active industrial and physical planning policies also made cost-benefit calculation a helpful tool. The further development of cost-benefit analysis can be seen as a method for introducing these new policy goals other than production economics or business economics, which had been the stronger of the goals in the sector since the 1940s. Hultén (2012) and Thoresson (2011) make similar observations when discussing the Swedish transport infrastructure planning system. Cost-benefit analysis has developed into a method used to include different perspectives in the planning process.

At the same time, the historical record from the 1940s to the 2010s reported in the appended articles shows that the government has been pragmatic when formulating its policies compared to the government committees' proposals. When the proposed policies from the 1940-1960s leaned towards deregulation and markets, the government was somewhat slower to deregulate and support railroads more than the official policy should perhaps have prescribed. As the social marginal cost policy was introduced the government had been fostering administrative efforts to increase efficiency and allowed for user funding for

specific projects. The government then seems to have played a pragmatic role in the system by balancing different needs and goals.

4.3.5 Incentives for efficiency changed?

Another possible way to express the change in the government's principles for financing might be that there has been a shift in focus of the discussion from a view close to Coase's standpoint in the 1940s, where the efficient operation of the road and rail-road agencies was an important concern for the government and government committees analyzing the policy area. The present focus, which has grown stronger since the 1970s, has rather been that maximization of welfare surplus should be the overriding goal of the government's policies, and only second comes the interest for organizational efficiency. This shift in the policy stance is presented in Figure 18 below.

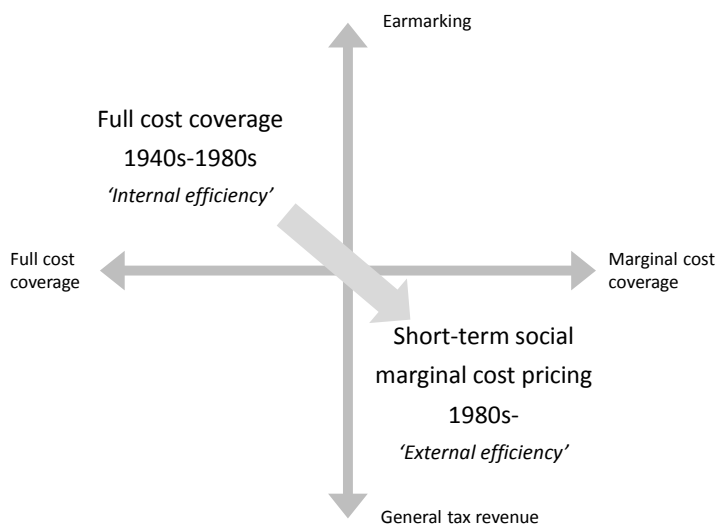


Figure 18

The marginal cost controversy in Sweden's transport infrastructure policy

The shift might be interpreted as a departure from the focus on the internal efficiency of the producing organizations and their relation to the users to a focus on the external efficiency. These wider relations between the transport infrastructure system and the surrounding economy are seen as not being reflected in the more narrow decisions on costs and income generated internally in the infrastructure system. The two concepts, internal and external efficiency, were used by government committees in the 1970s and 1980s, as these discussed the different efficiency concepts and the perspectives that should be favored.

As Figure 18 shows this change in focus has also been combined with a policy reorientation from a principle of earmarking the government's revenues from (primarily) road transport used for road maintenance and investments to a model wherein government revenues are treated as general tax revenues used at the discretion of Parliament and government in yearly budget decisions. The former principle reflects a view that there should be a

connection between revenues and actual spending in the same sector, perhaps a parallel to the Wicksellian interest principle for taxation. The latter principle comes closer to a theoretical public finance view, where all decisions on government spending should be taken as a comprehensive package and all available revenues are reflected against all spending purposes. This latter principle is also reflected in fiscal regulation frameworks in Sweden. Only a few exceptions of this overriding rule have been allowed, for example for some major bridges and for revenues from road congestions charging and railroad user charges.

The incentive effects connected to the different pricing principles were discussed in a number of reports issued by government committees from the 1940-1990s, as is shown in the appended articles. However, the focus of these questions has become less marked over time. The initial post-Second World War discussion was clear in this respect: the government was seen to have a role in fostering good management and organizations. Later discussions on these matters have been less developed and less explicit.

The shift from stronger to weaker incentives for organizational efficiency seems to have been combined with growing subsidies from the government to the railroads and with stronger fiscal interests expressed by the government as a motivation for road transport taxation. Revenues from fuel-based taxes have grown gradually, as VAT on top of the gasoline price including taxes was introduced in Sweden in the early 1990s. However, recently there has been some decline in the gross tax income related to fuel (Ekonomistyrningsverket, 2013), which might be connected to the successive introduction of more fuel-efficient vehicles. If Coase's cautions towards policies of this kind should be listened to, we should expect the overall efficiency of the operations of the systems and the general allocation of resources in the economy to have become less efficient as the incentives fostering productivity and efficiency have become weaker.

The change from general tax revenue funding to fee funding, in a system where government agencies operate the systems, might be a step to strengthen incentives working for customer focus and internal efficiency. There would, however, still be difficulties connected to the government model such as weak incentives for customer orientation and the risk that government agencies would prioritize internal aims in the organization more than the official policy (Wagner, 1991/2011).

One additional observation is that the government has gradually emphasized a market failure view with regard to its view on the functioning of the transport infrastructure system. Compared to the more openly positive market economy-friendly view expressed by the 1944 Transport Committee this is a major change. More on this below.

4.4 Strategic transport infrastructure planning – knowledge and coordination

This section deals with the long-term planning of transport infrastructure systems. It discusses two pairs of dimensions that are important when dealing with these issues. On the one hand is a balance between markets and public sector organizations. On the other hand is the balance between centralized and decentralized forms of organization of transport infrastructure systems and infrastructure planning. Examples from the current situation in the US and in the EU are used as examples of organizational models.

Planning has to do with change from a present situation to a desired future state. Planning has connections to actors' perceptions, abilities and goal structures, but also to the view on information and its deeper use and understanding in the form of knowledge. To a large extent planning also has to do with coordination of resources and actions.

In the current literature, strategic transport infrastructure planning and strategic transport policy issues are closely intertwined. To begin with, mainstream planning literature is in general focused on the understanding of the flaws connected to public sector planning and the further development of the public sector planners' traditional role. For example, how should public sector planners as experts be able to refine their practices with the help of improved forecasting techniques, developed cost-benefit analysis, and more refined strategic planning practices and systems? Questions such as these are asked by scholars like Banister (2002), Button and Hensher (2005), Flyvbjerg (2007 a, b), and Kölbl, Niegl and Knoflacher (2008).

Short and Kopp (2005) have focused on the different geographical levels in transport infrastructure policies, arguing for further research into planning practices at different levels, specifically focusing on supranational planning methods and practices. Banister and Hickman (2012) have joined those who strive for refinement of planning methods by arguing for further exploitation of scenario technique in strategic planning.

Furthermore, the interest for understanding the politics and economics of mega projects has also grown into a research area of its own. With the view that we will probably see more and more major or "mega-sized" transport infrastructure projects in the future, and based on the experience from having the "wrong" projects prioritized and later constructed, often with major cost-overruns, this has become a pressing area to explore. Here, perhaps contributions by Altschuler and Luberoff (2003), Bruzelius, Flyvbjerg, and Rothengatter (2002), and Flyvbjerg (1998) reflecting on different mega projects, political processes and risks stand out as the most prominent contributions.

Flyvbjerg often focuses on the striking irrationality of decision processes around mega projects with a "strategic misrepresentation" of pro-project interest in the public sector environment and with an outcome leading to the "survival of the unfittest" projects. Flyvbjerg (2007 a) has suggested strengthening incentives for efficiency through improved accountability and developed critical public review processes as remedies. Altschuler and Luberoff have included more public choice-related explanations for the functioning of the processes around mega projects with private sector rent seekers and public sector entrepreneurs, both easily recognisable actors in these projects. Van Wee (2007) among many others has added to the analysis by suggesting measures for strengthening the planning and forecasting methodologies in the tradition of the mainstream literature in the group of theories above.

Even if most of the scholars in the current literature have an interest in the development of strategic planning, and indeed discuss and try to find remedies to flaws, there are only few examples where a discussion on knowledge as a prerequisite for coordination is clearly discussed. Here, it is argued that the knowledge concept is crucial for a deepened understanding of strategic transport infrastructure planning.

4.4.1 Knowledge and coordination

Transport infrastructure systems must be planned, whether they are provided and managed by the public sector or by the private sector. Strategic planning in the transport infrastructure sector primarily includes the long-term physical and economic planning of extensions of the road and railroad networks. Yet, it can also include activities directed at arriving at a situation with more efficient management of the current networks.

Technology (signaling, bridge capacity, etc.) and quality aspects must be coordinated, and new construction, reinvestments and maintenance must be organized and carried out in a timely manner. Regulation to safeguard traffic safety or the efficient use of the roads

and railroads must also be coordinated. Scale effects are, by definition, captured only as resources are combined or the same resources used for different purposes, generally as an effect of coordination.

Information about a large number of different aspects related to the road and rail-road systems is necessary to be able to plan activities in the future and the present. This information must be transformed into a deeper understanding of circumstances that are important for the activity that an actor is intending to carry out. This deeper understanding based on information is captured by the knowledge concept. This might be seen as the sum pieces of data, information and experience put together to create patterns of thinking and theorizing around society and economic activity.

Langlois and Nelson and Winter have been pointed to earlier as examples of scholars signaling an interest for the generation of knowledge and capabilities through learning in organizations. Hayek (1945) discussed the possible use of and capability among centralized planners to obtain the necessary knowledge in order to be able to take correct decisions in a classical article in the field, *The Use of Knowledge in Society*. Hayek argued for a cautious view on these possibilities, furthering a view where knowledge is dispersed at the local and individual levels in society rather than at aggregate levels. According to this view, aggregated knowledge is available more as an end result of market exchange than as a result of centralized planning.

When the infrastructure system covers more than one jurisdictional area, the coordination of the systems includes more difficult aspects such as different institutional settings, language, culture and different priorities set in relation to the same project. There is also a tendency for every separate jurisdiction to try to reap the advantages of transport infrastructure measures while finding ways to allow other jurisdictions to pay for the same measures.

These aspects are also discussed in the theoretical field of fiscal federalism, that is discussing prospects for finding efficient functioning of public sector organizations affected by both politics and self-interest in the public administration, two of the obstacles against an efficient public sector organization (Oates, 2005). Hayek (1960) and Tiebout (1956) have also discussed the prospects of organizing public sector organizations at the local level, with Hayek seeing local government as a better alternative than central government and Tiebout pointing to the competition between different local jurisdictions as important for efficiency in the public sector.

Viewed from one side of a national border a project might show very different potentialities than another. As an example the interest from the southern Swedish region Skåne to connect to the Danish capital Copenhagen with its supply of a wide range of services and goods might be very different from the Danish interest in connecting to Skåne and Sweden's third-largest city Malmö, a medium-sized regional city with only few additional qualities to offer, save for perhaps low-wage workers and nice holiday surroundings.

A number of these barriers to cross-border infrastructure have been discussed recently by Rietveld (2012), who points to a number of institutional difficulties such as regulation, but also to different preferences and the lack of information about the situation in the other country. The knowledge aspect is clearly an important part of the understanding of these strategic infrastructure systems and how coordination can be realized.

Klein (2012) points to the situation wherein coordination can be interpreted as having two different meanings. On the one hand, Klein argues that the combination of different activities and factors (*concatenate coordination*), originally within a firm and later on a wider scale in the economy, in order to arrive at some higher level of "effective arrangement" (p. 37) is an example of a combinatory focus that the term "coordination" originally

had in economics. This transitive meaning of the verb to coordinate also makes intentionality a central aspect. Someone must coordinate in the firm or in society at large. How this coordination activity comes about, either centrally or spontaneously, can be seen as the basic aspect in many discussions around planning, for example in the debate on market socialism during the 1930-40s.

Since the 1960s, Klein argues that the meaning of coordination has changed to focus more on *mutual coordination*, an intransitive verb, where the interrelation with other actors or systems is instead the central aspect of coordination. This is also what is generally analyzed in game theory, even if Klein argues that mutual coordination has also become the main understanding of coordination in other areas such as macroeconomics.

Perhaps coordination in the latter form could also be seen to fit closer with different communicative views on coordination and planning, whereby efficient solutions of planning issues (often in a local setting) are sought without always taking the overriding efficient use of resources into consideration. Here, the main question and purpose is to analyze how in a system like transport infrastructure, an economizing (or efficient) use of the available resources comes about. Another interest is to analyze how the process of arriving to such a state can be understood or arranged. Processes and institutions fostering learning and economizing behavior are thus in focus. It seems like coordination of the concatenate type would be the one most close to this purpose.

Klein (2012) suggests that optimization or efficiency should perhaps be altered for "pleasing arrangements" (p. 37) when moving from the firm level to an economic system level. This is a view that reflects one of the characteristics of the institutional paradigm. A similar view also seems reasonable with regard to transport infrastructure planning. In a small project like minor road construction, it might be possible to optimize resource utilization such as cost reduction given a defined project aim. However, moving upwards in the system, optimization or even a reasonably vaguely defined efficiency, is more and more difficult to observe and evaluate, as complexities increase both internally in the system and externally. External influences, initiated by, for example, the political system or coming from counterparts in the projects makes the planning environment more and more complex.

The cost of coordination is raised in a study comparing the functioning of the public transit systems of the San Francisco Bay Area and of the Washington, D.C. area (Chisholm, 1989). One conclusion is that the relatively fragmented system in the Bay Area in the 1980s seems to have achieved a satisfactory level of efficiency and coordination at a reasonable cost. The tendency for amalgamation of previously more decentralized and multifaceted structures in public transport in the US, into larger 'Metropolitan Transportation Commissions', is studied. These have often been labeled as improving coordination by stronger hierarchy. Yet, Chisholm concludes that the probable costs of improving coordination through government intervention and the introduction of hierarchy as the organizational principle instead of spontaneity is probably a case of exponential cost growth rather than linear. Therefore, there are some signs that planned hierarchical coordination has an increasing cost bias rather than the opposite.

An important aspect of strategic planning for transport infrastructure is negotiation between actors who operate at different organizational levels in the transport system. Negotiations can also be seen as an expression of coordination, whereby the most efficient use of existing or new assets is sought. Negotiations can, according to Raiffa et al. (2002), from an analytical standpoint be divided into either a distributive or an integrative realm. Distributive negotiations are about sharing the values that are at stake among the negotiating parties, with a focus mainly on the split between the parties of whatever there is to divide. This can be a monetary value, power, influence or perhaps moral justice.

Integrative negotiations are defined by Raiffa et al. as those situations or processes where the parties engage primarily in shaping values that are larger than in the original situation. Raiffa et al. (2002) argue that integrative negotiations are centered on capabilities and resources among the parties. It is about “integrating the parties’ capabilities and resources to generate more value” (p. 97).

Raiffa et al. also exemplify the two basic models by explaining that distributive negotiations are about the division of goods more than value creation. Distributive negotiations, which can be expected to dominate in a system with central government financing provided to lower levels in the system, might be seen as a parallel to Klein’s suggested mutual coordination stance. Integrative negotiations might be closer to a concatenate coordination stance. The zero-sum game’s stylish distributive form of negotiations could be expected to be connected to government dominated planning modes, with their connections to politics. Market-based solutions are, on the other hand, more focused on value creation, which is the basis for exchange. Whether strong institutional arrangements are in place to foster exchange and learning could, from this point of view, be what decides whether market failure or spontaneous ordering is the outcome of these negotiations.

Figure 19 below shows four modes of strategic planning in terms of the two pairs: coordination and knowledge. The upper two modes represent ideal strategic planning modes, where some sort of optimization, given the resources and knowledge available, is achieved.

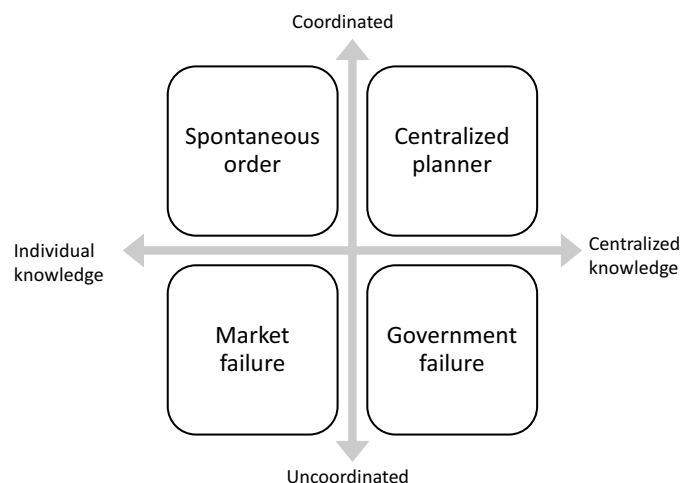


Figure 19

Four modes of strategic transport infrastructure planning

The lower two modes represent either market failure, here in terms of an uncoordinated less efficient result, and government failure, also in terms of lacking coordination. Failures can of course be the result of a number of different reasons. With regard to market failure, the absence of an institutional setting with defined property rights, weak contract law or low confidence between actors in the markets might make the economy operate at a less than optimal (or pleasing) level. Furthermore, government failure might be connected to unsuccessful planning or an individual (public official’s or politician’s private) preference

orientation rather than a general or objective preference orientation.

While the two upper modes can be seen as idealized examples of textbook versions of well-coordinated situations, the two failure modes are more likely to occur in either the less than rational world governments face and/or taking into account the many possible obstacles towards a spontaneous order (or Hayekian catallaxy) setting. Such obstacles might originate from government regulation that distorts price signals in the economy.

The many difficulties connected to arriving at a situation where a centralized planner provides a well-coordinated outcome have been described in a number of cases. A centralized government planner would have difficulties obtaining information about the transport infrastructure system as such. Many times the very diversified and elaborated political aim structures as such are another challenge when trying to convert these into practical policies. These often lead to a number of goal conflicts that are difficult to balance.

Trade-offs between regional policy aims, which work in favor of decentralized systems, and transport flow economizing leading to centralization are only one such nearly unsolvable conflict. The measurement of road and railroad users' marginal utility valuations is another difficult area for a centralized planner. The many obstacles to the success of a centralized planner have been discussed by Coase (1946) and Hayek (1944, 1945). Since then the discussion on limitations on planning and rationality as the main organizational idea has been a common theme in a vast amount literature. March and Simon (1958) made an important contribution to this literature and provided a starting point for a view on organizations as a fluid process rather than a strict bureaucracy, a theme that has been followed and developed by many scholars.

The centralized planner mode can also be seen as connected to neoclassical welfare economics theory with its focus on equilibrium analysis based on the assumption of unitary and rather stable utility functions among users over time. With the positivist assumption being the basis of these theories, it is also an integral view that once the proper analytical tools are taken into use there is always a possibility that the final optimization might finally be reached by a centralized planner. The widespread uses of social cost-benefit analysis, and the ongoing methodological development of this model as currently carried out in the Swedish Transport Administration (Trafikverket, 2012), are examples of activities and methods connected to the neoclassical paradigm but are also closely connected to the centralized planner mode. The examples given from current planning literature above also point to the strength of this orientation.

The standard solution of handling a situation where a natural monopoly exists, a basic tenet of neoclassic theory is to regulate or nationalize the assets and operations of the area. This would, in principle, allow for the efficient use of resources, based on marginal cost pricing and deficit funding by the government. Why a government monopoly would be more efficient than a possible private sector monopoly, or whether regulation should be focused on preserving or shaping at least oligopolistic competition, is seldom answered. This solution, although it is often seen as a measure to reach some kind of optimization, is generally one where the deficiencies of the centralized planner mode are obvious. Natural monopolies do not generally exist other than for some specific section or aspect of a transport infrastructure system, and they change over time. Nationalization as a solution to a perceived natural monopoly situation is, however, a measure that has generally a long-lasting effect, shaping paths for future action. What might be seen as short-term improvement is therefore often changed to a long-term failure.

The possibility fostering a move from a situation characterized by market or government failure to one where market forces work more freely is often suggested when reforming economies and societies characterized by rigid structures and low growth rates.

Those policies generally aim to make use of markets' ability to allow for innovativeness and dynamism, which is in turn connected to the decentralized knowledge that is a sign of this model. These solutions usually aim for entrepreneurship and experimentation, but they are also part of the theories that discuss the functioning of spontaneous orders. A better use of the available resources through a market system based on prices signaling supply and demand of goods and services, rather than plans based on projections by centralized planners, is often the purpose of these policies.

A crucial prerequisite for spontaneous ordering is the existence of an institutional framework, where the government has a role to safeguard the functioning of the system. Comparative studies with a focus on institutional settings have been carried out by a number of scholars, among which North (1990) has presented important insights. Besides the formal institutional framework, informal and cultural aspects also contribute to forming a stable environment for markets to function. A take on these different systems and their interrelations has been provided by Williamson (2000), as mentioned above, in which norms and traditions such as formal rules like proprietary rights operate at an over-layered level in any society, structures which change only slowly. These layers of institutions are connected to more short-lived structures such as governance structures, transaction costs, and at the basic level production functions and resource allocation arrangements at lower levels of the model.

4.4.2 The spatial dimension

The successive opening of the national transport markets in the EU for cross-border transport and the growing transport flows connected to increasing specialization in the European economy (as an effect of the internal market) is changing the preconditions for the organization of an efficient transport infrastructure system. In an earlier stage of European integration, efficiencies of scale were captured mainly at the national level in the transport system. In this development the interplay between the national and the supranational level is increasingly important in the development of transport infrastructure systems.

International (for Sweden mainly EU) cooperation and coordination can be expected to bring a need for more stringent and clear-cut national policies and strategies with regard to transport infrastructure. More cross-border related transport projects than earlier are discussed as the international exchange increases. Physical transportation connections to other EU member states are growing in importance.

Examples of projects where Sweden's international focus and participation is necessary are Öresundsbron, Svinesundsbron (both major bridges between Sweden and Denmark/Norway), and the Baltic Sea Strategy, as well as Trans European Networks for Transport (TEN-T) policies at large. Currently, many of these issues relate to Sweden's connection to Denmark and through the Fehmarn Bælt connection from Denmark to Germany, also with the European transport systems. The improvement of the railroad connection from Malmö to Oslo in Norway is also a related project. Mathiessen, Andersson and Andersson (2013) and Remmo (2012) have discussed several aspects in relation to these extensions, pointing to their value for long-term growth policies and calling for government action.

A similar process has taken place for other EU member states and, at a federal/state level, in the US with a gradual development of transport infrastructure systems organized at different levels in the system, and with a major role for the EU/federal level. In both the EU and the US, efficiencies of scale are present at the level above rather than at the national/state level.

It could be argued that similar discussions and aims to those currently on the agenda in the EU affected the discussion and decisions to strengthen road infrastructure in the US

in the 1950s. Among the purposes of the Interstate Highway System decisions was the idea of strengthening the US internal market as trade flows and personal mobility.

Recently, the increasing difficulties in preserving a sustainable federal funding system in the US has led to growing dependency on state and local funding and a reintroduction of private sector funding of the highway system (as PPPs and tolls). Compared to the EU's situation, this discussion about the future concerns of the already established interstate system is seen by most observers as sufficient in its basic structure, though lacking in capacity and resources for maintenance in many urban areas, with resulting heavy congestion in a number of places and a deteriorating quality.

There seems to be need for discussing the level above the nation states in the EU or the states in federal systems. The next section deals with these questions and the prospects for strategic transport infrastructure planning at different spatial levels.

4.4.3 Current trends in the EU and the US

The current development in the EU and the US with regard to strategic planning shows some signs of contradiction. The US seems to be heading for decentralization in the road system, while the EU seems to be strengthening the centralized coordination. The core question here, with the focus on strategic planning, is how the necessary coordination in order to achieve an efficient use of resources should be arranged? Could an efficient or at least satisfactory coordination come about through centralized government intervention or rather through decentralization to lower levels in the system?

Since the 1950s, the US has had a stronger central government-led coordination of road planning and regulation than in earlier periods. Its Interstate system and the methods for road planning were, as has been exemplified in the historical overview paper appended to the thesis (Hasselgren, 2013 d), seen as the most modern among the countries in the Western world, as Sweden developed its strategic road planning methods in the 1950s. In a time of financial austerity the US federal Highway Trust Fund is, however, under pressure. A solution that could gradually evolve from this situation seems to be that states and regions would take on stronger responsibility for the interstate highways, in many cases opening for alternative financing through tolls and PPPs.

At the same time, the transport infrastructure planning and financing in the EU seems to be going in another direction. While still being dominated by member states financing, the European Commission and its TEN-T Agency are fostering stronger coordinative measures in order to facilitate the construction of missing links in the core network of TEN-T roads and railroads. A number of technology-enhancing and regulative measures allowing for the internal market to function better through stronger competition, for example, are also part of the EU's policies in the sector. Private sector financing and private actors will also probably play more important roles in the future as part of these measures.

The US and EU seem thus to be taking different steps to achieve the necessary coordination in a situation with financial distress. The change in the US from stronger federal government coordination of interstate highways towards more of state and regional initiatives, and a growing proportion of financing coming from user fees, also seems to be in step with more local initiatives and more local knowledge. Lower spatial levels in the system could in parallel to the earlier discussion generally be expected to have access to wider knowledge bases than higher levels. At the same time, which is further discussed in Chapter 5, the coordination potential might be limited on local as compared to central levels in the systems.

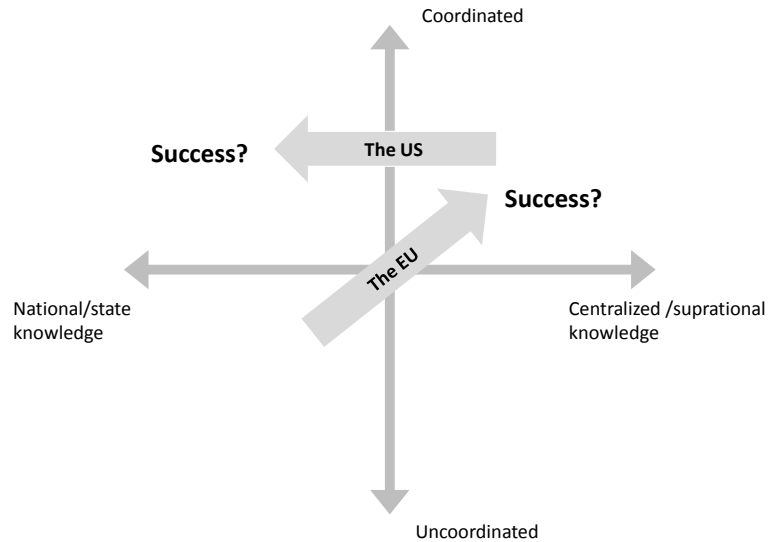


Figure 20

Centralization and decentralization of strategic transport infrastructure issues

The development in the US seems primarily to represent a horizontal move from one level of government administration to another spatial level of government administration, as displayed in Figure 20. It could be argued that this will likely lead to new examples of government failure, as viewed from the perspective of knowledge and coordination, but at a lower spatial level in the system. Even if some of the decisions will be better informed than earlier, the potential gains from a strategic planning and management at a level above the states might be reduced. The system might end up with higher quality decisions at a suboptimal level in terms of the strategic issues. These are some of the issues discussed by Tiebout and Hayek (see above) in their discussion on local versus central responsibility for sectors in the economy with public goods characteristics.

In terms of the knowledge/coordination aspects the tendency for centralization in the EU might be described as a vertical move upwards in the public administration system. The prospects for achieving a coordinated situation will probably improve, from an EU perspective, compared to the former situation with less focused EU policies and measures in the area. At the same time, the centralized planning mode sought after through this change might represent a situation where new government failures at a more centralized spatial level in the system might be the effect. The lack of appropriate data and planning processes both at national and supranational levels in OECD countries, and exemplified by many of the major EU countries, has been observed by Short and Kopp (2005) reporting to the European Conference of Ministers of Transport (ECMT).

Short and Kopp found a number of different planning methods in different countries, a lack of data to base decisions on, a highly politicized decision process, and a weak interest to follow-up and evaluate implemented decisions. At the supranational planning level, Short and Kopp report (p. 364) “analytic weaknesses” also present at the national level, “processes becoming political and politicized to the point where national pride was at stake”,

and that "It was inevitable that project benefits were over-emphasized". There still seems to be a lack of common understanding on which planning efforts should be carried out at a supranational level. The findings seem to underpin the difficulties connected to centralized government planning at both a national and supranational spatial level.

A contradicting view would of course be that centralized strategic planning efforts in the US have without question been an important part of the success of having the Interstate Highway System constructed. Without this centralization the system would probably have been developed slower and perhaps without the national perspective. And it could of course be argued that had the EU worked more strategically with TEN-T development and planning, at least since the 1980s when the EU's internal market focus was strengthened, EU-wide transportation systems would probably have been much more well-developed than today.

Part of the centralized strategic planning paradigm in the US has at the same time been a degree of inflexibility towards local town planning. The political processes with many kinds of negotiations carried out when it comes to financing, coalition building and local town planning issues related to the Big Dig project in Boston, MA, has been described by Altshuler and Luberoff (2003). Similar insights have been reported by Glaeser (2011), who discusses how cities can succeed but often fail when it comes to urban planning initiatives, including transport infrastructure. Apart from exemplifying the difficulties with implementing a one-size-fits-all policy throughout the US, numerous examples of mutual (distributive) rather than concatenate (integrative) planning and negotiation games are exemplified by these scholars.

A line of reasoning supporting more strategic and active coordination in the EU is that other projects would have been prioritized in the EU with such a strategic coordination, possibly with drastically lower investments in the Mediterranean countries and possibly more investments in the more heavily populated areas. From a macroeconomic and growth-oriented point of view this might have given a better result than the present situation, where heavy (over) spending in countries like Greece, Spain and Portugal in transport infrastructure might explain part of these countries' current fiscal difficulties.

This might, however, not give the complete picture. A crucial question, from a knowledge/coordination-perspective, is instead whether a strategy for transport infrastructure development that would have leaned more towards the spontaneous ordering model might have led to different priorities than those chosen both in the EU and in the US. It could be argued that the EU development might have been even more focused on road transportation than today, given the high costs of railroad infrastructure with such a planning orientation. Urban sprawl in the US, as discussed by Glaeser, is perhaps an example of the outcomes of market-led planning. Glaeser though generally gives a broader set of answers to why urban sprawl occurs, market-led urban planning being only one of them.

Winston (2010) describes some of the inefficiencies connected to US highway planning. He exemplifies the inefficiencies with the heavily developed planning bureaucracy, working in a number of organizational layers from the federal down to the local level and the complexities of the funding structure, which make outcomes of federal and state financing difficult to predict. The high degree of discretionary decisions in Congress over transport-related appropriations is another problem that probably lowers the efficiency of the system. Finally, cost-overruns in many investment projects have been a sign of the US system.

The case for leaning more towards a spontaneous market-based view on planning of complex large-scale systems, in some cases connected to urban planning, has been discussed by a number of scholars. Hayek has noted (1944) that transport infrastructure might be an

area for government action, and later (1960) argued that there are a number of flaws connected to public sector town planning such as lack of understanding of proprietary rights, the risk of over regulation and bureaucratization, which makes it less probable to be effective.

In the 1960 text Hayek reflects on the existence of “benefits or harms to others that a property owner may cause” (p. 474), echoing the insights of Coase’s (1960) article on the Problem of Social Cost that dealt with such externalities in market settings. Both Hayek and Coase call for the use of stronger proprietary rights and pricing or negotiations for solving these issues. Gruber (2011) and McCarthy (2001) both raise the more or less classical counterarguments to Coasean bargaining such as the difficulty to price externalities and the existence of free riders. The search for solutions to controversies over land use, partly the effect of external costs, is of course one of the core issues in any centralized planning effort, both generally and specifically for transport infrastructure with these systems’ many external potential conflicts.

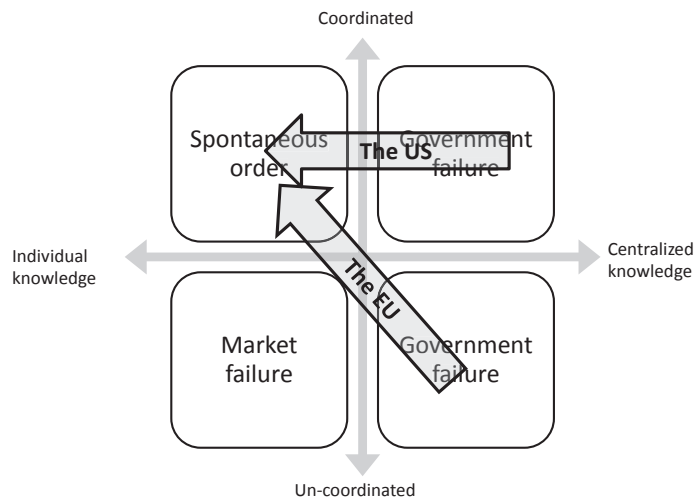


Figure 21

Coordination through spontaneous ordering – a possible way ahead?

Other scholars have focused more on possible ways of strengthening the spontaneous ordering processes, starting from a Hayek/Coase-style analysis. There seems to be a similarity among those scholars in the view that an alternative to government centralized planning should start from smaller geographical units than generally thought of in transport infrastructure planning. A focus on the local neighborhood, municipality or community is a common theme for scholars like Klein (2012), Pennington (2002) and Webster (2002). Based on proprietary rights, negotiations and contractual regulation planning issues at higher spatial levels in society is suggested to take place through spontaneous “inter-authority bargaining” (Pennington, p. 74) rather than through government planning. A bottom-up perspective seems to be an important feature of such spontaneous order style alternative planning. Webster also points to the probability that club-like structures will likely be part of more such decentralized models for spatial planning issues.

How to arrive at a situation that opens for experimentation and competition between different owners and managers of infrastructure assets is another theme that a number of

scholars have raised. Winston (2010) suggests allowing for entrepreneurship and experimentation as the way forward for US transport policy to be revitalized. Market solutions should also be actively sought for to revitalize the transportation sector.

The role of the government in a system based on this a decentralized spontaneous ordering planning mode seems to be one of the institution "protector", assuring the proper regulation (including competition regulation) and functioning of the legislative framework, rather than going into details of planning issues.

An important aspect of the spontaneous ordering mode is the probable existence of larger structures organized in order to reduce transaction costs on markets. Firms and other organizations, possibly encompassing wider spatial areas, are but one such possible structure, mentioned by Coase (1937). Therefore, spontaneous ordering is not necessarily seen as identical to small-scale solutions.

Some concluding remarks

To conclude there seems to be an alternative to strategic infrastructure planning, that is being organized as public sector activities (only). Reforms within the public sector primarily focused on reorganization at new spatial levels might, without an understanding of the planning potentials at different spatial levels, result in new government failures. Openings for decentralized spontaneous market orderings is an alternative that has been discussed in the literature and of which there are numerous examples in reality, based on proprietary rights. These alternatives seem to offer a variety of local solutions and learning processes at many different levels in society. Ideas from the discussion on multi-level governance seem to come close to these alternatives. The knowledge problem, which is inherent in centralized decision structures, perhaps particularly in the public sector, also seems likely to handle measures like these to some extent.

The two current different development strategies in the EU and the US seem primarily to represent the public sector variants of centralization and decentralization. Some measures conforming to market practices are apparent but could probably be strengthened compared to the present policies.

The success of actually having the Interstate Highway System in the US built was partly due to the stronger coordination powers that the federal government was given in the 1950s. Without arguing that all the decisions taken in relation to this system were necessarily justified or well informed from a coordination and knowledge perspective, it seems likely that the centralization of powers during this period was decisive in success of the construction program.

This could be a message to the EU in the current situation. Stronger strategic coordination might be called for if missing links in the EU transport infrastructure system should be realized. Another important message from the point of view might be that market orderings, to the extent possible, should be utilized. These orderings seem to produce knowledge as an end result. Strategic transport infrastructure planning could possibly favor a combination of both measures.

Mainstream literature, while partly discussing institutional aspects on transport infrastructure planning and acknowledging information and agency-related phenomena, seems surprisingly disconnected from the discussion around how coordination in the economy actually can arise. This is true also for the limited (at least explicit) interest in the knowledge problem in public sector planning.

5 REFLECTIONS AND POLICY IMPLICATIONS

In this chapter, the first section includes a further discussion on some of the issues that have been raised in the preceding chapters. These are reiterated and reflected on again from partly different standpoints. The purpose is to extract the general contents of the analyses in the thesis as a basis for a discussion on possible policy implications in the last section.

The scientific contribution in this thesis is fourfold:

- The thesis brings a deepened understanding of the long-term development of the government's role for and policy formation in the transport infrastructure sector in relation to the two theoretical paradigms: neoclassical theory and new institutional theory.
- The thesis shows that the government has first acted reluctantly, waiting for long to make decisions on the nationalization, and then forming transport infrastructure policy with a pragmatic view, gradually adjusting the policies to different situations, but with a stronger emphasis on market failure as the basic assumption over time.
- The thesis shows that there has been a controversy around the financing principles, between a full cost and a marginal cost perspective, which fits a general pattern in many other countries, but also with the two theoretical paradigms.
- The thesis shows that new institutional theory and inspiration from classical liberal theory are important sources for discussing how strategic transport infrastructure planning can be understood and developed.

The concluding discussion on policy implications in this chapter will take these insights as a point of departure.

5.1 Reflections

A market failure stance in transport infrastructure leading to sustained government interventionism

The historical background in Chapter 4 describing the nationalization process and the following policy formation from the 1940s to the 2010s has shown that the government has gradually become more involved in the road and railroad sectors in Sweden, with parallels in many other countries. It is argued that the government did not take the steps to nationalize the systems until it was perceived as absolutely necessary. And when the nationalization was a fact the government acted, through the 1940s until the late 1960s, more as a business-oriented owner of the infrastructure system compared to what might have been expected from an owner, as the government had nationalized formerly private and locally held assets. Competition and a focus on the financial costs of the businesses were primarily prioritized, while social aspects and welfare economics did not influence the sector more profoundly until the 1970-80s.

There has been a mix of influences from both of the theoretical paradigms studied in the thesis at different times and with different results for the policy formation. The long time period of government ownership, gradually stronger emphasis on marginal cost pricing, and financing policies have gradually fostered a general and overriding policy setting in the sector with a preference for a market failure view. It can be argued that this has led to a self-sustaining process where the nationalization in the 1930-40s has led to a widened government intervention and a stronger general dependence on the government in the road and railroad sector over time.

This is described in Figure 22 as a self-sustaining process where: (1) tendencies for large-scale effects in transport infrastructure lead to or motivate large organizational units in transport infrastructure; (2) a situation which calls for nationalization; (3) a move which is gradually followed by demands for marginal cost pricing; and (4) where marginal cost pricing makes subsidies necessary primarily for railroads, and major cross-subsidization flows in the road sector are made possible.

Marginal cost pricing thus makes the government more involved in the sector and in turn opens for sustained government ownership. Any potential competitors to the government are forced out of the market at the prevailing price level, and potential competitors are unable to establish themselves in the market at the prevailing price.

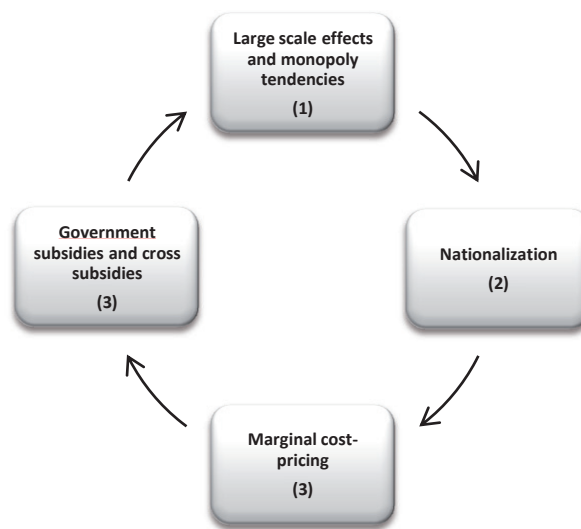


Figure 22

Self-sustaining process of government intervention and ownership

This process might also be seen as an example of path dependency creation. The government's ownership over a long period of time has created expectations for a continuation of that role in the future, a role that also had technological, economic, political, and socio-cultural explanations.

In terms of the institutional perspective, it could be argued that part of the market failure stance has been a tendency of the government to choose intervention in the market processes to impose regulation, taxes and compulsory fees to handle external effects. A less intervention-oriented policy stance could have been to lean more on markets and negotiation in line with Coasean bargaining, according to which markets (in a world with low or absent transaction costs and clear proprietary rights) could be expected to give efficient outcomes without government intervention.

The nationalization, which was originally motivated by general policy concerns more than by ideological values, seems therefore to gradually have evolved into a situation and role for and policy of the government that has been relatively easy to prolong but difficult to alter. Over time, the patterns of government interventionism gradually become more institutionalized and the alternatives seem to become more unrealistic. Aiming for rational

management and large-scale efficiency as the initial intention, the government in the long term seems to end up with a sector with lower than necessary organizational efficiency, innovativeness and flexibility.

A similar observation with regard to deregulation in the Swedish bus and railroad markets has been reported by Alexandersson (2010). The deregulation of these markets seems to have followed from other measures taken in relation to regional public transportation and railroads. Once deregulation has been set in motion a number of unanticipated consequences occur, spurring successive policy action by the government in order to accommodate the new situation. This in many ways seem to resemble the development of the government's role in transport infrastructure.

The "public good content" of transport infrastructure at different spatial levels

Transport infrastructure systems are developed at different geographical (or spatial) levels. Private and local roads and railroads are utilized by single users or infrastructure owners, while the number of users increases in the system to regional, national and supranational structures. There are a number of coordination problems that must be taken care of as the structures become more complex at higher, more strategic, levels in the transport infrastructure system.

Many of these issues have been discussed by Levinson (2002), where different management structures are pointed to as potentially efficient (p. 83 ff) depending on the geographical outreach of the systems. In general, Levinson suggests that higher level structures are more likely to be provided on market-like terms, while local structures will show more public goods signs. Perhaps at the most local of levels in the system this is reversed so that roads or railroads that are used only by single households or companies are likely to be provided by these actors themselves as private goods.

Tolls (if we for a while imagine physical tolls on roads) on a local road leading to one or few households or factories is relatively easy to imagine. It is also relatively easy to think about tolls on major roads as motorways, as such exist to a large extent. General tolling in cities (except for congestion charging) is, however, more difficult to imagine. These would probably lead to high transaction costs and a number of practical difficulties. Yet, of course, with the use of modern technology such as GPS tolling also in cities would of course be possible.

If the dichotomy public/private goods is taken as a starting point for an analysis of the degree of public versus private good content at different spatial levels, a figure like the one below could illustrate the arguments.

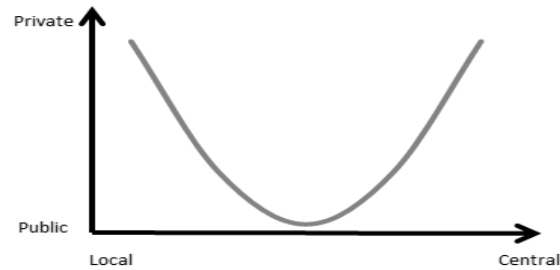


Figure 23

Private good versus public good content in transport infrastructure at different spatial levels

At the local level (roads for private homes and rail connections for individual industries) the assets are more or less genuinely private goods since they are used exclusively by only one user who could also pay for these assets. At the municipal or local government level streets in towns and regional or local railroad systems such as metro systems exist. These are often organized as public goods by the local government/region since it is often difficult to design a private sector business model that works at this spatial level. On the right side in Figure 23, national or border passing strategic roads and railroads are found. For these, once again, the excludability is higher and the degree of public good content lower. This would suggest that these are more likely to organize as private goods in market-like structures than local and regional roads and railroads.

The balance between spatial level and organizational form, which is important to bring into a discussion on possible future policy implications for roads and railroads and the government's role, is the theme of the last section in this chapter.

Information and knowledge

With regard to information and knowledge a number of scholars, such as Hayek (1944) and recently Klein (2012) and Pennington (2011), have discussed the tendency for knowledge to exist decentralized (dispersed) rather than it being possible to obtain by an organization's center or by a planner, even if the best of techniques for data sampling and collection is applied. For these authors, as for many others in the liberal tradition, this is one of the basic arguments against the possibility of successful centralized planning and also a case against many government activities in general.

Knowledge about aspects important for transport infrastructure development, according to this view, is more likely to be found among individuals than in centralized public sector organizations. This is not to say that organizations such as firms should not exist. These structures are justified by their function to reduce transaction costs, such as information cost, and thus have an important role in an economy and in a decentralized market model. One thing that is crucial with organizations active in markets is, in comparison with governments that firms must focus on the individual customer's demand in order to survive. In this way they, at any time, must understand and collect information about the individual customer's preferences, which can be seen as an expression of the decentralized, or dispersed, knowledge in any society.

There are a number of difficulties connected to knowledge accumulation and learning in markets that often make these perform less than optimally. Information asymmetry (sometimes leading to moral hazard) is one aspect that can lead to failure. Institutional factors like regulations, customs, languages, and different organizational settings can be other aspects that diminish or disable information flow and knowledge accumulation. As pointed out by Rietveld (2012), this is true when it comes to planning activities on a strategic level in transport infrastructure systems.

The public sector has often been criticized for not functioning in accordance with the idealistic rational model described in documents such as constitutions, but nevertheless the rational model is the starting point in many discussions on the prospects of government action compared to markets. One of the problems is that the politicians, and the administration, find it difficult to collect and transfer knowledge about the electorate's perceptions and priorities when it comes to activities like transport and transport infrastructure. The situation is probably even more difficult in the sense that there is no collective observable demand for transport infrastructure based on individual voters' priorities. Lacking such knowledge the public sector has two choices when it comes to strategic infrastructure planning: act like a private owner of a corporation focusing on the market and customers, or base its strategies on politics.

Difficulties with the first of these two alternatives, the government managed market solution, are that the structure of the organizations or agencies are often close to monopolies, which is not always a good model for a good interpretation of individual user's and customer's views. When the other model is chosen, with a political footing in strategic transport infrastructure planning, the problem is that politics is easily dominated by small groups of well-organized interests outside of political parties, like business associations, regional policy proponents or any other interest group. This is generally neither a good basis for an efficient use of the resources available for transport infrastructure nor for successful strategic planning. Thus, both market failure and government failure tendencies are realities in transport infrastructure planning. The lack of knowledge, and the weak incentives working for an increase of that knowledge, are important explanations of such failures.

The spatial dimension and the connection to incentive strength

Combining the two aspects of coordination and knowledge gives further insights as to the difficulties and possibilities faced in strategic infrastructure planning. In one extreme in a theoretical spectrum – the local – the potential gains from coordination of strategic development and the potential for actually having access to the necessary information for carrying out any fruitful coordination must be balanced. Therefore, at the local level in the system it is likely that information might be possible to collect in a municipality around some strategic development affecting transport infrastructure. This is possible both in the case of government-led planning and in the case of a market setting. The potential gain from strategic planning efforts at the same time is often rather limited since the complexity in local systems (even if it is often considerable) might not be that high.

Connected to knowledge is efficiency incentive strength, which can be expected to be stronger at local levels, where evaluation of public sector activities might be stronger than at higher spatial levels in the system. This is in line with Hayek's (1960) and Tiebout's (1956) reasoning, which has been reflected earlier.

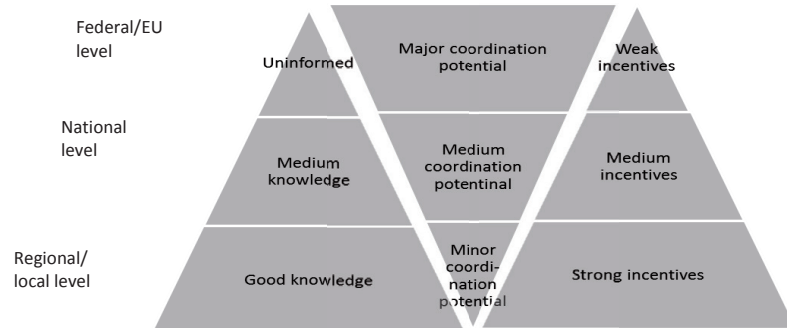


Figure 24

Potential gains from and prospects for coordination at different spatial levels in relation to incentive strength

In the other extreme, the supranational, there seems to be good reasons to expect that the coordination potential is higher. There are a number of interrelated questions that arise at the supranational level that allow for coordination gains. Different transport modes can be chosen to provide transportation capacity between countries, where the cost of experimentation on markets without coordination or strategic planning could be high. The institutional factors and circumstances that hamper cross-border projects from being realized also call for some kind of facilitation from a regulator. By lowering transaction costs through a supporting institutional setting, experimentation might be fostered and a natural monopoly situation might be avoided.

One of the main difficulties connected to coordination at this higher spatial level is of course the lack of knowledge on a number of issues related to transport infrastructure. For example, it is difficult to project the generated demand for rail transportation as a new bridge connecting two countries is planned.

New patterns for occupation and work will be formed over time, the scope of which is also difficult to project. The division of transport flows between road and rail on new connections is also very difficult to calculate. The net effect of these difficulties is a high risk level for these projects, which can be expressed as high transaction costs. Experimentation is difficult partly because of this. There seems to be difficulties connected to both the market model and government planning in these cases, where coordination might have the highest potential benefits. One of the explaining factors might be the weaker efficiency incentive structures at higher levels in the system. Evaluation of public sector activities are more difficult at national and supranational levels, where many different interest groups try to influence the outcome of the political processes and where resource allocation is often difficult to monitor.

It is also important to strike the balance between spatial planning levels, knowledge and incentives when discussing possible future policy implications and solutions to these. These insights at the same time have to be reflected against the insights from the former section, partly speaking in favor of market settings on higher spatial levels and public sector settings on regional and local levels. Transport infrastructure is a multi-dimensional field.

5.2 Policy implications

5.2.1 Future challenges for the government

Going from backward-looking and thus outcome assessment based on observation to forward-looking projection and normative prescription is difficult when aspiring for formal academic accuracy. One thing to note is that forward-looking is often closer to normative views than analysis based on observable outcomes. A reasonable starting point for a discussion on possible development lines in the future and challenges for the government might be to structure the analysis in line with the co-evolutionary approach in the thesis. Influences for change and challenges for the government might originate from all of the three factors in the co-evolutionary approach. Co-evolution clearly has to do with dynamism and change.

The argument in this thesis is that the combination of factors that call for change seems to be stronger today compared to many other situations since the nationalization. Whether the challenges to the government's role in transport infrastructure is more or less pressing today than in earlier periods since the nationalization can of course be discussed. It might be enough here to take as a starting point the view that there are of course always factors calling for change but that many factors seem to call for change right now.

As for *technology* it is obvious that there is current development with regard to more powerful IT support to underpin a more efficient capacity management on the existing infrastructure networks, and also a fast introduction of technology for road and railroad charging. Sustainability is at the forefront of much of this development, with the transport system being one of the main sources of carbon emissions and with an intense search for new fuels and energy sources. It also seems likely that technology development will lead to transport infrastructure systems, which are less nationally separated by different technologies as for signaling in railroad systems, for example. Both in the US and in most European countries sustainability-supporting technologies are prioritized in government development agendas and the industry in the transportation field at large.

Improved capacity utilization through the implementation of better traffic management systems based on GPS technology might reduce the need for new investment in transport infrastructure in the future. It is also possible that sustainability-inspired policies will foster electrification of roads and the wider breakthrough of low emission technology. Of course these changes might bring relative price changes between transport modes, which will in turn affect future attractiveness and the further development of transport infrastructure.

Within the area of *economic factors*, government financing of the road system (and to some part the railroad system) has been depending on the collection of fuel and vehicle taxes since the 1920s. The willingness to pay high fuel taxes and the low elasticity of demand for these goods has generated a steady stream of financing even as tax levels have increased drastically. This system is, however, likely to be challenged by more fuel-efficient motor vehicle technology in the future and a shift to new energy sources. Tendencies for a slowdown of the increase of revenues from the road transport-related taxes, or even decrease of the revenues, have been reported earlier in this thesis. The current per-liter dominated tax systems for road system taxes will therefore probably have to be altered for taxes on other energy sources like electricity and or per-km charging at a large scale in the near future to meet this challenge for government's funding of transport infrastructure.

Decreasing tax revenues might also make increased fees and self-financing for railroads necessary and cross-subsidies within the systems might therefore be difficult to uphold. While bringing difficult change processes for political reasons, this process is also

allowing for new less national and more cross-border style payment systems, and for the marketization of road and railroad systems. With more separable income streams, closed systems based on earmarking might become a reality. Thus, one of the basic motivations for government-administered systems might become less relevant.

There is a continuous drive for larger scales of most organizations working under a decreasing cost structure. In an earlier development step, larger structures were organized at a national level to take advantage of large-scale effects. A next step might well be to move to an international level to reap large-scale effects. Similar shifts in spatial focus have been realized in many transport system-related functions and organizations and are also likely in transport infrastructure. At the same time, the discussion on management styles in line with Langlois, Ruiter and Wagner, focusing more on learning, knowledge generation and the openness for other organizational forms than the often too simplified private/public dichotomy, should be taken into account. Transport infrastructure might, following this line of reasoning, be organized in multiple organizational forms in the future. Economic factors are thus bringing a number of challenges to the government's historical role in transport infrastructure.

Politics in many countries seems on the one hand to be focused on preserving the national perspective on transport infrastructure with cautions around changing financing systems and with an interest in preserving the possibility to influence regional development and regional growth through transport infrastructure systems. On the other hand, the political system in Sweden is interested in both stronger European and Nordic cooperation and is, at least in theory, open for strengthening the regional level. Ultimately, politics works for a structure where more decisions are taken at a multilateral or supranational level and/or at a local and regional level. The spatial dimension thus brings challenges for the government that seem to work in different directions.

A conclusion of this take on the future challenges is that there are indeed a number of possible future development lines that must be taken into account when a future role for the government is analyzed and formed. These challenges can affect both the balance between public and private provision of the systems and the spatial level the systems are organized at. The concluding section of this thesis will outline some possible models, and a number of trade-offs for the future development are discussed.

5.2.2 Possible future development

This thesis has illustrated a number of trade-offs that must be taken into consideration when discussing a possible future development for transport infrastructure. These trade-offs will probably affect the government's role and the transport infrastructure system in many different ways. In this section, the following aspects will be further discussed:

- The balance between public and private responsibility for transport infrastructure as the basic organizing principle.
- The balance between government and regions/local governments with regard to the geographical division of responsibility.
- The balance between the national level and the EU for strategic transport infrastructure planning and coordination versus more spontaneous coordination.

The discussion is organized around three figures where the different balancing themes are displayed. The different future organizing principles as displayed in the figures would, if implemented, be alternatives focusing on different outcomes of coordination, incentive st-

rength, and on welfare economics and politics. The combinations of possible future models also reflect the neoclassical/welfare economics-based view and the institutional/organizational view, respectively.

In general, solutions that focus on preserved government ownership, a tax-based funding system, would favor welfare economics and wider political aspects, whereas private sector solutions with user financing would favor higher productivity and a consumer orientation. The latter alternative seems to be in line with the current development in many European countries. For an overview of current development themes in some European countries of organization and financing of transport infrastructure, see Hasselgren (2013 a).

The figures below are to a large extent stylized in order to show different ideal models. It could of course be the case that proposals combining the different models in the figures could be chosen to combine stronger incentives with preserved government ownership, or alternatively government support for private sector organizations to be realized (concession style agreements or government guarantees for revenues).

The first balancing point to take into consideration when discussing the future government role and system structure focuses on the spatial level and the organization of ownership. Today, the government owns the roads and railroads, and the operations of the systems are organized at a national level with one operational government agency.

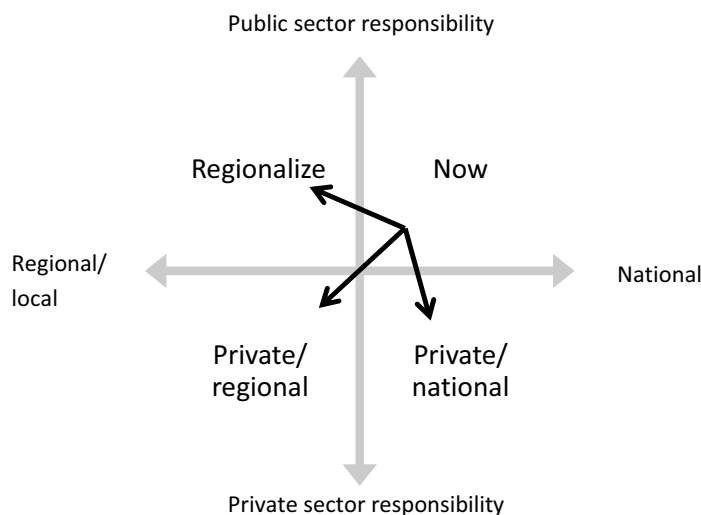


Figure 25

Ownership and spatial level balance

Alternatives could be to decentralize ownership to the regional level, while still in the public sector such as to the regions. One aspect to take into account in the current Swedish setting would be that the regional level is currently organized in different ways in different parts of the country. Some of the regions (*Västra Götaland* and *Skåne*) have stronger and formally established public sector organizations, which clearly could take on larger parts of the responsibility for roads and railroads. Most other regions are still left in a previous organizational structure, with a less consolidated public sector organization and in smaller geographical units.

Another possibility would be to transfer responsibility to the private sector. Also in this respect there could be a choice between a national and regional perspective. One model would be to allow for privatization of the national road system, possibly after reducing its length or only parts of it. Another model could be to organize a number of regional corporations for road management. Similar models exist in different countries, such as regional road organizations in Austria and a number of railroad corporations in Japan and the US.

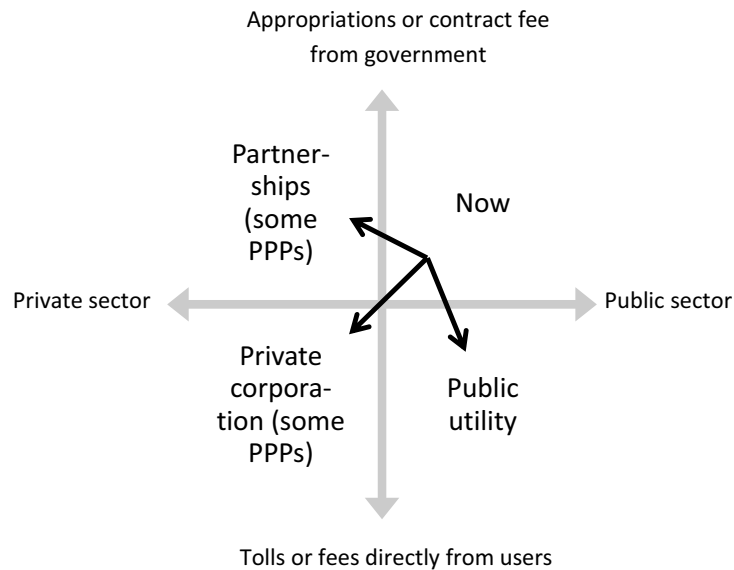


Figure 26

Financing and ownership balance

A similar balancing point exists between the financing methods and the choice of public sector versus private sector organization. Alternatives to the present system of government ownership and financing (mainly through taxes and compulsory fees) could be to establish a public utility, owned by the government but financed by user fees. Such an organization would strengthen the user orientation and incentives for efficient resource utilization while preserving the national coordination. Examples from Sweden are other government agencies such as the Swedish National Grid (*Svenska Kraftnät*), which manages the major electricity grid and is funded by user fees, or the agencies responsible for maritime and aviation systems. Many of the public utilities in Britain are other such examples.

Other alternatives to the present organization would be different kinds of partnerships between the public and the private sector. A common form of this in many other countries are PPPs, where the public sector and the private sector cooperate in different ways. The risk sharing between the parties can be organized in a number of different ways but often asks that the government carry some of the financial risks or pays a service fee to the private contractor for the provision of a road or railroad. Revised models for these types of partnerships between the public and private sector have been presented in Britain as part of the PF2 initiative, including a fresh start for the use of the Public Finance Initiative (PFI – UK's model for PPPs) (Hasselgren, 2013 a). Leaning more towards the private sector solution are examples where government support or guarantees to the private sector supplier is

more limited in its scope, in other words through toll financing combined with concessions. Some more far-ranging PPP agreements could also be included in this model.

PPPs have been used only to a very limited extent by the government in Sweden, and the it has recently stated (Bill 2012/13:25) that financing through private partners will generally be more expensive than through government. This government bill on the future development of transport infrastructure systems has more or less banned the future use of PPPs for government-run transport infrastructure projects.

However, PPPs for transport infrastructure have been used in Finland, Norway, Britain, and Germany – to mention only some European countries – for roads, some railroads, and also by regional and local governments in Sweden. The new major hospital in Stockholm, (Nya Karolinska Sjukhuset) is one such major example. This is to show that the PPP model can be brought to use if only if it is well designed and regulated, and with an understanding that it is best suited for increased efficiency, not as a financing model. In light of this the government's ban on PPPs is puzzling.

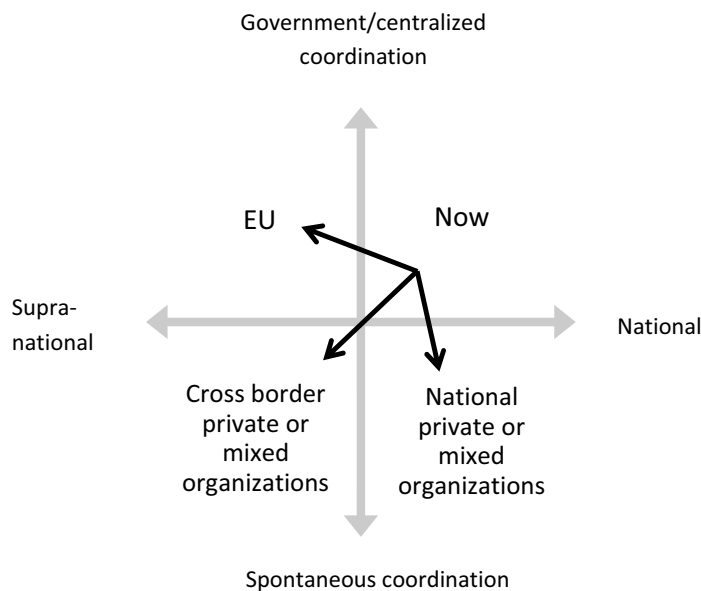


Figure 27

Coordination model and spatial level

Comparing the present government model, with largely centralized planning and coordination, with other possible models is the last variant of the balancing points. Here, one of the choices is to transfer more coordination responsibility to the supranational level or to focus on decentralization and spontaneous coordination at a national or regional level.

Transfers to the EU level have already been made with the development of the European transport policy with the TEN-T policies. Furthermore, the European Commission has suggested initiatives with proposals for (green) transport corridors at a European level and discussions around a Single European Rail Infrastructure Management in order to overcome some of the obstacles to the functioning of EU as one transport market.

Examples of both national mixed public private infrastructure organizations and cross-border cooperation, and in various mixed organizations, are found in some of the other infrastructure sectors such as finance, telecom, energy, postal services, and aviation. These also show that in sectors where formerly government ownership and coordination was the preferred model, private sector organizations are clearly capable of managing coordination roles such as strategic planning, financing and the efficient day-to-day operation of the systems. Up to the 1980s many of these sectors have also been seen as parallels to natural monopolies, where the government was the only or preferred owner or manager.

Today, these sectors are generally organized within the boundaries set by government control and regulations covering market access, competition, consumer rights, and fee structures. Most of the earlier functions of the government have, however, been left to the private sector to basically handle spontaneous coordination. In many of these sectors, business growth in combination with technological innovation has been both drivers of and an effect of privatization efforts. There are good reasons to believe that similar effects could result from changes in ownership in the road and railroad sectors as well. Innovation and growth have increased in most of the sectors in transport, which have been deregulated historically.

For a recent evaluation of some of the deregulated sectors in transport in Sweden, see Nilsson (2012). This report shows a mixed result with increases in supply, higher than average price increases, and a developed content of the services. Ottosson and Andersson-Skog (2013) have also recently presented an overview of regulatory regimes in the infrastructure sector in Sweden, which is interesting in this respect, exemplifying changes in regulatory regimes over time.

In terms of the balance between welfare economics and institutional theory, the models for future reorganization depend on the focus that the government wishes to place on the different aspects. It is possible to organize activities currently carried out in government agencies in more business-like structures. This is shown by, for example, the Swedish agency responsible for electricity networks, the government-owned corporations for airports (*Swedavia*), and railroad stations and terminals (*Jernhusen*).

If organizations of this kind should also take into account welfare economics and in general wider economic growth in their operation, that could be done through imposing (generally) softer financial goals for them compared to market organizations or by giving them specific roles in the articles of association. This has been the case for the government-owned corporation responsible for railway stations in Sweden, *Jernhusen*. Another measure is of course to implement regulation or taxes that might reflect external effects in the prices on the market or environmental effects in planning processes. This measure has been widely used in Sweden and could be seen as an example of measures in line with Coase's theories of market conform solutions to externalities.

From an institutional point of view, it could be argued that the alternatives presented above, besides their different strengths or weaknesses with regard to incentives for efficiency, perhaps differ most in relation to their possible responsiveness to change and openness to learning. Market-oriented organizations with a clear relationship to with users, for example for financing with earmarking, could thus be expected to be more open to learning and change than government agencies funded by taxes. In this respect the alternatives that open for market orientation, decentralization and customer focus, seem to meet institutional theory's recommendations better than centralized government models. Of course this is not to say that other models should be excluded. In the end, the choice of regulatory model, government intervention or market structures, has largely to do with different views on a number of aspects where clear-cut scientific conclusions are hard to establish.

Therefore, there are a number of alternatives for the government to meet the challenges in the future. In a long-term perspective, there have been successive shifts between periods with government-led consolidation and market-led innovation and growth. At this current time, with a number of challenges to the government-led systems, a change towards more market-led innovation and growth might be a solution for the future.

INTERVIEWS

Sweden

Former State Secretary **Leif Zetterberg**, Ministry of Enterprise, Sweden.

Head of Infrastructure Unit **Hans Brändström**, Ministry of Enterprise, Sweden.

Former State Secretary **Hans Lindblad**, Ministry of Finance, Sweden.

Director General **Brita Saxton**, Transport Analysis, Sweden.

Head of Division **Gunnar Eriksson**, Transport Analysis, Sweden.

Senior Advisor **Per Björklund**, Ministry of Enterprise, Sweden.

Former Secretary General **Anna Grönlund**, Swedish Bus and Coach Federation.

International organizations

Sector Manager **Marc H Juhel**, World Bank, Washington, D.C.

Senior Urban Transport Specialist **Matthew Jordan-Tank**, European Bank for Reconstruction and Development (EBRD), London.

Helmut Adelsberger, Directorate General for Mobility and Transport, Unit B.1 Trans-European Transport Network Policy European Commission, Brussels.

Former Executive Director **Hendrik Abma**, European Rail Infrastructure Managers, Brussels.

Denmark

Senior Advisor **Carsten Vædele Madsen**, Centre for Roads and Bridges, Ministry of Transport (*Transportministeriet*).

Director Road Planning **Ole Kirk**, Danish Road Directorate (*Vejdirektoratet*)

Project Director **Jan Erik Schneider-Tilli**, Banedanmark.

Senior Advisor **Annette Christensen**, Confederation of Danish Industry (*Dansk Industri*)

Finland

Senior Advisor **Suvanto Tuomo**, Ministry of Transport and Communication (*Kommunikationsministeriet*).

Director **Kari Ruohonen**, Investment Projects, Finnish Transport Agency (*Trafikverket*).

Germany

CEO Prof. **Torsten R. Böger**, Association for Transport Infrastructure Financing mbH (*VIFG Verkehrsinfrastruktur-finanzierungsgesellschaft mbH*) ().

Head of Division **Lutz Dietrich**, Infrastructure Financing Policy Issues, German Ministry of Transport, Building and Urban Development (*Bundesministerium für Verkehr, Bau und Stadtentwicklung*).

Head of PPP Division **Tatjana Tegtbauer**, German Ministry of Transport, Building and Urban Development (*Bundesministerium für Verkehr, Bau und Stadtentwicklung*).

Norway

Deputy Director General **Ola Brattegard**, Department of Public Roads and Traffic Safety, Ministry of Transport and Communications (*Samferdselsdepartementet*).

Deputy Managing Director **Kjell Werner Johansen**, The Institute of Transport Economics (*Transportøkonomisk institutt, TØI*).

Hans Silborn, Norwegian Public Roads Administration (*Vegdirektoratet*).

UK

Development Manager **Joelle Bailey**, Network Rail.

Head of Commercial Special Projects **James Baird**, Network Rail Infrastructure Limited.

Christopher Bell, Roads Feasibility Study, Highways Agency.

Head of Infrastructure Delivery **Stephen Dance**, Infrastructure UK, HM Treasury.

Michael Dnes, Roads Reform, Department for Transport.

Professor **Stephen Glaister**, Department of Civil & Environmental Engineering, Imperial College London.

Partner **Manish Gupta**, Infrastructure Advisory, Ernst & Young.

Deputy Director **Brian Kogan**, Railway Markets and Economics, Office of the Rail Regulator.

Policy Advisor **Alan Mundy**, Department for Transport.

Associate Director **Kai Rintala**, Global Infrastructure, KPMG LLP.

USA

Executive Professor **Joseph M Giglio**, Northwestern University, College of Business Administration, Boston, MA.

Professor **José A Gómez-Ibáñez**, Urban Planning and Public Policy, Harvard University.

Managing Director **Phil Herr**, Physical Infrastructure Issues, U.S. Government Accountability Office, Washington, D.C.

Director **Joseph Kile**, Congressional Budget Office, Washington, D.C.

Executive Director **David Luberoff**, Rappaport Institute for Greater Boston, Harvard Kennedy School.

Robert Puentes, Metropolitan Policy Program, Brookings Institute.

Dr. **Ron Utt**, The Heritage Foundation, Washington, D.C.

Senior Transportation Planner **C. Patrick Zilliacus**, Metropolitan Washington Council of Governments, Washington, D.C.

FIGURES	PAGE
Figure 1	12
Coordination through spontaneous ordering or planned action	
Figure 2	13
Some trade-offs in transport infrastructure policy and organization, connected to the theoretical paradigms	
Figure 3	22
Outline of thesis – appended papers and covered aspects	
Figure 4	25
The government’s functional roles and the spatial levels of transport infrastructure	
Figure 5	30
Neoclassical and institutional theories – some features	
Figure 6	32
Theoretical approaches – “the core and the cloud”	
Figure 7	33
The theoretical paradigms and applications of these in transport infrastructure	
Figure 8	35
Public and private goods and models for provision of these services and goods	
Table 9	40
Transaction costs and cases for hierarchy or market organization	
Figure 10	41
Three eras of managerial practices over time	
Figure 11	44
Development of transport infrastructure systems – a co-evolutionary approach	
Figure 12	48
The traditional arguments for government intervention in transport infrastructure	
Figure 13	51
Transport infrastructure chronology 1939-2010, a co-evolutionary perspective	
Figure 14	54
Push from technology and economic factors seem to explain the nationalization more than politics and socio-culture. A public sector organization was chosen.	

Figure 15 55

Postwar transport infrastructure policies were mainly developed based on a discussion around the available resources and the demand for new road capacity. Government ownership was not put into question.

Figure 16 57

Transport infrastructure policies have become more and more influenced by welfare economics and politics since the 1970s. Government ownership has prevailed with some openings for alternative financing and private initiatives.

Figure 17 61

Coase and Pigou/Hotelling – different views on cost coverage and financing

Figure 18 65

The marginal cost controversy in Sweden's transport infrastructure policy

Figure 19 70

Four modes of strategic transport infrastructure planning

Figure 20 74

Centralization and decentralization of strategic transport infrastructure issues

Figure 21 76

Coordination through spontaneous ordering – a possible way ahead?

Figure 22 80

Self-sustaining process of government intervention and ownership

Figure 23 82

Private good versus public good content in transport infrastructure at different spatial levels

Figure 24 84

Potential gains from and prospects for coordination at different spatial levels in relation to incentive strength

Figure 25 87

Ownership and spatial level balance

Figure 26 88

Financing and ownership balance

Figure 27 89

Coordination model and spatial level

LITERATURE

- Government committees and government bills

SOU 1947:85 "Det inrikes trafikväsendet", 1944-års trafikpolitiska utredning, Stockholm.

SOU 2011:49 "Medfinansiering av transportinfrastruktur", Stockholm.

Bill 2008/09:31 Transportstyrelsen och dess verksamhet, Stockholm.

Bill 2012/13:25 Investeringar för ett starkt och hållbart transportsystem, Stockholm.

The Instrument of Government (*Regeringsformen*), 1974:152.

- Reports from organizations

Ekonomistyrningsverket (2012) Utfallet för statens budget – del av ESVs underlag för årsredovisning för staten 2012, ESV 2013:23, Stockholm.

OECD/International Transport Forum (ITF) (2008) *Transport Infrastructure Investment: Options for Efficiency*, Paris, 2008.

Trafikverket, (2012) Samhällsekonomiska principer och kalkylvärden för transportsektorn: ASEK 5.

- Other articles and reports etc by the author

Hasselgren, B. (2011 a) The Reluctant Infrastructure Manager: Nationalization of Rail and Road Infrastructure in Sweden, 1930 to 1940, presented at Transportation Research Board's Annual Meeting 2012, USA.

Hasselgren, B. (2011 b) En mer effektiv transportinfrastruktur, *Ekonomisk Debatt*, vol. 39, no. 6, pp. 20-34, Stockholm 2011.

Hasselgren, B. (2012 a) *Effektivare transportinfrastruktur – med ny organisation och finansiering*, Rapport för Stockholms Handelskammare 2012:1, Stockholm.

Hasselgren, B. (2012 b) Challenges and reorganization models for Government in Transport Infrastructure, presented at research conference, Södertörns Högskola, 2012.

Hasselgren, B. (2013 a) *Transportinfrastrukturen i förändring, Organisering och finansiering*, ESO-rapport, juni 2013, Finansdepartementet, Stockholm.

Hasselgren, B. (2013 b) Review of Richard Wagner's 2012 book *Deficits, Debt and Democracy, Wrestling with Tragedy on the Fiscal Commons*, *Ekonomisk Debatt*, vol.41, no. 4, pp. 71-75, Stockholm.

Hasselgren, B. (2013 c) *Näringslivets transporter, Hur kan transportinfrastrukturen bli mer effektiv?*, research report for the Transport Group (*TransportGruppen*), ISSN 1653-6126, Stockholm.

- Other literature

Alexandersson, G. (2010) *The accidental deregulation: essays on reforms in the Swedish bus and railway industries 1979-2009*, (Doctoral dissertation, Stockholm School of Economics).

Altschuler, A. and Luberoff, D. (2003) *Mega Projects – The Changing Politics of Urban Public Investments*. The Brookings Institution, Washington D.C.

Alvfors, K.-G. (1977) *Järnvägsförstatligandet - svensk järnvägspolitik under 1930-talet*, Svenska järnvägsklubben skriftserie nr 21.

Andersson Skog, L. (1993) *Såsom allmänna inrättningar till gagnet, men affärsföretag till namnet. SJ, järnvägspolitiken och den ekonomiska omvandlingen efter 1920*, Åa Umeå.

Andersson-Skog, L. (1996) From State Railway Housekeeping to Railway Economics, Swedish railway policy and economic transformation after 1920 in an institutional perspective, *Scandinavian Economic History Review*, vol. 44, no. 1, pp. 23-42.

Anell L., Hedborg A., Lönnroth M. and Ingelstam L. (1971) *Ska vi asfaltera Sverige?* Pan/Norstedts.

Banister, D. (2002) *Transport planning*, Routledge.

Banister, D. and Hickman, R. (2012) 'Transport futures: Thinking the unthinkable', *Transport Policy*, <http://dx.doi.org/10.1016/j.tranpol.2012.07.005>

Bas, D. S. (2011) Hayek's critique of the general theory: a new view of the debate between Hayek and Keynes, *The Quarterly Journal of Austrian Economics*, vol. 14, no. 3, pp. 288-310.

Bergh van den, J. and Stagl, S. (2003) Coevolution of economic behavior and institutions: towards a theory of institutional change, *Journal of Evolutionary Economics*, vol. 13, no. 3, pp. 289-317

Blankart, C. B. and Fasten E. R. (2011) Knut Wicksell's principle of just taxation revisited, in *The Evolution of Economic Theory Essays in Honour of Bertram Schefold* ed. by Caspari, V, Routledge, London, pp. 132-141.

Blaug, M. (2007) The Fundamental Theories of Modern Welfare Economics, Historically Contemplated, *History of Political Economy*, vol. 39 (2), pp. 185-207, Duke University Press.

Blomkvist, P. (2001) *Den goda vägens vänner – Väg- och billobbyn och framväxten av det svenska bilsamhället 1914-1959*, Brutus Östlings Bokförlag Symposion, Stockholm/Stehag.

Bogart, D. (2009) Nationalizations and the Development of Transport Systems: Cross-Country Evidence from Railroad Networks, 1860-1912, *The Journal of Economic History*, vol. 69 (01), pp. 202-237.

Bohm, P. (1973) *Ansvarigt och oansvarigt om bilismens kostnader*, vol. 1 (5), pp. 326-330, Ekonomisk Debatt, Stockholm.

Bohm, P., Bruzelius N., Hesselborn P.-O., Johannesson M., Ruud T. and Thedéen T. (1974) *Transportpolitiken och samhällsekonomien*, LiberFörlag, Stockholm.

Bruzelius, N., Flyvbjerg, B., and Rothengatter, W. (2002) 'Big decisions, big risks. Improving accountability in mega projects' *Transport Policy*, vol. 9 (2), pp. 143-154.

Buchanan, J. M. (1968) *The Demand and Supply of Public Goods*, Liberty Fund Inc, USA, 1968/1999.

Buchanan, J. M. and Tullock, G. (1962) *The calculus of consent: Logical foundations of constitutional democracy*, (Vol. 100), University of Michigan Press.

Bulletinen (2012) Nr 2, 2012, Enskild väghållning i svensk historia 1200-2010, based on Blomkvist, Pär Om förvaltning av gemensamma resurser: Enskild väghållning och allmänningens dilemma i svensk historia 1200–2010 (Managing Common Pool Resources: Road Keeping and the Dilemma of the Commons in Swedish History 1200–2010), Division of Industrial Dynamics, Royal Institute of Technology, Stockholm (Stockholm 2010), TRI-TA-IEO 2010:06.

Button, K. (2010) Transportation Economics: Some Developments Over the Past 30 Years, *Journal of the Transportation Research Forum*, vol. 45, no. 2.

Button, K. J. and Hensher, D. A. (2005) *Handbook of Transport Strategy. Policy and Institutions*, Oxford: Elsevier Ltd.

Cars G., Malmsten B. and Witzell J. (2011) *Infrastruktur med finansiering*, KTH Royal Institute of Technology, Department of Urban Planning and Environment, Stockholm.

Chandler, A. D. (1977) *The visible hand: the managerial revolution in America business*. Belknap Pr.

Chandler, A. D. (1990) *Scale and Scope*, Belknap Press of Harvard University Press.

Chandler, A. D. (1992) Capabilities and the Economic History of Industrial Enterprise, *The Journal of Economic Perspectives*, vol. 6, no. 3, pp. 79-100, American Economic Association.

Chisholm, D. (1989) *Coordination Without Hierarchy, Informal Structures in Multiorganizational Systems*, University of California Press.

Clifton J., Lanthier P. and Schröter H. (2011) Regulating and deregulating the public utilities 1830-2010, *Business History*, vol. 53 (5), pp. 659-672.

Coase, R. H. (1937) The Nature of the Firm, *Economica, New Series*, vol. 4, no. 16, pp. 386-405.

Coase, R. H. (1946) The Marginal Cost Controversy, *Economica, New Series*, vol. 13, no. 51, pp. 169-182. Blackwell Publishing.

Coase, R. H. (1947) The Marginal Cost Controversy: Some Further Comments, *Economica, New Series*, vol. 14, no. 54, pp. 150-153, Blackwell Publishing.

Coase, R. H. (1960) The Problem of Social Cost, *Journal of Law and Economics*, vol. 3, pp. 1-44, The University of Chicago Press.

Coase, R. H. (1970) The Theory of Public Utility Pricing and its Application, *The Bell Journal of Economics and Management Science*, vol. 1, no. 1, pp. 113-128, The Rand Corporation.

Flyvbjerg, B. (1998) *Rationality and power: Democracy in practice*, University of Chicago Press.

Flyvbjerg, B. (2007 a) 'Policy and planning for large-infrastructure projects: problems, causes, cures', *Environment and Planning: B Planning and Design*, vol. 34 (4), p. 578 ff.

Flyvbjerg, B. (2007 b) 'Truth and lies about megaprojects.' Inaugural speech, TU Delft.

Giorgi, L. and Schmidt M. (2002), European Transport Policy – A Historical and Forward Looking Perspective, *German Policy Studies*, vol. 2 (4).

- Glaeser, E. (2011) *Triumph of the City – How Our Greatest Invention Make Us Richer, Smarter, Greener, Healthier and Happier*, Penguin Group, USA.
- Gómez-Ibáñez, J. A. (2004) Railroad reform: an overview of the options, in Conference Proceedings of the Railway Reform.
- Gruber, J. (2011) *Public finance and public policy*, Worth Publishers, New York, USA.
- Harvey, D. (1989) *The Urban Experience*, The John Hopkins University Press, UK.
- Hayek, F. A. (1944) ed. by Caldwell, B. (2007) *The Road to Serfdom, Text and Documents*, University of Chicago Press.
- Hayek, F. A. (1945) The Use of Knowledge in Society, *American Economic Review*, XXXV, no. 4, pp. 519-30, American Economic Association.
- Hayek, F. A. (1960) ed. by Hamowy R (2011) *The Constitution of Liberty – The Definitive Edition*, University of Chicago Press.
- Hayek, F. A. (1984) *Der Strom der Güter und Leistungen* (Vol. 101), Mohr Siebeck.
- Heckscher, E. F. (1907) *Till belysning af jernvägarnas betydelse för Sveriges ekonomiska utveckling*, Centraltryckeriet, Stockholm.
- Hernes, T. (2008) *Understanding organization as process – Theory for a tangled world*, Routledge.
- Hotelling, H. (1938) The General Welfare in Relation to Problems of Taxation and of Railway and Utility Rates, *Econometrica: Journal of the Econometric Society*, vol. 6 (3), pp. 242-269.
- Huerta de Soto, J. (2010) *The Austrian School*, Edward Elgar, USA and UK.
- Hultén, J. (2012) *Nya vägar till järnvägar och vägar, Finansieringspragmatism och planeringsrationalism vid beslut om infrastrukturinvesteringar*, Political Studies 166. Lund.
- Johnson, D. and Turner, C. (2007) *Strategy and Policy for Trans-European Networks*, Palgrave Macmillan, Great Britain.
- Kaijser, A. (1994) *I fädrens spår...*, Carlssons Bokförlag, Stockholm.
- Kaijser, A. (2004) The dynamics of infrasystems. Lessons from history, Proceedings of the 6th International Summer Academy on Technology Studies – Urban Infrastructure in Transition.
- Klein, D. B. (2012) *Knowledge and Coordination – A liberal interpretation*, Oxford University Press.
- Klein, P. G. (2000) New Institutional Economics, *Encyclopedia of Law and Economics 1*, pp. 456-489.
- Kölbl, R., Niegl, M., and Knoflacher, H. (2008) 'A strategic planning methodology' *Transport Policy*, vol. 15 (5), pp. 273-282.
- Laffont, J. J. and Tirole, J. (1993) *A theory of incentives in procurement and regulation*, MIT press.
- Langlois, R. N. (1992) Transaction-cost Economics in Real Time, *Industrial and Corporate Change*, vol.1, no. 1, Oxford University Press.

- Langlois, R. N. (2003) Chandler in a Larger Frame: Markets, Transaction Costs and Organizational Form in History, *Economics Working papers*, Paper 2003 16, University of Connecticut.
- Leflavie, X. (1996) Organization as structures of domination, *Organization Studies*, vol 17, no. 1, pp. 23-47, Sage Publications.
- Levinson, D. M. (2002) *Financing Transportation Networks*, Edward Elgar, Cheltenham, UK.
- Liljegren, E. (1999) *Den stora förvirringen. Partipolitik och bilintressen I riksdagsbehandlingen av bilskatternas utformning 1922-1939*, Working Papers in Transport and Communication History 1999:5, Umeå University and Uppsala University, Sweden.
- Lindsey, R. (2006) Do Economists Reach A Conclusion on Road Pricing? The Intellectual History of an Idea, *Economic Journal Watch*, vol. 3, no. 2, pp. 292-379, Econ Journal Watch.
- March, J. G. and Simon, H. A. (1958) *Organizations*, New York, John Wiley.
- Matthiessen, C. W., Andersson, Å. E., and Andersson, D. E. (2013) *Öresundsregionen. Den dynamiska Metropolen*, Dialogos Förlag.
- McCarthy, P. S. (2001) *Transportation economics; theory and practice: a case study approach*, Malden, MA, US: Blackwell Publishers.
- McCloskey, N. D. (2010) *Bourgeois Dignity: Why Economics Can't Explain the Modern World*, Chicago University Press.
- McCraw T. K. (2007) *Prophet of Innovation, Joseph Schumpeter and Creative Destruction*, Belknap Press of Harvard University Press, USA.
- Medema, S. G. (2009) *The Hesitant Hand, Taming Self-interest in the History of Economic Ideas*, Princeton University Press.
- Merkert, R. (2009) *The organisation of European railways: A transaction cost perspective*, The University of Leeds Institute for Transport Studies
- Milgrom, P. R. and Roberts, J. (1992) *Economics, organization and management*, Englewood Cliffs, NJ: Prentice-Hall.
- Millward, R. (2005) *Private and Public Enterprise in Europe*, Cambridge University Press
- Millward, R. (2011) Public Enterprise in the Modern Western World: An Historical Analysis, *Annals of Public and Cooperative Economics*, vol. 82 iss. 4, pp. 378-398, Blackwell Publishing Ltd.
- Mokyr, J. (1990) *The Lever of Riches: Technological Creativity and Economic Progress*, Oxford University Press.
- Mosca, M. (2008) On the origins of the concept of natural monopoly: Economies of scale and competition, *The European Journal of the History of Economic Thought*, vol. 15 (2), pp. 317-353, Taylor & Francis.
- Nelson, R. and Winter, S. (1982) *An Evolutionary Theory of Economic Change*, Cambr. Mass: Belknap Press of Harvard University Press.
- Newbery, D. M. (1990) *Pricing and congestion: economic principles relevant to pricing roads*, Oxford.

- Nilsson, J. E. (2012) *Regelförändringar i transportsektorn - Effekter av omregleringen inom inrikesflyg, taxi, kommersiell tågtrafik och bilprovning*, Swedish Competition Authority (Konkurrensverket), Uppdragsforskning 2012:6, Stockholm.
- North, D. C. (1990) *Institutions, Institutional Change and Economic Performance*, Cambridge University Press.
- Oates, W. E. (2005) Toward a Second-Generation Theory of Fiscal Federalism, *International Tax and Public Finance*, vol. 12 (4), pp. 349-373, Springer Science.
- Osborne, S. ed. (2009) *The new public governance?: emerging perspectives on the theory and practice of public governance*, Routledge.
- Ostrom, E. (2005) *Understanding Institutional Diversity*, Princeton, NJ, Princeton University Press.
- Ottosson, J. (1997) Path dependence and institutional evolution: the case of the nationalisation of private railroads in interwar Sweden, in Magnusson, L and Ottosson, J, *Evolutionary economics and path dependence*, Cheltenham, Edward Elgar Publishers Ltd, pp. 186-196.
- Ottosson, J. and Andersson-Skog, L. (2013) *Stat, marknad och reglering i historiskt perspektiv* Uppdragsforskningsrapport 2013:3, Swedish Competition Authority (Konkurrensverket), Stockholm.
- Parry, I. W. and Bento, A. (2001) Revenue recycling and the welfare effects of road pricing, *The Scandinavian Journal of Economics*, vol. 103 (4), pp. 645-671.
- Pennington, M. (2002) *Liberating the Land The Case for Private Land-use Planning*, Institute for Economic Affairs, London.
- Pennington, M. (2004) Citizen Participation, the 'Knowledge Problem' and Urban Land Use Planning: An Austrian Perspective, *The Review of Austrian Economics*, vol. 17 (2), pp. 213-231, Kluwer Academic Publishers
- Pennington, M. (2011) *Robust Political Economy*, Classical Liberalism and the Future of Public Policy, Edward Elgar Publishing Limited, UK
- Peters, B. G. and Pierre, J. (2004) Multi-level governance and democracy: a Faustian bargain? in *Multi-level governance*, ed. by Bache I. and Flinders, M., Oxford University Press, USA
- Pierson, P. (2000) Increasing Returns, Path Dependence and the Study of Politics. *The American Political Science Review*, vol. 94, no. 2.
- Raiffa, H. with Richardson, J. and Metcalfe, D. (2002) *Negotiation Analysis*, Harvard University Press.
- Remmo, J. (2012) Utmaningar och hinder i gränsöverskridande transportinfrastrukturplanering: En studie av TEN-T med Nordiska triangeln som exempel (Master Thesis, KTH Royal Institute of Technology).
- Rietveld, P. (2012) Barrier Effects of Borders: Implications for Borders; Implications for Border-Crossing Infrastructure. *European Journal for Transport Infrastructure and Research*, vol. 12 (2), pp. 150-166, ISSN: 1567-7141.
- Rietveld, P. and Stough, R. (2007) *Institutions and Sustainable Transport: Regulatory Reform in Advanced Economies*, Edward Elgar, UK and USA.

- Roth, G. ed. (2006) *Street Smart, Competition, Entrepreneurship and the Future of Roads*, The Independent Institute, Transaction Publishers
- Ruggles, N. (1949) The Welfare Basis of the Marginal Cost Principle, *Review of Economic Studies*, vol. 17 (1) , pp. 29-46, Oxford University Press.
- Ruiter, D. (2005) Is Transaction Cost Economics Applicable to Public Governance? *European Journal of Law and Economics*, vol. 20 (3), pp. 287-303, Springer Science.
- Sager, T. (2012) *Reviving Critical Planning Theory*, Routledge, UK.
- Samuelsson, P. A. (1954) The Pure Theory of Public Expenditure, *The Review of Economics and Statistics*, vol. 36 (4), pp. 387-89.
- Sannerstedt, A. (1979) *Fri konkurrens eller politisk styrning? 1963 års trafikpolitiska beslut – debatten om innehåll, tillämpning och effekter*, Studentlitteratur, Lund.
- Schön, D. A. (1971) *Beyond the Stable State. Public and private learning in a changing society*, Temple Smith, London.
- Schumpeter, J. A. (1934) *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*, University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.
- Schumpeter, J. A. (1942) *Capitalism, Socialism and Democracy*, Harper Perennial Modern Thought (2008).
- Schumpeter, J. A. (1950) The March Into Socialism, *The American Economic Review*, vol. 40, no. 2, pp. 446-456, American Economic Association.
- Short, J. and Kopp, A. (2005) Transport infrastructure: Investment and planning. Policy and research aspects, *Transport Policy* vol. 12 (4), pp. 360-367, Elsevier.
- Thoresson, K. (2011) *Att beräkna det goda samhället: Samhällsekonomiska analyser och gränslandet expertis-politik inom transportområdet* (Doctoral dissertation, Linköping).
- Tiebout, C. (1956) A Pure Theory of Local Expenditures, *Journal of Political Economy*, vol. 64, no. 5, pp. 416-424, University of Chicago Press.
- Tunzelmann von, N. (2003) Historical co-evolution of governance and technology in the industrial revolutions, *Structural Change and Economic Dynamics*, vol. 14 (4), pp. 365-384, Elsevier Science B.V.
- Wagner, R. E. (1991/2011) *Charging for Government. User charges and earmarked taxes in principle and practice*, ed. by Richard E. Wagner, Routledge Revivals.
- Wagner, R. E. (2007) *Fiscal Sociology and the Theory of Public Finance – An Exploratory Essay*, Edward Elgar, USA.
- Van Wee, B. (2007) Large infrastructure projects: a review of the quality of demand forecasts and cost estimations, *Environment and Planning B: Planning and Design*, vol. 34 (4), pp. 611-625.
- Webster, C. (2002) Property rights and the public realm: gates, green belts and Gemeinschaft, *Environment and Planning B: Planning and Design*, vol. 29 (3), pp. 397-312.

- Williamson, O. E. (1981) The Economics of Organization: The Transaction Cost Approach, *The American Journal of Sociology*, vol. 87, no. 3, pp. 548-577, The University of Chicago Press.
- Williamson, O. E. (1999) Public and Private Bureaucracies: A Transaction Cost Economics Perspective, *The Journal of Law, Economics and Organization*, vol. 15, no. 1, pp. 306-342, Oxford University Press.
- Williamson, O. E. (2000) The New Institutional Economics: Taking Stock, Looking Ahead, *Journal of Economic Literature*, vol. 38, no. 3, pp. 595-613.
- Winston, C. (1991) Efficient transportation infrastructure policy, *The Journal of Economic Perspectives*, vol. 5 (1), pp. 113-127, American Economic Association.
- Winston, C. (2010) *Last Exit – Privatization and Deregulation of the U.S. Transportation System*, Brookings Institution Press, Washington D.C.
- Zappia, C. (2001) Equilibrium and disequilibrium dynamics in the 1930s, *Journal of the History of Economic Thought*, vol. 23 (1), pp. 55-75, Taylor Francis.

APPENDED PAPERS

Hasselgren, B. (2013 d) The Reluctant Infrastructure Manager, 70 Years of Government Ownership of Transport Infrastructure in Sweden, KTH Royal Institute of Technology, Research Paper, Stockholm

Hasselgren, B. (2013 e) The Swedish Government as Owner of Transport Infrastructure. Policy formation from the 1930s to the 2010s, reprinted from *Scandinavian Journal of Public Administration*, 16 (4), pp. 49-71

Hasselgren, B. (2013 f) Pricing Principles, Efficiency Concepts and Incentive Models in Swedish Transport Infrastructure Policy, Reprinted from VTI rapport 787, pp. 22-35, Swedish National Road and Transport Research Institute (VTI), Linköping

Hasselgren, B. (2013 g) Marginal Cost Controversies in Swedish Transport Infrastructure Policy, in peer-review process for publication by Aalborg University, Denmark

Hasselgren, B. (2013 h) Strategic transport infrastructure planning – centralisation or decentralisation? In peer-review process for publication in *European Journal of Transport and Infrastructure Research* (EJTIR), Delft University of Technology

TRITA-SoM 2013-05
ISSN 1653-6126
ISNR KTH/SoM/13-05/SE
ISBN 978-91-7501-765-5