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Impacts on land use characteristics from fixed link projects: four case studies from Norway

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Abstract

Infrastructure projects with large increase in accessibility, often experience over- or underestimation in traffic volume prognosis. This has been the case in several fixed link projects in Norway. Fixed link projects replaces ferry services with a bridge or a tunnel, resulting in large time savings across the fjord. This paper investigates four fixed link projects in Norway. The fixed links connects islands to towns with a population of up to 50.000. This study investigates how land use is affected by the opening of a fixed link. Commuting patterns, population, housing prices and number of companies are analysed with the difference in difference method. Results show a growth due to the fixed link for two of the cases, while the other two experience small or no growth caused by the fixed link. The results indicate that land use changes might appear for islands, which get a fixed link connection to non-urban areas.

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1. Introduction

Traffic volume prognosis is a crucial part in the assessment of new infrastructure projects. The prognosis is the basis for calculations of e.g. user benefit in cost benefit analysis, pollution, and toll income. This process requires assumptions of people's travel behaviour. A lack of accuracy in the assumption and hence in the forecasts might lead to the selection of an infrastructure that is not optimal. Traffic volumes for fixed links projects with precision is currently of crucial importance in Norway. The project "Coastal Highway Route E39" will improve a national road, replacing 7 ferry services with fixed links along the western coast of Norway (Ellevset, 2012). Fixed links are bridges or tunnels that join areas previously separated by geographic barriers, providing a permanent connection. Fixed links might lead to significant travel time savings and improve the convenience of travelling. However, the cost does not necessarily decrease when the fixed link are opened, as a part of the investment are normally financed through tolling.

Few studies have been conducted on impacts of fixed link projects. However, some ex-post evaluations of these projects, have found significant over/underestimation of traffic volumes for these kinds of projects (Díez Gutiérrez et al., 2015; Flyvbjerg et al., 2006; Skamris and Flyvbjerg, 1996). The mismatches might be caused by the imprecise prediction of the willingness to pay for a fixed link, according to Bråthen and Hervik (1997). Knowles and Matthiessen (2009) also mention the lack of data on the psychological effect of substituting a ferry with a fixed link. Flyvbjerg et al. (2006) found that the main reasons for the forecast inaccuracies are within trip distribution and land use development.

Transport models are normally used to obtain traffic volume forecasts. The Norwegian model is a four-step transport model, which does not account for possible changes in land use, and it uses the same population forecasts regardless of the possible impact by a new infrastructure. Nevertheless, Díez Gutiérrez et al. (2015) analysed new Norwegian fixed links joining smaller towns/settlements to cities with more than 50.000 inhabitants, within commuting time. The fixed links affect population growth, housing market and people's behaviour. The population increases considerably right after the reduction in travel time caused by the fixed links, and even more after the reduction in travel costs caused by the toll removal. Consequently, the housing market also changes, increasing the square metre price and the construction rate of new dwellings. These findings are in coherence with the urban economic theory, which states that improvements in accessibility might promote an increase in population, economic activities and housing prices in one area (Coppola et al., 2013).

In this paper, we conducted four ex-post evaluations of fixed links, which join smaller towns/settlements (up to 50.000 inhabitants) closer together. The objective was to gain knowledge about how these fixed links affect land use characteristics and society and, to observe the impacts in rural areas. The method analyses changes in development of population, commuting, housing market and number of companies at the municipal level over time. The timeframe of observation was from the opening year of the fixed link until 5 years after. Unlike most of earlier studies, we focused on islands, which have a definite influential area. In addition, we also compared the cases to similar islands without the influence of a fixed link.

The four fixed links are presented in chapter 2. Chapter 3 describes the difference in difference method used to compare the evolution of the variables in the affected areas to a control group. Chapter 4 presents the results of the study, where we observe possible trend changes before and after the opening of the fixed links. The discussion concerning the trend changes are described in chapter 5. The conclusions of this study are summarized in chapter 6.

2. Case studies

In this paper, four fixed links along the west coast of Norway are studied. Fig.1 shows the analysed cases; Trekantsambandet, Eiksundsambandet, Halsnøysambandet, and Atlanterhavstunnelen. The analysed affected areas are marked with a solid grey line, while the control groups are marked with a dotted grey line.