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Transportation Research Procedia 10 (2015) 286 – 295

Transportation Research Procedia

www.elsevier.com/locate/procedia

18th Euro Working Group on Transportation, EWGT 2015, 14-16 July 2015, Delft, The Netherlands

Impacts on land use characteristics from ferry replacement projects. Two case studies from Norway

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Abstract

Fixed links projects are bridges or tunnels that connect two areas separated by geographic barriers. Fixed links reduce dramatically the travel time and provide reliability and flexibility, as often they replace ferry services. This might impact on land use characteristics and travel behaviour. We aim to explain these impacts by making time series analyses of empirical data on two fixed links that connect islands to the mainland on the west coast of Norway. We find that changes in travel time and cost might generate an increase in the attractiveness of the municipalities connected by the fixed links, leading to an increase in population. The greater demand for housing triggers a growth in square metre price for dwellings and construction rates. There is also a higher annual traffic growth than the experienced before the fixed link was opened. Despite that, we do not find either an additional increase in the number of companies or changes on number of employees in the existing companies.

Peer-review under responsibility of Delft University of Technology

Keywords: Fixed link, regional development, land use, housing market, labour market, population

1. Introduction

Fixed links are bridges or tunnels that join areas previously separated by geographic barriers, e.g. fjords. Fixed links might cause significant travel time savings since they often replace ferry services. They remove waiting time, increase speed of travel and provide a flexible link 24 hours 7 days a week. In addition, it is less likely that a fixed link would close due to bad weather conditions. The technology advances make it possible to build longer and more challenging fixed links and, hence, the number of planned fixed links projects have been increasing in recent years. The west coast of Norway is an example as seven ferry crossings are planned to be replaced by fixed links (Statens vegvesen, 2012). This paper aims to improve the knowledge on how these infrastructures affect land use characteristics and society.

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Peer-review under responsibility of Delft University of Technology
doi:10.1016/j.trpro.2015.09.078

Fixed-link impacts have been scarcely studied; nonetheless the weakness of the traffic forecast models have been highlighted in Norway by Tørset et al. (2013) and in Denmark by Knowles and Matthiessen (2009). Some ex-post evaluations of fixed links have shown the inaccuracies of the forecasts. The traffic over the international fixed link of The Channel Tunnel between England and France was lower than 50% of what was forecast even five years after the opening (Flyvbjerg et al., 2006). The traffic on the Øresund bridge between Denmark and Sweden was only 81% of the expected traffic the opening year. In contrast, the traffic on the two Danish projects the Great Belt Fixed Link and the Sallingsund Bridge exceeded the forecast by 73% (Knowles and Matthiessen, 2009) and 27% (Skamris and Flyvbjerg, 1996) respectively. In Norway, Trekantsambandet presented an overestimation by 40% and the North Cape by 20% (Lian and Ronnevik, 2010).

The over/underestimation of traffic volumes in the forecasts can be partly explained by the inaccurate prediction of the willingness of the users to pay for a fixed link (Bråthen and Hervik, 1997). This is also mentioned in Knowles and Matthiessen (2009) whose study stresses the lack of data on the physiological effect of substituting a ferry with a fixed link. In the study by Flyvbjerg et al. (2006) 208 road projects, fixed links among them, were evaluated by ex-post analysis. They found that the main reasons for the forecast inaccuracies are within trip distribution and land use development. There is little empirical data explaining changes in destination choice from infrastructure projects. In Norway, population forecasts from Statistics Norway are the key input factors for calculating traffic generation in the transport model. In the current methodology, the model uses the same population forecasts regardless of the possible impact on land use characteristics and society.

Interaction between infrastructure improvements and land use changes has been previously highlighted in Banister and Berechman (2001) and Geurs and van Wee (2004). According to Vickerman (1998) fixed links can promote regional development and cohesion. Integrating communities might widen and optimise the labour market (Louw et al., 2013). This may lead to redistribution rather than growth in the labour market (Gjerdåker and Engebretsen, 2010) (Louw et al., 2013) which is often evident in the commuting data. Our research question for this paper is: What are the possible impacts on land use characteristics and travel behaviour by fixed links, in a Norwegian context? We expect that a fixed link increases the interaction between the affected areas, triggering growth in population and housing market. Moreover, we presume an increase in the number of companies; a wider labour market might result in a growth in commuting between the affected areas.

This paper aims to contribute to the research on fixed link impacts by analysing and combining several types of empirical data over a long time period. The analysed data are traffic volumes, commuting patterns, population, construction and sales of dwellings, and company data. Unlike most of earlier studies, we focus on islands, which have a defined influential area. In addition, we also compare the cases to similar areas without the influence of a fixed link.

In this paper we investigate the ex-post impacts of two fixed links in Norway, presented in chapter 2. In chapter 3, we explain the methodology and the data. The results from the analysis are presented in chapter 4, where we observe possible trend changes before and after the opening of the fixed links. Furthermore, in chapter 5 we discuss the pattern variations, and how the impacts of the fixed links may affect the inaccuracy of the traffic estimations. Chapter 6 comprises the conclusions of this study.

2. Case studies

In this paper, we examine two fixed links, which connect the main islands of the municipalities of Rennesøy and Finnøy to the mainland in the Stavanger area. The study is conducted at municipality level as shown in Figure 1.

We look at a total of six municipalities or regions. Kvitsøy and Strand are municipalities still connected to the city of Stavanger by ferry services. The mainland is divided into two parts; the Stavanger, Sola and Sandnes region (SSS-region) and Randaberg. The SSS-region is well-integrated with a common labour and housing market, thus we look at it as a single entity. We look at Randaberg separately since both fixed links from Rennesøy and Finnøy are joined to the mainland on this municipality.

Figure 2 shows the different connections from the mainland to Rennesøy and Finnøy for three different periods.

Before 1992, Rennesøy and Finnøy were only connected to Stavanger by ferry services, presumably with a frequency of 4 trips per day. The travel time from Rennesøy (Vikevåg) to Stavanger was approximately 150 minutes, including 30 minutes waiting time, with a fee of 148 NOK. The travel time from Finnøy (Judaberg) to Stavanger was