Policy Analysis for Different Types of Decision-Making Situations

MATTS ANDERSSON

Abstract

This thesis seeks to contribute to decision support for policy makers in the transport sector. In order to frame the papers and to relate them to the broad field of "policy analysis", I have structured the papers around a simple framework with three decision levels: responsibility, policy gap, and policy measure. The thesis contains five papers.

"Transaction and transition costs during the deregulation of the Swedish Railway market" is a paper in the transaction cost school. We studied the costs associated with the shift from monopoly to competition in the Swedish railway market, and we found that the change resulted in comparatively small transaction costs, but that transition and misalignment costs seem to be larger.

In "Parking policy under strategic interaction", I examined the effect of strategic interaction between jurisdictions using an analytical model based on Hotelling's linear city model. I conclude that the procedure for setting supply in most municipalities has a strong downward effect on municipal parking fees and that resource flow competition implies that the fees are higher than the efficient prices (but that the effect of the supply procedures makes this effect incongruous).

In "Validation of aggregate reference forecasts for passenger transport", we followed up the Swedish national forecasts for passenger transport produced from 1975 to 2009 and tried to explain the deviations. We found that the forecasts during the last decades have overestimated car traffic, and that this is due to input errors. The potential problem of using cross-sectional models for forecasting intertemporal changes seems to have been limited.

In "The kilometer tax and Swedish industry - effects on sectors and regions", we estimated factor demand elasticities in the Swedish manufacturing industry and used these to analyze the effects of a kilometer tax for heavy goods vehicles. We found that the kilometer tax leads to factor substitution in that it decreases transport demand and increases labor demand. The effects on output are less pronounced.

In "The effect of minimum parking requirements on the housing stock", we used a model of the rental, asset, and construction markets. We quality-assured our assumptions and our results through interviews with market actors. In our example suburb, we found that parking norms reduced the housing stock by 1.2% and increased rents by 2.4%.

Sammanfattning

Det övergripande målet med denna avhandling är att bidra till bättre beslutsstöd för beslutsfattare inom transportsektorn. För att rama in artiklarna och för att relatera dem till det breda fältet "policyanalys" har jag strukturerat avhandlingen genom ett enkelt ramverk med tre nivåer: ansvar, policygap och styrmedel. Avhandlingen innehåller 5 artiklar:

"Transaktions- och transitionskostnader vid avreglering av den svenska järnvägsmarknaden" är ett papper i transaktionskostnadsskolan. Vi studerade kostnaderna i samband med övergången från monopol till konkurrens på den svenska järnvägen. Vi fann att förändringen resulterade i relativt små transaktionskostnader, men att transitions- och rätlinjighetskostnaderna var större.

I "Parkeringspolitik under strategisk interaktion" undersökte jag effekten av strategisk interaktion mellan jurisdiktioner med hjälp av en analysmodell baserad på Hotellings linear city-modell. Jag drog slutsatsen att förfarandet för att sätta utbudet i de flesta kommuner har en stark dämpande effekt på kommunala parkeringsavgifter samt att resursflödeskonkurrensen innebär att avgifterna är högre än de samhällsekonomiskt effektiva priserna (men att effekten av hur utbudet sätts gör denna effekt svårtydd).

I "Validering av aggregerade referensprognoser för persontransporter" följde vi upp de svenska nationella prognoserna för persontransporter från 1975 till 2009 och försökte förklara avvikelserna. För biltrafik fann vi att prognoserna har överskattat resandet under de senaste årtiondena och att detta beror på felaktiga antaganden om indata. Det potentiella problemet med att använda tvärsnittsmodeller för prognoser för intertemporala förändringar verkar ha varit begränsat.

I "Kilometerskatten och svensk industri - effekter på sektorer och regioner" skattade vi faktorefterfrågelasticiteter för den svenska tillverkningsindustrin och använde dessa för att analysera effekterna av en kilometerskatt på tunga lastbilar. Vi fann att kilometerskatten leder till faktorsubstitution genom minskad efterfrågan på transporter och

ökad efterfrågan på arbetskraft. Effekterna på produktionen är relativt små.

I "Effekten av parkeringsnormer på bostadsstocken" använde vi en modell av hyres-, tillgångs- och byggmarknaderna. Vi kvalitetssäkrade resultat och antaganden genom intervjuer med marknadsaktörer. I vår exempelförort fann vi att parkeringsnormerna minskar bostadsbeståndet med 1,2% och ökar hyrorna med 2,4%.

Acknowledgements

Contents

1. Introduction

Transportation affects people's lives in many ways, and many types of policy decisions need to be taken. Luckily, the transport sector is endowed with good analytical tools; one could, for example, argue that it is in the lead when it comes to cost-benefit analysis (CBA). Some other aspects are not as well researched.

This thesis seeks to contribute to decision support for policy makers in the transport sector. To achieve this, I have structured the thesis around a simple framework with three levels. The first level is to determine who should have responsibility for the policy area, the second is to estimate the gap between expected and desired outcome, and the third is to examine the economic or legislative policy measures that are available to close that gap.

Figure 1: Three levels of policy analysis

Responsibility is sometimes divided into problem formulation and execution. The responsibility box in my framework refers to the executional responsibility (because I use methods from economics rather than from political science in the papers, I am deliberately diffuse when it comes to agenda-setting power). Williamson (2000) sets out a model with some similarities to my framework (Figure 2).
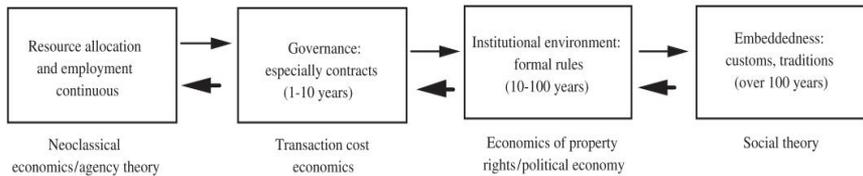
Figure 2: Williamson's model of linkages between economic institutions.[1]

Williamson's model sets out four temporal levels of social analysis, and the information in parentheses in Figure 2 is the general frequency in years over which the different changes take place. While the purpose of Williamson's model is to illustrate decision-making as a process where things develop over time, the purpose of my framework is rather to support a decision that is to be taken now. Instead of focusing on how the situation arose, I focus on decision support.

This "kappa" (the cover essay for the thesis) does not seek to give an exhaustive literature review or to analyze what the state-of-the art is for each decision-making level. Neither do I have the intentions of my "framework" to be a new Williamson model. My ambition is only to frame my papers by relating them to the broad field of "policy analysis". The disposition is as follows. Section 2 is a short overview of the included papers (since the actual papers are attached, these descriptions are kept very short). In Sections 3–5, I discuss each level and the articles relating to that level. In Section 6, I reflect on how each paper has contributed to the aim of the thesis and on areas for future research.

---

[1] This is a simplified version of Williamson's model, taken from Button (2006).

2. Overview of the included papers

This thesis consists of five papers. The respective level and sector treated in each paper are presented in Table 1.

Paper	Sector(s)	Level
Transaction and transition costs during the deregulation of the Swedish railway market	Rail	Responsibility
Parking policy under strategic interaction	Parking	Responsibility
Validation of aggregate reference forecasts for passenger transport	Passenger transport	Policy gap
The kilometer tax and Swedish industry effects on sectors and regions	Road freight, Manufacturing industry	Policy measure (economic)
The effect of minimum parking requirements on housing stock	Parking, Housing	Policy measure (legislative)

Table 1: Level and sector treated in each paper.

Below are short and popularly written presentations of the papers (the actual papers are attached after the bibliography).

Paper 1: Transaction and transition costs during the deregulation of the Swedish railway market

Matts Andersson, Staffan Hultén. *Research in Transportation Economics*, volume 59 (2016), pages 349–357.

The research on regulatory reform has identified three types of costs associated with the shift from monopoly to competition – transaction costs, misalignment costs, and transition costs. In paper 1, we used a

case study approach to analyze these costs during the deregulation of the Swedish railway system.

We concluded that vertical separation and the introduction of competition in the railway markets resulted in comparatively small direct transaction costs (which is in line with earlier research). Extraordinary transaction costs in the form of interrupted contracts are also a minor problem for the railway system as a whole. Transition costs seem to be larger, and handouts to the former monopolist have been ten times higher than the costs for interrupted contracts. Misalignment costs also seem to be significantly larger and more troublesome to handle than direct transaction costs, railway maintenance costs in Sweden using competitive tenders have increased much more than railway traffic with no measurable improvement in performance.

Paper 2: Parking policy under strategic interaction

Matts Andersson. Submitted to *Journal of Transport Economics and Policy*.

In this paper, I examined the effects that strategic interaction between jurisdictions have on parking policy. My focus was on strategic competition between municipalities, but I also studied the interaction between the municipalities' policies and national/regional policies. In order to do this, I developed an analytical model based on Hotelling's linear city model.

I concluded that it is not feasible to study the supply side with a linear city model since supply is not set in a way that is consistent with the assumptions underpinning the linear city model. I also concluded that the procedure for setting supply in most municipalities has a strong downward effect on prices. For parking fees, I concluded that resource flow competition implies that the competitive prices are higher than the efficient prices (but that the effect of the supply procedures makes this effect incongruous). From a vertical competition perspective, I

concluded that road investments lower parking prices, that there is resource flow competition between congestion charges and parking fees, and that benefit spillovers imply that municipalities' park-and-ride policies often mean that the full benefits of public transport investments are not attained.

Paper 3: Validation of aggregate reference forecasts for passenger transport

Matts Andersson, Karin Brundell-Freij, Jonas Eliasson. *Transportation Research Part A*, volume 96 (2017), pages 101–118.

In this paper, we studied Swedish national forecasts for passenger transport produced from 1975 to 2009. Our aim was to determine whether the forecasts differ from the actual outcome and, if they do, to explain why. Forecasts and forecast assumptions are taken from the forecast reports, and actual outcomes were taken from the official Swedish statistics (with some adjustments).

We concluded that road and air passenger kilometer growth rates have generally been overpredicted since the early 1990s. Aggregate railway growth has been fairly accurate, but it is made up out of two erroneous forecasts – commercial long-distance railway growth has been overpredicted, and the growth of subsidized intra-regional railway travel has been underpredicted (following vast unanticipated supply increases). Focusing on car traffic forecasts, we showed that a very large share of forecast errors can be explained by erroneous input assumptions. Despite the forecast errors, we found that the potential problem of using cross-sectional models for forecasting intertemporal changes seems to be limited. The arguments are that forecasts with corrected input assumptions are very close to the actual outcomes and that the elasticities from the cross-sectional models are consistent with those from a time-series model.

Paper 4: The kilometer tax and Swedish industry - effects on sectors and regions

Henrik Hammar, Tommy Lundgren, Magnus Sjöström, Matts Andersson. *Applied Economics*, volume 43 (2009), pages 2907–2917.

The purpose of this paper is to examine the effects of a kilometer tax on the Swedish manufacturing industry's factor demand and output. To determine this, we estimated factor demand elasticities in the Swedish manufacturing industry using firm-level data and analyze the sensitivity to price changes.

The results show that the introduction of a kilometer tax for heavy goods vehicles, at the levels discussed by the Swedish Road Tax Commission (SOU, 2004), decreases transport demand and increases labor demand. The effects on output are less pronounced, though some industries (e.g. wood, pulp, and paper) can be expected to be affected more than others due to their dependence on road freight transport. The direction of the effects on transport demand and output are obvious since the study concerns a price increase for the input factor "transports", the interest here lies in the calculated sizes of the effects. The direction of the effect on labor demand, on the other hand, is quite interesting since it is not given a priori by theory and it is different from the direction assumed in the public debate.

Paper 5: The effect of minimum parking requirements on the housing stock

Matts Andersson, Svante Mandell, Helena Braun Thörn, Ylva Gomér. *Transport Policy*, volume 49 (2016), pages 206–215.

We studied how parking norms affect the size of the housing stock. Our analysis was based on a model of the rental, asset, and construction markets. The underlying mechanism is that prices and profits are affected when developers are forced, through parking norms, to build more parking spaces than the customers demand. The results were validated by interviews with market actors.

In our example, suburb parking norms reduce the housing stock by 1.2% and increase rents by 2.4% compared with a situation without parking norms where the developers only build profitable parking spaces.

3. Aspects of division of responsibility

Introduction

How the agent in charge will act is the main question for public choice theory. A starting point for public choice theory is to challenge the implicit assumption that the imperfect market allocation is to be compared to an ideal government-led allocation. An example of a conclusion from a public choice perspective is the Leviathan hypothesis, which states that decentralization can work as a mechanism for constraining the expansionary tendencies of government (Brennan and Buchanan, 1980). Another example is that central government might be hindered by political constraints to provide more generous outputs in one jurisdiction than others, and hence not achieve a Pareto-efficient pattern (Oates, 2005).

There are other schools of thought studying this issue, but focusing more on the effects of different governance structures. Arguably, the three main schools of thought are neo-classical economics (traditional microeconomics focusing on allocation efficiency), Schumpeterian economics (focusing on incentives for development), and transaction cost theory.

A question close to "who should be responsible" is "who should finance". Hotelling, whose model I based paper 2 on, discussed efficient usage and efficient financing issues back in 1938 (Hotelling, 1938). A seminal text is Oates (1972), who advocated that efficient usage demands perfect matching between users and financers (if the demand is local but the financing comes from a broader tax base, demand will be too high).

There has been a long-standing debate between "Pigouvian" (following Pigou, 1932) and "Coasian" (following Coase, 1960) planners. The discussion mainly concerns land use planning, but it can be extended to other areas. From a Pigouvian perspective, land use planning may be viewed as producing various kinds of public goods (Webster, 1998). Based on this, different control policies need to be analyzed. Coasian

planners instead advocate voluntary solutions to these externality problems (the government should help by establishing clear property rights to lower transaction costs and thereby facilitate bargaining). My framework is suited for analyzing policy measures derived from both Coasian and Pigouvian perspectives. However, Coasian and Pigouvian planning can also be seen as competing schools or paradigms, and my framework is not suited for choosing a winner between them.

Paper 1: Transaction and transition costs during the deregulation of the Swedish railway market

Paper 1 is a paper in the transaction cost school. In the transaction cost school, transaction costs are only analyzed as an outcome of a structure, unlike in the Coasian planning school where they affect the outcome of negotiations (for example, high transaction costs make an efficient market outcome less likely). There are two strands of literature on how to define transaction costs. In one strand, transaction costs occur because of market imperfections and will gradually disappear due to selection and adaptation. Either a firm with high transaction costs will adapt and attain greater economic efficiency or it will be outcompeted (Nickerson & Silverman, 2003). In the other strand, transaction costs are the costs for using the market mechanism (Coase, 1937).[2]

Empirical examinations of transaction costs require detailed decisions on which costs to include and such decisions are not always made with clear theoretical guidance available. There are some empirical papers written on transaction costs in deregulated railway markets. One example is Merkert (2010), who viewed transaction costs as the costs to prepare, negotiate, carry out, and supervise contracts. In Paper 1, we took a slightly broader view. We defined transaction costs as the market

---

[2] Note that discussion in Coase (1937) on how to define transaction costs should not be mixed up with "Coasian planning" (see the discussion in the chapter above where I refer to Coase (1960)). It is the same author but different theories.

imperfections resulting in a need for supervision and regulation of the markets, the costs for conducting tenders, the costs for writing and enforcing contracts, and the costs for dispute resolution and lawsuits. Although somewhat broader, this definition meant that we were still able connect the costs to empirical manifestations.

In addition to the transaction costs described above, we also examined misalignment costs and transition costs. Misalignment refers to a situation where the governance structures are not aligned with the activities they are intended to govern. Misalignment costs seemed to be an important factor in deregulated European railway markets in earlier papers (Van de Velde, 2015). Examples include situations where the lengths of the contracts differ from the technical lifespan of the rolling stock (Yvrande-Billon & Ménard, 2005) and where operators have low incentives to lower infrastructure managers' marginal costs (Araújo, 2011). McNulty (2011) has had an important role in the discussion about misalignment costs in the railway sectors in recent years. McNulty (2011) claimed that the British railway sector has a 40% efficiency gap compared to France, the Netherlands, Sweden, and Switzerland. The studies following McNulty's approach have found that the gains of vertical integration mainly come from improved alignment of incentives and that the gains from decreasing other types of transaction costs are relatively modest (Nash et al., 2014).

Transition costs appear whenever a political decision results in a change of market organization (Baxter, 1995); they are the sum of adjustment costs and procrastination costs (Bresser-Pereira & Abud, 1997). Procrastination creates costs because of efficiency losses due to the delayed deregulation of a regulated monopoly or due to a misalignment of the regulation in relation to the market transactions the regulation is intended to guide. Procrastination costs usually increase faster than adjustment costs decrease, which means that delays increase costs (Bresser-Pereira & Abud, 1997).

The types of costs we were able to add to the ones included in Merkert (2010) or Merkert et al. (2012) were costs for placing bids and costs for

interrupted contracts. However, the inclusion of these costs did not refute the estimate of Merkert et al. (2012), the broad conclusion is still that vertical separation and the introduction of competition in railway markets result in comparatively small direct transaction costs. Our research also concurs with McNulty (2011) in that misalignment costs seem to be significantly larger and more troublesome to handle than direct transaction costs.

Data availability is high for transaction costs in the sense that the information is there; the difficulty comes with collecting and interpreting the data. The difficulty in interpretation mainly lies in drawing socioeconomic conclusions based on financial data, while not always being certain if the data represent transfers or resource exhaustion. This is especially true for transition costs since they often represent a loss for one actor and a gain for some other actor. For misalignment costs, the use of a "macro" approach is quite common (see, for example, (McNulty, 2011)). A rough description of the methodology is that such studies compare two states and conclude that the difference is due to misalignment costs. To be able to draw such conclusions, one has to control for other possible explanations and give a credible explanation for why misalignment costs are the cause. Since this is often difficult, a case study approach is often better (the challenge with those is to include all effects). However, sometimes one still needs to use the "macro" approach, and this was the case in our analysis of the large increase in railway maintenance costs. Because we controlled for the relevant factors (contract efficiency, amount of traffic, and macro-level performance), our conclusion that the increase in railway maintenance costs is due to misalignment should be well founded.

The first aim of the article was to quantify transaction, misalignment, and transition costs that have occurred since the deregulation of the Swedish railway market. The quantification aimed to provide insights into the relative importance of the different types of regulatory reform costs during this 15 year period. The second aim was to discuss if and how the costs can be decreased. A full examination of whether the

change from state-owned monopoly to vertically separated competitive markets was favorable would have required both measuring the corresponding costs in the contra factual scenario (without deregulation) and quantifying the benefits of regulatory reforms. Hence, our article was intended only to be a contribution to this discussion, not an attempt to give a full answer.

Paper 2: Parking policy under strategic interaction

In Paper 2, I take the hierarchal level of different decisions as a given and do not analyze which decision level is most appropriate (this is the common delimitation in, for example, Nash and Stackelberg games as well). The focus in the article is instead on how the jurisdictions will act and how those actions will affect welfare.

There is little literature about the supply of parking spaces, most of the available literature focuses on pricing of parking at a given supply. Roughly summarized (a more thorough summary is given in Paper 2), the literature started with the first-best conclusion that parking should be priced at its marginal opportunity cost, and then found second-best arguments for why prices should be higher. Most of the parking literature is concerned with parking policy within the same jurisdiction, most often within a city.

Because my object of study was strategic interaction between different jurisdictions, I turned my attention to the public economics literature. The theoretical models underlying most of the empirical studies can be separated into spillover models and resource-flow models (see Brueckner (2003) and Genschel and Schwarz (2011) for reviews). In the spillover models, each individual municipality chooses the level of an instrument (for example, a tax) in order to influence an outcome (for example, traffic emissions). The individual municipality is not only affected by the outcome within their own municipality, but also by the outcome in other nearby municipalities. Resource-flow models focus on an indirect relationship. In these models, the municipality is affected by

how much of a certain mobile resource there is within the municipal borders (the typical example would be some kind of tax base). By their choice of policy instrument, the individual municipalities can affect how the mobile resources allocates.

The literature on strategic competition in the transport sector is primarily based on network models. In order to derive useful economic insights without having to engage in the complexity of real-world networks, the literature mainly focuses on three prototypes – parallel, serial, and mixed networks (De Borger & Proost, 2012). Because these types of models deal with flows on links, they were not applicable to my analysis of strategic competition in the parking sector.

There are several different types of strategic interactions connected to parking, and I had few a priori hypotheses regarding which of the strategic interactions are important. This meant that an inventory was needed, which I did using a matrix with the dimensions effect type and hierarchal level (Figure 1).

	Spillover effects	Resource flow effects
Municipality		
Regional government		
National government		

Figure 1. Structure of the inventory scheme.

In the first row, we find the pure spillover and resource-flow cases that concern interactions between two agents on the same hierarchical level. In the bottom two rows, we find cases where a municipality's parking policies are influenced by – and have influence on – policies in areas that are controlled by agents on a higher hierarchical level. The matrix turned out to be very useful for inventory and structuring (and would most

likely also be useful for similar analyses in other sectors), but it is not an analytical result in itself.

In Paper 2, I concluded that parking supply is not feasible to study with a linear city model since it is not consistent with the assumptions underpinning the linear city model. Shoup (1997) shows that parking supply in the US is set to cover demand without regard to prices. In Paper 5, we found support for this in Sweden as well, Swedish municipalities seem to set parking norms so that there is residential parking for all cars. In Paper 2, I concluded that the procedure for setting supply in most municipalities is likely to have a strong downward effect on prices. The costs for building parking spaces are paid by the construction firms and are embedded in the total construction costs. Because the costs are not paid by the municipality, and are even hard to see for the municipality, the municipality might treat parking costs as if they are sunk with no opportunity cost. This is amplified by supply and pricing most often being handled by different parts of the cities' administrations (for example, the urban planning department and the traffic department). The effect on prices constitutes a further disadvantage of parking norms[3] (to be added to, for example, the effect on the housing stock examined in Paper 5). One of the main theoretical arguments for parking norms is that on-street parking is underpriced, implying that developers (if not forced to build parking spaces) will want their residents to park on the streets, thus causing excess demand. That parking norms in themselves contribute to underpricing implies that this argument suffers from circularity.

In contrast to parking supply, parking fees are very feasible to study with a model based on the linear city model, and here I drew some conclusions more in line with the strategic interaction literature following Oates (1972).

---

[3] The juridical status of parking norms differs between countries; see (COST, 2005) for an overview. However, the basic principle is the same; developers must build a specified number of parking spaces per apartment, square meter of store area, etc.

The model choice in Paper 2 depended on the fact that the research questions concern interaction between jurisdictions (most parking articles concern parking policy within a single jurisdiction). The model choice for parking studies is generally strongly affected by data availability, and poor data availability in general means that most parking studies are theoretical. This was also true in my case, estimating the types of objective functions used in resource flow or spillover models (see Brueckner (2003) for an explanation of these) was not possible because of the lack of data. Defining the variables also poses a problem: parking policy is more difficult to define than, for example, a tax rate.

4. Aspects of identification of policy gap

Introduction

Basing planning on the identification of a policy gap and the examination of policy measures to close the gap might seem like the obvious solution. Although it is arguably a good procedure, two types of counter arguments exist.

The first is that such a process is based on the classic paradigm that planning is to be built up in a step-by-step process according to an idea of what is rational. However, the literature contains many examples showing that rational planning might have limited importance for actual decision-making. Examples could be taken from both the public choice literature discussed above and econometric evaluations of decision processes in the transport sectors (see, for example, Eliasson & Lundberg (2012)). A shift from pure instrumental rationality to more strategic rationality is sometimes advocated. Theories of communicative transport planning consider planning as an iterative process that gradually changes the decision environment and those involved in the planning. These theories also assume that those involved in the planning consider funding and goals simultaneously, see, for example, Willson, (2001).

The second counter argument is that the identification of future policy gaps requires a forecast based only on implemented or decided policies (as compared with the goals). Because the forecasts are used not only for policy measures intended to close the gap, this might mean that we plan assuming a society that we do not want. Imagine, for example, a cost-benefit analysis (CBA) for a road. If the forecasts based solely on decided policy predict more road traffic than what is compatible with the goal for CO_2 emissions, the CBA will be overly profitable (assuming that the politicians will act to reach the goals on CO_2 emissions). An alternative is to plan assuming that the goals will be reached. The major disadvantage of this approach is that it reduces the pressure to actually take the actions needed to reach the goals. It also gives less incentive to investigate the effects of different actions. In theory, there is also a third

method possible, which is to ask the politicians about which policy instruments to include. This is difficult in practice, politicians are usually reluctant to advertise new instruments in this context (as planning conditions). In the national infrastructure planning in Sweden, forecasts are usually based solely on decided policy. The exception is the plan made in 2008–2009 where parts of the EET strategy[4] were assumed to be implemented, which meant that the targets were assumed to be reached. Planning by assuming that the goals will be reached is more common at the local/regional level in Sweden. The discussion in this paragraph is simplified to clarify the alternative procedures. One thing that makes the situation more complex in reality is that the mandate (the area over which the policy maker to whom the decision support is intended has executive responsibility) is often somewhat vague. This means that the division between external conditions and the policy decisions that need to be made can be vague.

Forecast follow-ups in the literature are performed as if the forecasts were intended to predict the most likely outcome, which is also the way forecast outcomes are usually treated in the public discussion. The paragraph above implies that validity is an important issue when following up on forecasts, and an important question to ask is whether the forecasts were actually intended to be predictions of the most likely outcome. Predicting the most likely outcome often means delicate assumptions because it is sometimes politically sensitive to explicitly point out what the most likely outcome is. For example, politicians might state a goal for CO_2 emissions, while at the same time ruling out most or all relevant policy measures to achieve the stated goal. In such a situation, establishing a ''most likely outcome''-forecast is both difficult and politically sensitive because it amounts to second-guessing politicians' actual intentions or future decisions (which might not coincide with the stated goals). Another side of this problem is that

---

[4] EET was the Swedish Environmental Matters Council's Strategy for Efficient Energy Use and Transport. I headed a project were we listed and analyzed the different measures (Swedish Environmental Protection Agency, 2007).

politicians might act if they realize that goals are not being reached, thus preventing the forecasted level from being reached.

The vast majority of follow-ups are project specific. It seems fair to conclude from the literature that travel demand for new (untolled) road infrastructure projects tends to be underestimated (Flyvbjerg et al., 2005; Nicolaisen, 2012; Nicolaisen & Driscoll, 2014; Welde & Odeck 2011; Parthasarathi & Levinson, 2010), while travel demand for rail infrastructure and toll-road projects tends to be overestimated (Bain 2009; Button et al., 2010; Flyvbjerg et al., 2005; Fouracre et al., 1990; Nicolaisen, 2012; Welde & Odeck, 2011; Pickrell, 1992). Flyvbjerg et al. (2005) studied megaprojects in 14 countries and concluded that demand forecasts for rail projects (25 cases) are on average more than twice as high as the realized demand, while road forecasts (183 cases) are 9.5% too low. The study also concluded that the inaccuracies in the forecasts was constant for the 30-year period covered by the study and that forecasts had not improved over time. Whether or not the road is tolled might have an impact on the forecast accuracy, Welde and Odeck (2011) reviewed the literature and found that traffic on tolled projects is generally overestimated (which is the opposite of untolled road projects). In their follow up of Norwegian road projects, they found that toll road forecasts are generally more accurate than untolled road projects, and a possible reason for this is that road planners over the years have been under increased scrutiny to provide careful estimates.

Nicolaisen (2012) distinguishes between different types of road and rail projects. The highly underestimated road projects are typically fixed links that attract and generate drastic amounts of travel, and the overestimated ones are typically motorways and bypasses that were supposed to have led most of the traffic volume in a particular corridor to switch to the new link. The typical underestimated rail project is a new rail project in a major urban area with good connections to additional transit services, and the typical highly overestimated rail project is an inter-city connection that expects to capture large shares of the total commuting traffic in a particular corridor.

Paper 3: Validation of aggregate reference forecasts for passenger transport

In paper 3, we evaluate the forecasts as if they were intended to predict the most likely outcome even though most of the forecasts were only intended to be reference scenarios to be used when evaluating different investments. The forecasts only included investments (roads and railways) that had already started or had gone too far to stop and policy measures that were already decided on. This means that there is an obvious theoretical problem of content validity in our paper – we follow up against a goal that the forecasts were not meant to reach. However, our analysis indicates that this problem is not so big in practical terms. Fuel prices in Sweden increased by 72% in real prices from 1992 to 2013, which was not captured in the forecasts. Increased taxes account for 42% of the fuel price increase, hence one could argue that failure to correctly incorporate future tax increases should not be regarded as an input error because forecasts are not usually intended to reflect any policy changes except those that have already been decided on. However, half of the increase in tax earnings is VAT, which follows the increase in crude oil prices and requires no new policy decisions. Therefore, the assumption of ''only decided policy measures" has not had that large of an impact on the systematic underprediction of future fuel prices. However, one can never be sure that the content validity problem is not significant because many factors are harder to test for than fuel prices and there might have been more diffuse political events affecting the forecasts.

Paper 3 clearly originates from a postpositivistic worldview (see, for example, Creswell (2014) for a discussion on postpositivism) in many senses – it is deterministic in the sense that causes determine outcome, and it looks to reduce ideas to testable sets. It also assumes that there is an objective reality that we are trying to understand. To compare the forecasts with the "actual outcomes" means that we had to define the actual outcome. The follow-up literature does not worry about abstract philosophical issues, but comparability is an important concern. Comparability comes in three shapes: comparing against the correct

statistics, separating ex-ante analysis and ex-post analysis, and separating project forecasts and reference forecasts.

Data availability on actual outcomes is generally high in Sweden for passenger transport forecasts (the high data availability is what made the data-demanding models possible to begin with). The largest data problem for follow-ups is instead knowing which assumptions were made in different forecasts. This problem is somewhat unnecessary because it could have been solved in the forecast documentation with little effort. Better documentation of assumptions would not only aid follow-ups, it would also aid in making adjustments between the base year (the year most of the data are from) and the year the forecasts are released. The gap between base year and release year is often quite long and creates an uncertainty in the forecasts that could have been mitigated quite easily. It is also a problem that the definitions differ between Swedish forecasts and Swedish statistics, especially in the rail sector.

Separating ex-ante and ex-post analyses is not a problem in the literature. The ex-ante literature is mainly based on various kinds of systematic sensitivity tests of models (De Jong et al., 2007), while the ex-post literature is concerned with follow-ups. The problem lies more in the fact that popular discussions about uncertainty are often limited either to assuming that the models work or to arguing that the models never work. In Paper 3, we tried to overcome these argumentation flaws by structuring potential errors into model deficiencies, differences between cross-sectional and intertemporal relationships, changes in preferences or behaviors, and assumption errors.

The third problem, separating project forecasts from reference forecasts, is sometimes a problem in the literature. In particular, demand forecasts for any particular project are necessarily a mixture of project and reference forecasts, and many forecast validation studies do not explicitly separate the two. The distinction between reference forecasts and policy forecasts is needed because conclusions both regarding strengths and weaknesses and policy implications might be

very different. For example, if it turns out that reference forecasts tend to underestimate the growth of a particular mode, it does not necessarily follow that forecasts of the effects of an investment in that mode tend to be underestimated. Comparing follow-ups of project-specific forecasts to our follow-up of reference forecasts and to the reference forecast-oriented follow-ups in Gunn et al. (2006), Nicolaisen (2012), and Odeck (2013), the results are quite different. Project forecasts for roads are, for example, on average underestimations, while we found that reference forecasts for car traffic have on average been overestimations.

The main contribution we tried to make in Paper 3 was to explain the reasons for the deviations between forecasts and outcomes. Most of the literature focuses on the actual follow up, and when causes for the inaccuracies are discussed, the discussion is usually about political-economic and planning psychology factors. Flyvbjerg and associates (Flyvbjerg, 2009; Flyvbjerg et al., 2002; Flyvbjerg et al., 2005) argue that the bias must be attributed to intentional misrepresentations by project developers. Flyvbjerg et al. (2005) noted that road forecasts "are substantially more balanced than rail forecasts, which indicates a higher degree of fair play in road traffic forecasting". However, Osland and Strand (2010) found no general support for the theory of strategic misrepresentation and argued that there are other mechanisms at work that could better help to explain the forecast inaccuracies. Eliasson and Fosgerau (2013) showed that bias might be due to selection bias without there being any bias at all in predictions ex-ante and that such a bias is bound to arise whenever ex-ante predictions are related to the decisions on whether to implement projects. Paper 3 thus contributes to the highly underresearched field that "technically" examines what actually went wrong in the reference forecasts. This analysis is a complement rather than a substitute to the literature presented above. Only discussing psychological factors does not explain what actually went wrong in the forecast, and conversely our "technical" analysis does not provide the full background to why the input errors were made.

5. Aspects of examination of policy measures

Introduction

CBA is the natural frame for the examination of policy measures in the transport sector. It is not always possible or appropriate to perform a CBA, but it is a suitable mindset for examining policy measures.

A CBA should take into account all types of effects (time gains, pollution etc.) that affect individuals in society. However, no actual analysis could ever do this in practice. We differ between calculations and assessments. A calculation includes effects that are quantifiable and monetarily valuable (resulting in a numerical profitability measure), while an assessment should include all effects. The effects included in the calculation are usually investment costs, operation and maintenance costs, availability, emissions, accidents, producer surplus, and the marginal cost of public funds. Effects that should be included to make it an assessment are primarily intrusion, exploitation, and vulnerability.

A couple of articles (e.g., Asplund & Eliasson, 2016) have shown that the ranking of different investments by profitability is hardly affected if conditions or values change. However, two things should be mentioned in this regard. The first is that these studies concern economic planning (when investments with different purposes are compared), and it might be that the ranking is less stable in the physical planning (when different designs of the same investment are compared). The second is that the studies only concern the cost benefit calculation, the ranking might be less stable if variables that are difficult to value (such as intrusion) are included.

The absolute level of an investment's profitability is arguably more unstable than its relative level of profitability. Absolute profitability depends on factors that are difficult to determine (for example, the calculation period and the discount rate), while relative profitability is affected by factors that are more stable (such as time gains, the value of time, and the value of a statistical life).

CBA can be used to compare investments in different modes. When we reviewed the models used in Sweden,[5] we concluded that the models provide comparable results subject to the limitations of each model (Andersson et al., 2008). On a more principal level, there are some distortions (for example, the assumption that localization is not affected by the investment disfavors rail investments), but the overall conclusion is still that the calculations are comparable.

CBAs have a clear implication for prioritization. If not all profitable investments can be financed, the ones with the highest cost-benefit ratio should be prioritized (according to the so-called rucksack theorem). Many studies have examined how the results from CBAs are treated in the actual prioritization of investments. As with the studies on ranking discussed above, the focus is on the economic planning. Nilsson (1991) found very little correlation between calculation results and investment decisions. Eliasson and Lundberg (2012) found a somewhat stronger correlation, at least for the investments proposed by the Swedish traffic authorities in their plans, not for the objects pointed out by the government. Eliasson et al. (2015) also suggested that the traffic authorities' proposals correlated with the results of the calculation, but that the government's decision did not. The "sign" (whether the investment is profitable or unprofitable) was found to be more important than the level/ranking of the profitability. Given that the relative values of CBAs are much more stable than the absolute values, this is worrying from a theoretical perspective. It is also worrying that a common conclusion in the international literature is that electoral support for the national government in a region affects the amount of investment in that region, and that this seems to be true for Sweden as well (Jussila Hammes, 2013).

The literature about the optimal size of the total infrastructure budget is macro-oriented (see Andersson et al. (2015) for a summary). Many

---

[5] The standard models in Sweden are Sampers (large projects, all modes), EVA (smaller road projects), and Bansek (smaller railway projects).

interesting conclusions are made in the literature, but the literature is far from being able to provide solid advice on optimal budget size.

There is a large body of literature on cost follow-ups. Underestimation of costs is a recurrent problem, and Flyvbjerg et al. (2005) found in a large international study that costs were underestimated in nine out of ten cases. The literature trying to explain such underestimations, however, is much thinner. "Optimism bias" is a common explanation (Flyvbjerg, 2009; Flyvbjerg et al., 2002; Flyvbjerg et al., 2005), although there are those who dismiss it (Osland & Strand, 2010). Another common explanation is that the opposition is usually weak because the costs are paid by the entire tax collective. When there is an asymmetry in the relationship between those who benefit from the investment (who have a lot to gain from it) and those who lose (who lose relatively little per person), principal-agent and rent-seeking problems arise (Eisenhardt, 1989; Stiglitz, 1989). Poor opportunities for monitoring in Sweden (Nilsson et al., 2012) might enhance these problems. However, the underestimations could also be caused by selection bias, and Eliasson and Fosgerau (2013) showed that even if there is no bias in the original forecasts, the process will reward investments with underestimated costs.

An important feature of the benefit calculations for infrastructure investments in Sweden is that the valuations are determined centrally by the Transport administration's ASEK-group. The Transport administration also provides the models and national reference forecasts that are to be used for all investment analyses. The fact that the calculation methods are so uniform means that most criticism should be directed against the central calculation methodology, not against individual analyses. The lack of corresponding guidelines for cost calculations is a likely contributor to the cost underestimations.

We treated the connection between CBAs and gender distribution of benefits thoroughly in Andersson et al. (2007). The discussion about whether different groups are treated appropriately in a CBA quickly boils down to how effects for different groups should be valued (which to

some extent requires ethical considerations). Performing a CBA is not appropriate for finding the causes of a lack of gender equality, but a common conclusion is that the main problem lies in agenda setting and that that structured decision support reduces the inequalities here (if one is forced to report the effects of one's proposals, the importance of setting the agenda will decrease). A CBA is, however, very suitable for describing the distributional effects of different policy measures (men/women, rich/poor, etc.). Geographical distribution is the most relevant for financing and is calculated regularly.

Paper 4: The kilometer tax and Swedish industry - effects on sectors and regions

In Paper 4, we estimate the effects of a kilometer tax on the Swedish manufacturing industry's factor demand and output. The kilometer tax analyzed is the one proposed in the Swedish Government Official Reports (SOU 2004:63).[6] We performed the estimation by introducing transportation as an input in a factor demand model (FDM). The factor demand model is based on standard micro-economic foundations in which the objective of each individual firm is to maximize profits and each individual firm operates in a competitive environment and has access to a technology that transforms a number of inputs into a single output. To estimate the demand system one needs to choose a functional form. The chosen functional form should put as few restrictions as possible on the technology but still be operational from an econometric point of view.

There is a trade-off between making a detailed calculation of one market, as in a factor demand model, and capturing all effects but on a more schematic level, with a general equilibrium model. In Andersson et al. (2012), we compared estimations with the factor demand model and

---

[6] The suggested kilometer tax in in SOU 2004:63 was higher than a recent suggestion in a Swedish Government Official Report (SOU 2017:11), especially for the heaviest vehicles.

estimations with the general equilibrium model STRAGO. When we estimated the tax base effect on private intermediate commodities (i.e. labor and capital) with the FDM, the net social benefit is extremely positive. The net social benefits were less positive when using the general equilibrium model and were even slightly negative when administration and investment costs where included. The direction of the difference between the partial (FDM) and the general equilibrium (STRAGO) estimates is logical since the equilibrium effects most likely are negative. The in market effect might be positive: increasing transport taxes makes firms replace transports with other production factors. Equilibrium requires market to clear (which counteract the in market effect) and increasing kilometer taxes on goods freight makes leisure relatively cheaper (which makes labour supply go down).

Changes in accessibility affect many markets, including transport, labor, real estate, etc. Most CBAs, however, are based on valuation of the effects on the transport market, i.e. vehicle costs, fuel costs, and the value of time. This means that most, but not all, effects on other markets are captured indirectly. How much of the effects on other markets can be valued on the transport market is an under-investigated research area, although there are some papers on this topic (for example Eliasson & Fosgerau, 2017). One connection between Paper 4 and CBA is that measuring the effects on industry output is an alternative to measuring the effects on the transport market.

Another connection between Hammar et al. (2009) and CBAs is the marginal cost of public funds. Whether a so-called "double dividend" effect can be included in the CBA for economic policy measures often determines the sign of the net result. The first dividend is the reduction in the external effect that the corrective tax aims to correct, and the second dividend is that the revenue from the taxes can be used to lower other (distortional) taxes. Fullerton and Metcalf (2001) showed that the tax base effect (on the market that the corrective tax is implemented/raised on) and the revenue effect can cancel each other out. In Andersson et al. (2012), we concluded that this is an empirical

question and that the traditional CBA (measuring the effects on the transport market) should be complemented with estimations of tax base effects on other markets using models tailored for such estimations.

This discussion is even more intense for passenger transport, although the context is somewhat different (the discussion concerns the relationship between CBA and the effects on the labor market rather than on the "double dividend"). Parry and Bento (2001) showed that the increase in generalized travel costs due to congestion charges might cause losses due to reduced labor supply at the extensive margin that are large enough to cancel out the transport-related benefits. The discussion has continued in a stream of papers (Parry & Bento, 2002; Van Dender, 2003; Pilegaard & Fosgerau, 2008; De Borger, 2009). Arnott (2007) makes a similar point, but related to agglomeration benefits rather than distortive taxation. In Anderstig et al. (2016), we investigate this by estimating the effects of the Stockholm congestion charges on labor income using an estimated relationship between accessibility and income. The result was that the effects on labor income are positive (i.e., add to the time gain and are far from counteracting them completely). This means that the tax base increased, indicating that there is double dividend (or even a "triple" dividend because it is an increase). Crucial for this result was that we allowed for heterogeneity in both value-of-time and in the relationship between accessibility and income.

Summing up the discussion about the connection to CBAs, two things should be mentioned. The first is that the discussion about the marginal costs of public funds and the double dividend implies that the optimal tax level can be both higher and lower than external marginal costs (the first-best Pigouvian level). The second is that the profitability of an economic policy measure is an empirical question. Some Pigouvian/neo-classical economists advocate that pricing external effects so that the total price comes closer to the total societal external costs is by definition profitable because all effects can be seen as a strive for efficiency. This ignores the investment costs and assumes that all inputs have an alternative use (for example, that there is no hysteresis on the

labor market). Our investigation showed that kilometer taxes to a large extent induce factor substitution and to a lesser extent induce production decreases. This is promising for the profitability of the tax.

Paper 5: The effect of minimum parking requirements on the housing stock

In paper 5, Andersson et al. (2016), we look at one interesting effect of parking norms – the effect on the size of the housing stock. Numerous other effects need to be included to make a full CBA (or at least a pro et contra analysis) for parking norms:

- Urban sprawl. Subsidizing parking means that the number of parking spaces will increase, which contributes to urban sprawl. The parking spaces are subsidized by the municipality or by others (for example, by apartment owners without a car).

- Apartment sizes. If developers has to build X parking spaces per apartment, they tend to build big apartment.

- Effects on welfare distribution.

- Amount of traffic. The non-internalized external parts of the external effects are relevant for a CBA.

Most of these effects are principally well known, and Shoup (1997) discusses most of them, but the empirical literature on these effects is thin. A CBA of minimum parking requirements should also include the positive effect of solving the second-best problem that is created by on-street parking being too cheap. This means that a lot of thought must go in to setting the reference alternative. An important difference between the second-best situation discussed for freight transports and the second-best situation for parking is that the latter is created by politics. The external effects of trucks cannot be totally erased by political decisions, but the underpricing of parking can be.

The trend now is that parking norms are made "flexible" (i.e. can be affected by measures taken by the developer). Flexible parking norms are a significant advantage compared to the old, stiff norms in that they do not lead to over-supply of parking spaces to the same extent. It is important to recognize, however, that they suffer from many of the same weaknesses as the stiff norms. One example is time-inconsistency. The stiff parking norms determine how many parking spaces should be built, but nothing stops the apartment building owners from selling the parking garage to a shop owner 20 years later (see Envall & Nissan (2013) for a follow up of the extent to which this is done). The situation for a freight-bike (to take an obvious example) that allows the parking norms to be lowered is the same; no one controls that it is there 20 years later.

6. Concluding remarks and future research

To be able to improve decision support, I have in some of the articles presented in this thesis have ventured into areas that are relatively under-researched. This is not entirely out of altruism, I also think that these areas are the most interesting to explore. In the following, I will reflect on what the contribution of each article has been and give my thoughts on relevant future research in each area.

In Paper 1, "Transaction and transition costs during the deregulation of the Swedish Railway market", we tried to contribute to the literature on transaction costs in deregulated railway markets. Apart from contributing with the Swedish case, we also tried to make some theoretical development by, for example, improving definitions. The railway sector is nowadays relatively well studied from a transaction cost perspective. Instead of more studies on the rail sector, I advocate for studies on sectors that seem under-studied from a transaction cost perspective (for example, the energy sector) and for theoretical studies. Theoretical advancements are to be made, for example, by improving the connections between the theoretical definitions and which effects should be investigated in a particular study. A broader advancement would be to connect transaction cost theory to neo-classical economics and to Schumpeterian economics. These schools are unnecessarily divided today. Some transaction-cost economists tend to think that all systems should be optimized based on the minimization of transaction costs. This is appropriate for a firm with a given output (the theory is based on explaining the behavior of firms), but when used to compare administrative processes with different allocation effects, such an approach leads to sub-optimization. Neo-classical economists, on the other hand, tend to disregard transaction costs in their analyses. The critique in Hayek (1945) about the treatment of information is also to some extent still valid today. A short-term objective of future research could be to clarify what is included in different perspectives. Transaction cost articles, for example, include parts of what neo-classicalists would call "production costs". Even though separating production and

transaction costs is troublesome, even on a conceptual level, the mix-up in the literature often seems to be unnecessarily large.

Strategic interactions between jurisdictions is a mature field in economics. However, the public good discussed in this literature is always somewhat vague. For example, Besley and Coates (2003) write that such public good can "be thought of as roads or parks". The only important characteristic is whether its benefits spill over to other regions. In Paper 2, "Parking policy under strategic interaction", I tried to perform a more detailed analysis of how the characteristics of a transport system affect strategic behavior, but there is, of course, much more to be done. The transport pricing literature analyzes different characteristic of the transport system, mostly looking at serial or parallel networks. Because this too is a mature field, much might be gained by connecting these fields of research.

The literature on traffic forecast follow-ups is dominated by policy-measure forecasts, and most of these studies focus solely on investments. In paper 3, "Validation of aggregate reference forecasts for passenger transport", we contributed to the much scarcer field of reference forecast follow-ups. With our "technical" approach, we also made a methodological contribution to the literature on explaining forecast errors (the literature is mostly focused on political-economic and planning psychology factors). Our approach also made it possible to draw conclusions about the applicability of cross-sectional models for longitudinal forecasts. For future research, I think our technical approach should be applied more in policy forecast follow-ups. Because errors in policy forecasts can depend on either the reference forecast or the calculation of the effect of the policy measure, the causes need to be analytically separated more than they usually are in the literature.

The effects of transport policy measures on the manufacturing industry are relatively well studied. We draw some interesting conclusion in Paper 4, "The kilometer tax and Swedish industry -effects on sectors and regions", about the regional dimension of kilometer tax (much smaller than what is often claimed) and the effect on labour demand (positive).

In my opinion, the most important issues for further studies of freight transport effects are not factor demand or general equilibrium effects, but the relationship between those effects and the CBA. How freight transport effects should be valued in the CBA is generally . The most under-studied area in freight transport CBAs is probably the cause and effects of transport time variation. We studied this in Andersson et al. (2017b), but much more needs to be done.

Empirical studies of the effects of parking norms are scarce. In Paper 5, "The effect of minimum parking requirements on the housing stock", we contributed to enlightening one important aspect – the diminishing effect on the housing stock. Other effects also need to be studied, and since our article has a bit of a "first stab" character the effect on the housing stock most likely also needs further studies. The limited data available puts restrictions on what can be done and is quite likely the primary explanation for the scarcity of empirical studies. This means that econometrics are not usually doable, but other available methods might work as we show in the article.

Summing up, this thesis shows that policy support is required in many forms, but that the underlying theories are the same. In developing policy support, I think it is beneficial to venture into areas that are relatively under-researched. Even though this increases the risk for failure, it improves the chances for making a novel contribution to the field.

Appendix 1: Declaration of contribution

Paper 1

Matts Andersson, Staffan Hultén (2016) *Transaction and transition costs during the deregulation of the Swedish Railway market. Research in Transportation Economics*, volume 59, pages 349–357.

I wrote parts of the article and presented it at the Thredbo 2015 conference in Chile.

Paper 2

Matts Andersson *Parking policy under strategic interaction.* Submitted to *Journal of Transport Economics and Policy*.

Sole author.

Paper 3

Matts Andersson, Karin Brundell-Freij, Jonas Eliasson (2017) *Validation of aggregate reference forecasts for passenger transport. Transportation Research Part A*, volume 96, pages 101–118.

I wrote most of the article (Karin and Jonas supervised and contributed by writing parts of the text). The article is an outcome of a larger research project. I led the project and did the main analysis (I calculated how big the forecast errors were and what explains them, analyzed all of the forecast reports, gathered most of the statistics, etc.), but many people made significant contributions. Staffan Algers calculated the effect of the change in driving license share in car-owning households and wrote a note about the history of forecast models in Sweden (Algers, 2015). Stehn Svalgård and Frida Aspnäs calculated the elasticities using the current forecast model. Göran Tegnér and Janne Henningsson compiled the price and supply statistics for public transport.

The main report of the research project is (CTS, 2016), which also includes the freight part of the project.

I presented the article at numerous seminars and conferences.

Paper 4

Henrik Hammar, Tommy Lundgren, Magnus Sjöström, Matts Andersson (2009) *The kilometer tax and Swedish industry - effects on sectors and regions. Applied Economics*, volume 43, pages 2907–2917.

I was the main author of the report that this article is based on (Swedish Environmental Protection Agency, 2007). Tommy performed the factor demand calculations, and I did some background calculations. Henrik and Magnus did not participate in the report, but did most of the work with turning it into an article.

The Swedish EPA arranged a conference about the project at which I presented the report. I also presented the report at the Swedish national transport conference Transportforum.

Paper 5

Matts Andersson, Svante Mandell, Helena Braun Thörn, Ylva Gomér (2016) *The effect of minimum parking requirements on the housing stock. Transport Policy*, volume 49, pages 206–215.

I wrote all sections in the article, except for Sections 3 and 4 that were mostly written by Svante. Helena and Ylva performed the interviews. Helena also made figure 2.

Bibliography

Algers, S. (2015). *Prognosmodellernas utveckling 1980 - 2014* (Version 2.1). Unpublished manuscript.

Andersson, M., Nielsen-Skovgaard, S., Jarlebring, I., Hedström, S., Vagland, Å., Andersson, W. & Köhler, J. (2007). *Jämställdhet i prognoser, kalkyler och konsekvensbeskrivningar* (WSP Analysis & Strategi, 2007:12). Stockholm: WSP Analys och Strategi.

Andersson, M., Pädam, S. & Thorsson, T. (2008). *Jämförelse av Samkalk, EVA och Bansek* (WSP Analysis & Strategy, 2008-07-02). Stockholm: WSP Analys och Strategi.

Andersson, M., Anderstig, C., Berell, H., Berglund, S., Eliasson, J., Lundholm, M., Lundgren, T., Pyddoke, R., Sundberg, M. & Westin, J. (2012). *The Effect of Transport Taxes on Society* (CTS report 2012). Stockholm: Centre for Transport Studies.

Andersson, M., Dehlin, F., Jörgensen, P. & Pädam, S. (2015). *Wider Economic Impacts of Accessibility - a Literature Survey* (CTS 2015:14) Stockholm: Centre for Transport Studies.

Andersson, M. & Hultén, S. (2016). Transaction and transition costs during the deregulation of the Swedish Railway market. *Research in Transportation Economics, 59*, 349-357.

Andersson, M., Mandell, S., Braun Thörn, H. & Gomér, Y. (2016). The effect of minimum parking requirements on the housing stock. *Transport Policy volume, 49,* 206–215.

Andersson, M. (2017) *Parking policy under strategic interaction*. Manuscript submitted for publication.

Andersson, M., Brundell-Freij, K. & Eliasson, J. (2017a). Validation of aggregate reference forecasts for passenger transport. *Transportation Research, 96*, 101–118.

Andersson, M., Berglund, B., Flodén, J., Persson, C. & Waidringer, J. (2017b). A method for measuring and valuing transport time variability in logistics and cost benefit analysis. Forthcoming in Research in Transportation Economics.

Anderstig, C., Berglund, S., Eliasson, J. & Andersson, M. (2016). Congestion Charges and Labour Market Imperfections. *Journal of Transport Economics and Policy, 50*(2), 113–131.

Araújo, S. (2011) Has deregulation increased investment in Infrastructure?: Firm-level evidence from OECD countries. *OECD Economics Department Working Papers, 892*.

Arnott, R. (2007). Tolling with agglomeration externalities. *Journal of Urban Economics, 62*, 187–203.

Asplund, D. & Eliasson, J. (2016). Does uncertainty make cost-benefit analyses pointless? *Transportation Research, 92*, 195-205.

Bain, R. (2009). Error and optimism bias in toll road traffic forecasts. *Transportation, 36*, 469–482.

Besley, T. & Coates, S. (2003). Centralized versus decentralized provision of local public goods: a political economy approach. *Journal of Public Economics, 87*, 2611-2637.

Button, K.J., Doh, S., Hardy, M.H., Yuan, J. & Zhou, X. (2010). The accuracy of transit system ridership forecasts and capital cost estimates. *International Journal of Transport Economics, 37*(2), 155–168.

Baxter, L. W. (1995). *Different approaches to estimating transition costs in the electric-utility industry*. Oak Ridge: Oak Ridge National Laboratory.

Brennan, D. & Buchanan, J. M. (1980). *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. Cambridge: Cambridge University Press.

Bresser-Pereira, L. C. & Abud, J. (1997). Net and total transition costs: The timing of economic reform. *World Development, 25*(6), 905-914.

Brueckner, J. K. (2003). Strategic interaction among governments: An overview of empirical studies. *International regional science review 26*(2), 175-188.

Button, K. (2006). The political economy of parking charges in ''first'' and ''second-best'' worlds. *Transport Policy, 13*, 470–478.

Coase, R. H. (1937). The Nature of the Firm. *Economica*, *4*(16)*,* 386-405.

Coase, R. (1960). The problem of social cost. *Journal of Law and Economics, 3*, 1-44.

European Cooperation in Science and Technology. (2005). *Parking Policies and the Effects on Economy and Mobility* (COST Action 342).

Creswell, J. (2014). *Research Design – Qualitative, Quantitative & Mixed Method Approaches.* Sage publishing.

Centre for Transport Studies (2016). *Uppföljning av basprognoser för person- och godstransporter publicerade mellan 1975 och 2009* (CTS 2016:16). Stockholm: Centre for Transport Studies.

De Borger, B. (2009). Commuting, congestion tolls and the structure of the labor market: optimal congestion pricing in a wage bargaining model. *Regional Science and Urban Economics, 39*, 434–48.

De Borger, B. & Proost, S. (2012). Transport policy competition between governments: A selective survey of the literature. *Economics of Transportation, 1*, 35–48.

De Jong, G., Daly, A., Pieters, M., Miller, S., Plasmeijer, R., & Hofman, F. (2007). Uncertainty in traffic forecasts: literature review and new results for The Netherlands. *Transportation*, *34*(4), 375–395.

Eisenhardt, K.M. (1989). Agency Theory: An Assessment and Review. *Academy of Management Review, 14*(1), 57-74.

Eliasson, J. & Fosgerau, M. (2013). Cost overruns and benefit shortfalls: deception or selection? *Transportation Research, 57*, 105–113.

Eliasson, J. & Fosgerau, M. (2017). *Cost-benefit analysis of transport improvements in the presence of spillovers, matching and an income tax* (CTS 2017:3). Stockholm: Centre for Transport Studies.

Eliasson, J. & Lundberg, M. (2012). Do cost–benefit analyses influence transport investment decisions?: Experiences from the Swedish transport investment plan 2010–21. *Transport Reviews, 32*(1), 29–48.

Eliasson, J., Börjesson, M., Odeck, J. & Welde, M. (2015). Does benefit/cost-efficiency influence transport investment decisions? *Journal of Transport Economics and Policy, 49*(3), 377-396.

Envall, P. & Nissan, A. (2013). *Parkering i storstad: Rapporter från ett forskningsprojekt om parkeringslösningar i täta attraktiva städer* (Swedish Transport Administration, 2013:047). Swedish Transport Administration

Flyvbjerg, B. (2009). Survival of the unfittest: why the worst infrastructure gets built—and what we can do about it. *Oxford Review of Economic Policy, 25*(3), 344–367.

Flyvbjerg, B., Holm, M.S. & Buhl, S. (2002). Underestimating costs in public works projects: error or lie? *Journal of the American Planning Association, 68*(3), 279–295.

Flyvbjerg, B., Skamris Holm, M. K. & Buhl, S. L. (2005). How (In)accurate Are Demand Forecasts in Public Works Projects?: The Case of Transportation. *Journal of the American Planning Association*, *71*(2), 131–146.

Fouracre, P.R., Allport, R.J. & Thomson, J.M. (1990). *The performance and impact of rail mass transit in developing countries*. Crowthorne, Berkshire: Transport and Road Research Laboratory.

Fullerton D. & Metcalf G. E. (2001). Environmental Controls, Scarcity Rents and Pre-existing Distortions. *Public Economics, 80*, 249-267.

Genschel, P. & Schwarz, P. (2011). Tax competition: a literature review. *Socio-Economic Review, 9*(2), 339-370.

Gunn, H., Miller, S. & Burge, P. (2006). The External Validation of the NTM: Final Report. Paper presented at the European Transport Conference.

Hammar, H., Lundgren, T., Sjöström, M. & Andersson, M. (2009). The kilometer tax and Swedish industry - effects on sectors and regions. *Applied Economics, 43*, 2907-2917.

Hayek, F. A. (1945). The use of knowledge in society. *The American Economic Review*, *35*(4), 519-530.

Hotelling, H. (1938). The general welfare in relation to problems of taxation and of railway and utility rates. *Econometrica, 6*(3), 242-269.

Jussila Hammes, J. (2015). Political economics or Keynesian demand-side policies: What determines transport infrastructure investment in Swedish municipalities? *Research in Transportation Economics, 51*, 49-60.

McNulty. (2011). *Realising the potential of GB rail: Final independent report of the rail value for money study - Summary report.* London: Department for Transport.

Merkert, R. (2010). Changes in transaction costs over time: The case of franchised train operating firms in Britain. *Research in Transportation Economics, 29,* 52-59.

Merkert, R., Smith, A. S. J. & Nash, C. (2012). The measurement of transaction costs: evidence from European railways. *Journal of Transport Economics and Policy, 46*(3), 349-365.

Nash, C. A., Smith, A. S. J., van de Velde, D., Mizutani, F., & Uranishi, S. (2014). Structural reforms in the railways: Incentive misalignment and cost implications. *Research in Transportation Economics, 48,* 16-23.

Nilsson, J.-E. (1991). Investment decisions in a public bureaucracy: a case study of Swedish road planning practices. *Journal of Transport Economics and Policy, 25*, 163–75.

Nilsson, J.-E., Bergman, M., Mandell, S., Nyström, J. & Pyddoke, R. (2012). Vart tar pengarna vägen?: Om behovet av bättre uppföljning för ökad effektivitet i offentlig sektor. *Ekonomisk debatt, 49*(1)*,* 44-56.

Nickerson, J. & Silverman, B. (2003). Why firms want to organize efficiently and what keeps them from doing so: Inappropriate governance, performance, and adaptation in a deregulated industry. *Administrative Science Quarterly, 48,* 433-465.

Nicolaisen, M. S. (2012). *Forecasts: Fact or Fiction?: Uncertainty and Inaccuracy in Transport Project Evaluation* (Doctoral thesis). Aalborg: Uniprint. Available at: https://www.researchgate.net/publication/275213963_Forecasts_Fact_or_Fiction_Uncertainty_and_Inaccuracy_in_Transport_Project_Evaluation

Nicolaisen, M. S. & Driscoll, P. A. (2014). Ex-Post Evaluations of Demand Forecast Accuracy: A Literature Review. *Transport Reviews*, *34*(4), 540–557.

Odeck, J. (2013). How accurate are national road traffic growth-rate forecasts?: the case of Norway. *Transportation Policy, 27*, 102–111.

Oates, W. (1972) *Fiscal Federalism*. New York: Harcourt-Brace Jovanovich.

Oates, W. (2005). Toward a second-generation theory of fiscal federalism. *International Tax and Public Finance*, 13, 349–373.

Osland, O. & Strand, A. (2010). The politics and institutions of project approval: a critical-constructive comment on the theory of strategic misrepresentation. *European Journal of Transport Infrastructure Research, 10* (1).

Parry, I. W. H. & Bento, A. (2001). Revenue recycling and the welfare effects of road pricing. *Scandinavian Journal of Economics, 103*, 645-71.

Parry, I. W. H. & Bento, A. (2002). Estimating the welfare effect of congestion taxes: the critical importance of other distortions within the transport system. *Journal of Urban Economics, 51*, 339–65.

Parthasarathi, P. & Levinson, D. (2010). Post-construction evaluation of traffic forecast accuracy. *Transport Policy, 17*(6), 428–443.

Pigou, A. C. (1932). *The Economics of Welfare*. London: Palgrave Macmillan.

SOU 2004:63. *Skatt på väg*. Stockholm

SOU 2017:11. *Betänkande av vägslitageskattekommitén.* Stockholm: Elanders Sverige AB.

Pickrell, D.H. (1992). A desire named streetcar fantasy and fact in rail transit planning. *Journal of American Planning Association, 58*(2), 158–176.

Pilegaard, N. & Fosgerau, M. (2008). Cost benefit analysis of a transport improvement in the case of search unemployment. *Journal of Transport Economics and Policy, 42*, 23–42.

Yvrande-Billon, A. & Ménard, C. (2005). Institutional constraints and organizational changes: The case of the British rail reform. *Journal of Economic Behavior & Organization, 56*(4), 675-699.

Shoup, D.C. (1997). The High Cost of Free Parking. *Journal of Planning Education and Research, 17*, 3-20*.

Stiglitz, J. (1989). Principal and Agent. In J. Eatwell, M. Milgate, P. Newman (Ed.), *The New Palgrave: Allocation, Information and Markets.* New York: W. W. Norton.

Van Dender, K. (2003). Transport taxes with multiple trip purposes. *The Scandinavian Journal of Economics, 105*, 295–310.

Van de Velde, D. M. (2015). European railway reforms: Unbundling and the need for coordination. In M. Finger, T. Holvad, & P. Messulam (Eds.),

Rail economics, policy and regulation in Europe (pp. 52-88). Edward Elgar.

Webster, C. J. (1998). Public Choice, Pigouvian and Coasian Planning Theory. *Urban Studies*, *35* (1), 53-75.

Welde, M. & Odeck, J. (2011). Do planners get it right? The accuracy of travel demand forecasting in Norway. *European Journal of Transport and Infrastructure Research, 11*(1), 80–95.

Willson, R. (2001). Assessing Communicative Rationality as a Transport Planning Paradigm. *Transportation, 28*, 1-31.

Williamson, O.E. (2000). The new institutional economics: taking stock, looking ahead. *Journal of Economic Literature 38, 595–613.*

Swedish Environmental Protection Agiency. (2007). *Klimat, transporter och regioner - En studie om målkonflikter och målsynergier*. Stockholm: Swedish Environmental Protection Agency.