# Achieving political acceptability for new transport infrastructure in congested urban regions

**Jonas Westin**[1]

**Pierre Basck**[2]

**Joel P. Franklin**[1,*]

**Stef Proost**[3]

**Charles Raux**[2]

**\*** Email: mailto:joel.franklin@abe.kth.se

## 1      Introduction

Many urban regions contemplate investing in peripheral roadways that bypass the city center, as a means of alleviating congestion and facilitating more efficient travel across the greater metropolitan area. Increasingly, such proposals are accompanied by tolling as a means of finance. Indeed, an optimal policy from an efficiency point of view would consider tolling both the bypass and the existing central roadway that is relieved. However, this may be blocked by stakeholders and voter groups. In this paper the main objective is to characterize the set of policies that are acceptable given the population, transport system, and local political processes; and to relate these to first-best and second-best policies.

## 2      Background

The Lyon conurbation (1,200,000 inhabitants) has a typical European urban form in which the central area contains approximately half the inhabitants and jobs. However, like similar agglomerations Lyon is subject to urban sprawl, with both population and jobs having a long-term tendency to move into the suburbs.

The main French North-South motorway runs across Lyon city centre implying clashes between long distance and local traffic, and thus congestion, pollution, noise and other harmful effects. Lyon's authorities are planning to divert some of this traffic by building a western motorway bypass (about 15 km long). The project includes a possible toll on the new bypass and either a reduction of capacity or a toll on the current motorway.

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[1] Deptartment of Transport Science, KTH Royal Institute of Technology, Stockholm, Sweden

[2] Laboratoire d'Economie des Transports, Université de Lyon, Lyon, France

[3] Centre for Economic Studies, KU Leuven, Leuven, Belgium

Financing is under the responsibility of the local governments, who have agreed on a common management of the decision procedure. The year 2013 will see a public debate and, if it is decided to go further, the infrastructure may open by 2025.

# 3    Methodology

We use a simplified model of part of the Lyon roadway network, calibrated to a more disaggregate implemented model for greater region. We employ the simplified transport model both to find welfare-optimizing policies, and within a model of the political process to identify the most likely transport solutions that can receive majority support.

## 3.1 Model of the Transport System

In the simplified model, we model the city on Lyon using a simple network model with two main roads (an eastern city road and a western bypass) and two back roads, one to the east and one to the west. Such abstracted models have been used to examine similar issues such as pricing with an un-tolled alternative [1], tolling by neighboring states [2], and games between parallel [3] and serial [4],[5] roadway operators.

Compared to these, our model includes a rich representation of the population groups within the region that could influence the political decisions whether to build the bypass and, if so, what tolls to set. The population is divided in to North, South, City Center (including East), and West[4]. Using the model, we calculate the change in welfare for multiple geographical areas and interest groups for a continous set of toll policies, both on the bypass and on the main city road, enabling us both to visualize the policy space and to calculate response surfaces for different stake holders as input to the model of the political process.

The baseline assumptions in the simplified model above are based on an implementation of the VISUM travel model system in the Lyon metropolitan area. Further, we use the VISUM model to test the solutions found by the simplified model on a more disaggregate scale. With these results, we can analyse which aggregated geographical groups are winners and losers in terms of gains or losses in generalized costs, taking into account tolls and changes in travel times.

## 3.3 Model of the Political System

We inspire our model of the political process on the setting of Dixit,  Grossman & Helpman [6]. Two processes influence the decision. First is the purely political process; second, a

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[4] There is also a peripheral zone that transits through the transport system but is not subject to local income taxes and does not participate in local policy decisions.

lobbying game. In the purely political process the preferences of the voters are aggregated into one preference function for policies. For this, we chose to rely on the agenda setter model [7], which is well-suited for decision making over several dimensions. In this model, one of the representatives, appointed agenda setter, proposes a minimum winning coalition that has a majority and that maximizes his own utility.

The second process is the lobbying process, in which several lobby groups offer a campaign contribution to the government that maximizes their preference function [6]. The closer the government decision approaches their preferred choice of policy variables, the higher the contribution to the government. The lobbying component, together with the direct political process, allows us to represent the role of issue-based lobbies, such as auto clubs, environmentalists, and business organizations.

## 4 Findings

Our results will illustrate the character of various interest groups' preferences with respect to a defined policy space. As an example, we can see in Figure 1 how welfare levels for the four subregional groups would be affected by the toll level of the new bypass and the toll level of the existing motorway. The light grey areas correspond to tolling policies where welfare increases whereas the dark areas correspond to policies where the area is worse off. The efficient combination of toll levels is around $(t_C, t_B) = (0.5, 0.5)$. From the figure we preliminarily see that it might be difficult to reach an agreement that satisfies all four geographical areas, and that only one area (the West) sees the efficient toll policy as welfare-improving.
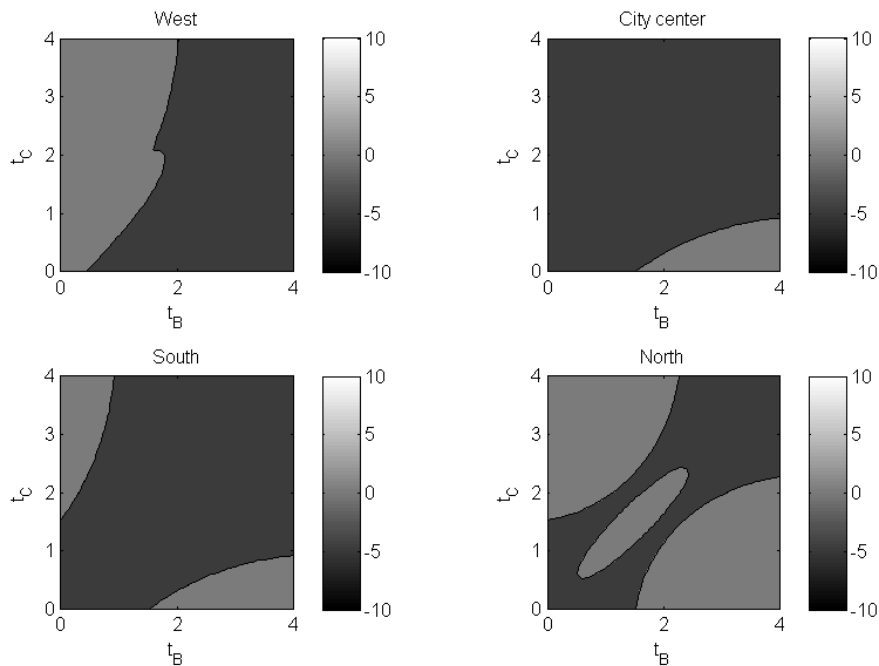
**Figure 1. Change in welfare after constructing a bypass for the four urban subregions, as a function of the toll on the new bypass ($t_B$) and the toll on the existing central road ($t_C$)**

Further results will expand the regional analysis to differentiate between high- and low-income residents in each area, as well as political interest groups such as auto clubs and environmental organizations. After identifying a set of discrete "representative policy options", the results of the political process model will further result in probabilities for each of these, helping to indicate how relatively "acceptable" each policy scenario would be.

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