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Infrastructure investments and rural development: The case of Norwegian National Tourist Routes

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Infrastructure investments and rural development: The case of Norwegian National Tourist Routes

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Abstract

This thesis studies the impact of tourism based infrastructure investments on rural development in Norway by looking at the ongoing case of investment into the Norwegian National Tourist Routes. Using a generalized difference-in-differences estimation we look at the impact of opening attractions in different municipalities across Norway on this set of outcome variables: Population growth, unemployment, traffic accidents and housing prices. The results from the difference-in-differences estimates indicate no significant effect of opening attractions, but the estimates of what we call top attractions show that the number of traffic accidents increase by 20 to 22 per 1000 inhabitants. While not all of the models used show significant results for the other variables, top attractions seem to have a positive effect on population growth and housing prices in some of the models. With a limited number of our results yielding significant findings, we cannot conclude that the investment into tourism based infrastructure and tourist routes have had a noticeable short-run impact on local development at least when looking at all attractions, while for top attractions there seems to be an increase in number of traffic accidents. That being said, the analysis has been done while the project is still ongoing and has only been able to look at the contemporaneous and short-run effects. Therefore, investment into tourism based infrastructure and tourist routes might still have a significant impact on local development in the long-run.

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1. Introduction

Infrastructure investments are a tool used globally to improve local development and economic growth. Infrastructure investment can thereby take many different forms, including investment into roads, train connections, bridges, or electrical and telecommunications infrastructure. All these types of investments have a common purpose in that they aim to improve social and economic development in the location of the investment. A lot of academic research has investigated the impact and implications of these distinct types of infrastructure investments (e.g. Berger & Enflo (2017), Fang, Kleimann, Li & Schmerer (2019)). Nonetheless, an area that lacks in-depth research is investments into tourism related infrastructure and its effects on local development (for important exceptions, see Lourens (2007) and Rogerson (2007)). In this thesis we therefore aim to contribute to this literature by investigating a tourism based investment project by the Norwegian state: National Tourists Routes, also known as Norwegian Scenic Routes, and see what effects it has had on rural development. Our central research question thus is the following: "What are the socio-economic impacts of the Norwegian government's investment into National Tourist Routes?"

National Tourist Routes is a large investment project into 18 different roads across Norway. The roads have been hand-picked by the Norwegian Public Roads Administration based on their scenic environments. The decision to invest is made with the aim to increase the perceived value and attractiveness of the routes for tourists, both Norwegian and foreign. There are mainly investments into architecture and attractions such as rest stops, art pieces and viewpoints along the assigned tourist routes, with plans to develop approximately 200 different attractions. The project involves 10 fylkeskommuner, 64 municipalities as well as other public bodies, businesses and local organisations, and is set to be finished by the end of 2023.

With a budget of 4,6 billion NOK, this is a large project that influences major parts of the Norwegian society. Hence, we find it of interest to look more in detail into the actual economic effects of the project. Have the investments resulted in economic growth, reduced unemployment or increased house prices in the local communities? Have these investments resulted in any potential negative side effects, such as increased traffic from tourists, which may lead to more accidents?

The opportunity to do research on such a novel project on this scale in Norway is very appealing to us. Hence, we took this opportunity with great curiosity. Naturally, there are substantial challenges with doing research on a project that is still ongoing, but the possible benefits of finding novel results are exciting and motivating. As such, we hope to shed new light on tourism based infrastructure investments and its impact on rural development.

While there has been some previous research on the economic implications of tourist routes (Lourens (2007) and Rogerson (2007)), to the best of our knowledge the only previous research on this Norwegian project's impact is by Menon Economics on behalf of the Norwegian Public Roads Administration. Their research analyzed data on four of the 18 tourist routes with the objective to see if the national tourist routes were creating additional value for the businesses connected to the tourist routes. They did this by comparing accounting numbers of firms connected to the routes with accounting numbers of similar firms in areas without tourist routes. Menon Economics suggested that there were significant positive effects on the businesses connected to the routes (Menon Economics, 2017 & 2019). Our research differs from Menon's research in three main ways. First, we aim to look into the development at municipality level, and not at a business level. Additionally, we are addressing a distinct set of outcome variables, including unemployment, population growth, traffic accidents and house prices. These variables will give us a broader view of how these investments affect different parts of society, such as the population composition and the job market, but also the housing market and road traffic. Finally, by taking into account not only positive outcomes (such as growth, employment and house prices), but also potential negative side-effects (such as traffic accidents), our research thus gives a broader view on the overall effects of the investment.

With these outcome variables in mind, our empirical analysis relies on a difference-in-differences approach to compare municipalities both before and after implementation of the tourist routes and the connected attractions. By doing this, and by using economic theory, we will try to suggest some novel findings and indications as to whether the project has had an impact or not on the involved local communities.

The remainder of this thesis is organized as follows: In the next section we provide a review of previous research to contextualize our study and topics. Further, we will detail our research design and strategy and explain the data used in our analysis. Finally, we will present results and accompanying discussion before providing some concluding remarks.

2. Literature Review

Since the National Tourist Routes program involves large-scale investments in tourism infrastructure, two literatures are of relevance to our analysis. The first literature of interest deals with tourism's impact on economic growth and local communities, and the second discusses the relation between infrastructure investments and local development. A lot of research has been done on both these topics, and hence the literature review will touch upon both types of research papers to shed light on whether and how investments into infrastructure and tourist routes have contributed to economic growth and development in local areas through the years in several countries and regions. By including studies from countries and areas across most continents (including Europe, Asia, Africa and North America), we are providing a broad basis of knowledge for further analysis.

The literature review will be divided into different sections. The first section will provide a discussion of the relationship between tourism and economic growth. Then we will gradually zoom in towards the essence of the paper, and include research on our defined outcome variables as well as how different types of infrastructure investments (such as tourist roads and railway routes) have an impact on local development. We will thereby discuss several papers that explicitly deal with tourist attraction investments, which are arguably the closest to our own empirical case. Lastly, we combine the results and findings from all the previous research and summarize it in a preliminary research conclusion, and based on this write a set of hypotheses that are to be tested empirically in our analysis.

2.1 Tourism and its impact on economic growth

Whether a country's investments in international tourism can be used as an engine for economic growth is an important question for policy-makers (Du, Lew & Ng, 2016). There is no doubt that international travel and tourism comprises a major part of the global economy and is the largest service sector in international trade (Lew, 2011). Tourism is also within the top five sources of international export income for more than 80% of countries in the world (UNEP, 2009, cited in Du, Lew & Ng, 2016). As such, it is no surprise that there have been several studies in different countries on the relationship between tourism and economic growth, and most of the studies argue for a positive long-run relationship. Du, Lew & Ng (2016) refer to examples from all over the world, including all continents, indicating that there exists a long-term positive relationship between tourism and economic growth. This is confirmed by Brida, Gómez & Segarra (2020), who are studying 80 countries in the period 1995-2016 and indicate positive and statistically significant estimates of tourism evolution on economic growth. A meta-analysis by Nunkoo, Seetanah, Jaffur, Moraghen & Sannassee (2020) reviews 113 different studies and supports the findings regarding the positive effects of tourism on economic growth. They do, however, state that direct implications from other studies should be done with caution as findings from the different studies depend on the chosen specifications and estimation choices which might lead to biases.

The main motivation for a business or region to serve tourists is generally economic (Stynes, 1997). Regions and destinations may see tourism as a way to make use of their comparative advantages in natural and cultural supply-side resources to improve the local economy, thereby generating foreign exchange and creating jobs etc. (Hindley and Smith 1984; Mihalič 2002). From a theoretical and macroeconomic perspective, international tourism contributes to the export income of a destination (Du, Lew & Ng, 2016). Lee & Chang (2008) re-investigated the long-run comovements and causal relationships between tourism development and economic growth, and provided evidence for a unidirectional causal relationship from tourism development to economic growth in OECD countries. They show that tourism not only increases foreign exchange income, but also contributes to an increase in employment opportunities and, by virtue of the growth in the tourism industry, leads to overall economic growth (Lee & Chang, 2008).

In the research paper by Du, Lew & Ng (2016), the findings indicate that investments in tourism in and of itself are insufficient for economic growth. However, they do state that the increase in tourist activity positively influences the economic growth of a country and region. The reason tourism has the potential to stimulate economic growth is that it is complementarity with other economic activities. It contributes to gross domestic product (GDP) via job creation, generating foreign exchange etc. (Cárdenas-García, Sánchez-Rivero, & Pulido-Fernández, 2013, cited in Du, Lew & Ng, 2016). On the other side, Deskins & Seevers (2011) argue in their article regarding tourism effects of government expenditures in the US that additional Tourism Promotion Spending increases tourism and growth in employment for states that have low levels of initial tourism expenditures. However, the effect will diminish as initial levels of tourism expenditures increase.

2.2 Impact of comparable previous tourism projects

Tourism routes have emerged as a significant element for the promotion of tourism, especially in small towns and rural areas (Rogerson, 2007). The development of these kinds of routes is vital to tourism-related commerce. Some routes provide access to a single and primary tourism attraction, while most routes seem to represent and link secondary attractions as clusters (e.g. Briedenhann & Wickens, 2004; Hoel & Perfater, 1992; Leiper, 1990, cited in Denstadli & Jacobsen, 2010).

According to Meyer (2004), tourist routes seem to be a particularly good opportunity for developing less explored areas with valuable cultural resources, which can appeal to special segments of tourists. The tourists of interest often stay longer and spend more money on their stay when dedicated routes have been developed. Routes may also appeal to a variety of users, such as international overnight tourists using the routes as part of a special interest holiday as well as longer-staying tourists who use them for day excursions. Route tourism is all about linking together a series of attractions in order to promote local tourism and encourage visitors to travel from one place to another (ECI Africa, 2006a,b, cited in Lourens, 2007)

Most academic research in this domain tends to take the form of in-depth case studies of one or more specific routes. A paper by Lourens (2007), for instance, deals with two routes: the Camino de Santiago in Spain and France, and the Midlands Meander in South Africa. Results from these two separate cases demonstrate that, with the right government and private sector leadership, route tourism can play a vital role in the economic development of local communities. This finding is confirmed in an article by Rogerson (2007), which examines the local development impacts of the Magaliesberg Meander (a route tourism initiative that traverses two South African provinces). Rogerson (2007) argues that this tourism route has substantially extended the tourism growth potential of the area.

The mechanisms behind these development effects are often found to be quite diverse. Briedenhann and Wickens (2004, p. 72) – as cited in Rogerson (2007) - argue that these development effects arise due to "the clustering of activities and attractions in less developed areas, which stimulates cooperation and partnerships between communities in local and neighboring regions and serves as a vehicle for the stimulation of economic development through tourism". Tourist routes thus give reasons for cooperation within communities and allows municipalities to extract the maximum potential effect from tourism. Rogerson (2007) also argued that the local areas connected to the routes have a better foundation for growth when they are rural. The reason is that rural areas are less developed than urban areas, which increases the opportunity for more economic growth within the municipality. These observations may be of particular relevance to our research question since most of the areas directly connected to the Norwegian National Tourist Routes program are initially relatively rural.

2.3 Infrastructure and local development

A key part of the National Tourist Routes program relates to its investment in new tourist attractions. This involves significant infrastructure investments, therefore we here also bring forward research studying the contribution to local development of infrastructure investments. We thereby focus on several recent studies on the impact of railway investments because these are similar to (tourist) road investments in terms of their link to the transportation of people. The questions addressed in these studies – i.e. on the relation between infrastructure investments and local development – are also close to our own research question, such that the empirical tools and conclusions can be of high relevance for our own research design.

Berger & Enflo (2017) study the effects of new railroad connections on economic growth. They thereby use difference-in-differences and instrumental variable estimates on Swedish data. The results indicate that towns gaining a new connection to railways experienced substantial relative increases in population. Interestingly, such growth mainly reflected a relocation of population and economic activity. Hence, it came at the cost of nearby non-connected towns. This makes it challenging to calculate the net-effect (Berger & Enflo, 2017). It is, moreover, difficult to draw clear conclusions as transport infrastructure is not randomly assigned across locations. Even though Sweden transformed from one of the poorest countries in Europe to one of the richest in the world partly due to investments like this, Swedish towns were small and the population was largely rural in the nineteenth century. This ensures that even a small shock was able to permanently shift economic activity between locations. Yet, it is unclear whether similar effects would also be observed in modern developing countries that are less urbanized. World Bank (1994 and 2009), cited in Berger & Enflo (2017), nonetheless state that improving transport infrastructure is seen as crucial to stimulating growth, and that it has substantial causal short-term effects on urban development.

Another example of similar railway investment projects is presented in the research paper by Fang, Kleimann, Li & Schmerer (2019). They provide an analysis of potential effects of the establishment of the CR Express (China Railway Express) on real economic outcomes. The CR Express is an infrastructure investment, which crosses a significant number of EU countries that differ with respect to economic size and domestic conditions, and connects 60 cities in China with 50 cities across 15 European countries. Its purpose is to boost the connectivity within the Eurasian market, and transports, among other things, electronic products and clothes from China to Europe, as well as cars and beverages in the opposite direction. Fang et. al. (2019) found the CR Express is a strong contributor to employment, which confirms that the establishment of the CR Express has an impact on the local economy. The results manage to give substantial evidence to support the positive effects of railway connections on local employment. The findings show that the treatment effects of the CR Express spill over into its surrounding regions (Fang et al., 2019). This contrasts with Berger & Enflo (2017), who are showing exact opposite results[1]. Fang, Kleimann, Li & Schmerer (2019) carefully concluded that increased connectivity brought by the CR Express has already generated real impacts on local economic activities in its local areas and areas nearby (Fang et al., 2019).

2.4 Infrastructure and housing prices

It is intuitive to think that an attractive environment is likely to influence house prices. Houses in attractive settings will have an added value over similar, less favorably located houses (Luttik, 2000). The natural question then becomes: what is attractive? Which environmental features make a location an attractive place? In answering this question, Kauko (2006) mentions accessibility and pleasantness of the location. Daams et al (2016) likewise focus on the effect of attractive natural spaces in their research on the Dutch market, and suggest that there is a positive effect on the house prices. However, the effect of attractive natural space on house prices varies in accordance with the level of urbanization: the effect varies between metropolitan, urban, and nonurban regions both in magnitude and in the distance at which the effects can be observed. Li & Brown (1980) provide evidence for higher house prices in areas with high visual quality aesthetic attributes and lower house prices related to negative externalities connected to air pollution and noise. These views and findings are relevant for our thesis as it is reasonable to believe that the investments into the different attractions along the tourist routes will affect the local environment, and thereby house prices.

More direct evidence in this direction is provided in a Greek study by Efthymiou & Antoniou (2013). They indicate that proximity to transportation infrastructure has a direct impact on house prices. However, this impact might be both positive

[1] A potential reason for the spillovers to be of different signs can be due to the difference in outcome variables. The Swedish paper looks at population, while the China study looks at economic activity such as employment. A second plausible reason might be the fact that Sweden and China are significantly different countries making the results differ.

or negative depending on the type of the transportation system. Metro, tram, suburban railway and bus stations affect the prices positively, while national rail stations and airports have a negative effect due to externalities such as noise. While they state that these results cannot be directly transferable to other locations and areas, it could nonetheless give useful indications for how house prices respond in our Norwegian setting.

2.5 Increasing road activity on traffic accidents

There is not much recent literature on traffic accidents and relevant potential reasons for it. Many of the previous research papers are quite old, and contain causes which are not in our interests, such as demographic factors and drivers' behavior as Wang, Quddus & Ison (2013) states in their article. In the same paper, they mentioned that road safety, which might be measured by traffic accidents, can be explained by traffic characteristics and road characteristics. Traffic characteristics includes traffic flow, while road characteristics includes road improvements and investments. Their results show that the total number of traffic accidents increases as traffic flow increases. The number goes down as road infrastructure improves, meaning that upgrading the roads will lead to a higher level of traffic safety.

Dickerson, Peirson & Vickerman (2000) performed an econometric investigation of the relationship between traffic flow and accidents, and indicate that this relationship varies significantly depending on geographical area and road classification. Their result implies that there is a substantial negative road accident externality when the traffic flow is high, which is similar to the result by Wang et al (2013). There is also a study by Vitaliano and Held (1991), cited in Dickerson et al (2000), who investigate traffic accidents and traffic flows on urban and rural roads in New York, and the same results once more were confirmed. The effects were not as solid, but traffic flow still caused negative external effects on traffic accidents.

2.6 Preliminary research conclusion and hypotheses

Overall, previous research has shown that well-designed and creative tourism routes can generate several positive advantages and lead to economic growth. According to Meyer (2004), developing tourist facilities, activities and services along tourist routes is a way to make tourists spend more time and money. This will provide additional employment and income, both directly and indirectly (Rogerson, 2007). Evidence from previous research gives reasons for a positive impact on local development and economic growth in areas connected to the routes. However, whether the spill-over effects for the areas nearby are positive or negative, remains a point of debate in previous research.

Most papers focus on very different aspects in their research, particularly in terms of the relevant outcome variables. This makes it difficult to conclude which factors are likely to be particularly relevant and what outcomes are actually affected. We therefore decided to cast a somewhat broader net, and selected our main outcome variables of interest to include unemployment, population growth, car accidents and house prices in the area. The reason behind our chosen outcome variables is their connectivity with tourism and infrastructure. Several of the previous researchers have given evidence for this, where Rogerson (2007) and Lee and Chang (2008) states that tourism contributes to an increase in employment opportunities, and Fang et. al. (2019) show positive effects of railway connections on local employment. Regarding population growth, the Swedish study by Berger & Enflo (2017) indicates that towns getting access to the connected railways experienced substantial relative increases in population. In general, and based on findings from Luttik (2000) and Li & Brown (1980), attractive regional features are shown to have a considerable impact on house prices, and lastly an expected increase in traffic is a potential reason for increasing share of accidents (Wang et al, 2013).

Based on previous research, our hypothesis is that the investment in National tourist routes in Norway and the attractions associated with the routes will have positive effects on local employment and potentially also positive effects on population growth. Additionally, we expect traffic accidents to be a negative side effect of the investments into attractions, corresponding to the results by Wang et al (2013) and Dickerson et al (2000), meaning that the traffic accidents will increase. This assumes that the attractions along the tourist routes will increase tourism and the activity on the roads[2]. We also expect an increase in house prices. The thought behind the increase in house prices is mainly due to the increase in accessibility and the aesthetically pleasing attractions located along the routes. Inspired by the study by Berger and Enflo (2017) we furthermore expect that any observed effects are strongest in areas with direct access to the routes, but remain significant also in areas lying in a close range from the connected regions. We are, however, not sure how quickly the effects might play out as some of our variables probably are lagging. Hence, it is arguably an empirical question whether the short-term effects we focus on empirically (due to data availability) are statistically and/or substantively significant.

3. Research design

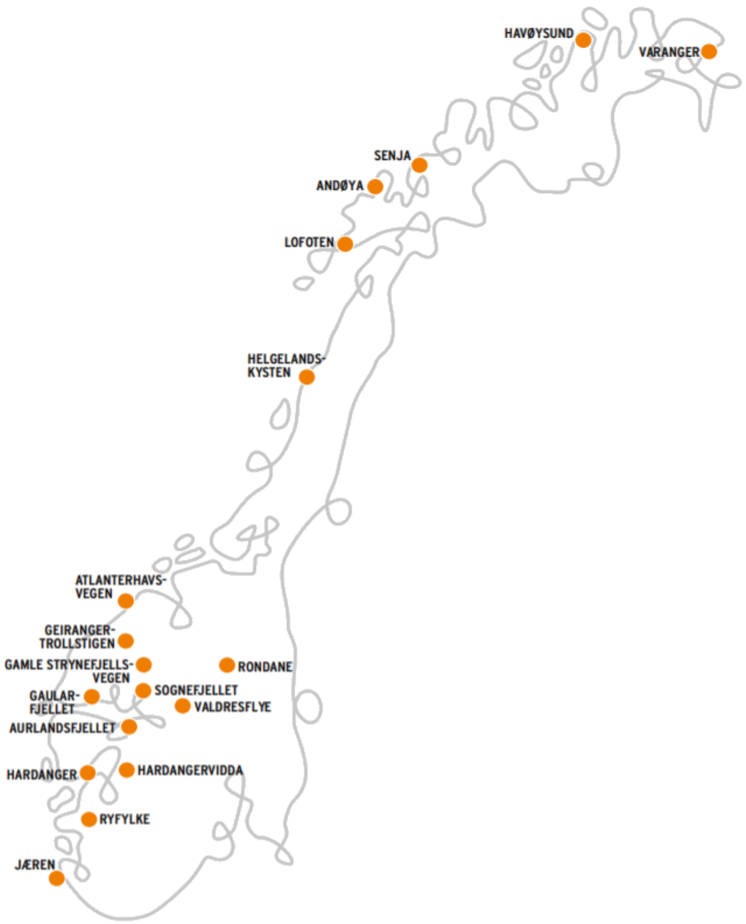
In this section, we go through the various elements of the research design we developed to answer our research question. We first discuss our case selection where we go more in depth into what National Tourist Routes is and explain its implementation. Then we will go through the various data we have collected, including the variable definitions and sources. Then we describe our empirical methodology.

3.1 Case selection

Now we will go more into the details of the routes and what sort of information is available in regards to the project. Firstly, as mentioned, there are 18 different routes spread out over 10 fylkeskommuner (as they were in 2018), going through a total of 64 different municipalities. The different routes vary in length with the shortest being only 27 kilometer called “Gamle Strynefjellsvegen” going through the two municipalities Skjåk and Stryn. The longest route, called “Helgelandskysten”, is 434 kilometers long and goes through 13 municipalities. The first routes to officially become tourist routes were Gamle Strynefjellsvegen, Hardanger, Helgelandskysten and Sognefjellet in 1997, while the remaining 14

[2] Note that if there are significant improvements of the roads of the tourist routes the number of traffic accidents might go down which would work to bias our findings regarding the negative externality of traffic accidents. Information from National Tourist Routes’ communication channels does not indicate any specific investments into road improvements.

officially became routes in 2012. Officially becoming a Tourist Route means they have been selected by Norwegian Public Roads Administration and have gotten a sign at each entry point of the route. Where the 18 different routes are located can be seen in the image below.



(Nasjonale Turistveger Årsmelding 2019)

Along with the routes themselves comes investment into creating attractions along the routes. These investments go into three different types of attraction: rest stops, art pieces and flagship attractions. Rest stops are stops along the routes made at specific places that are deemed particularly suitable for viewing experiences as well as architectural designed restrooms. A total of 53 different rest stops have been developed since the start of the project. The first one opened in 1996 in Lom and was called Vegaskjelet. In the years before 2006 15 rest stops opened in the period 1996 to 2005. The most rest stops opened in 2006 with a total of 11 stops. Following 2006 there has been an even number of new rest stops opening, totalling 26 new rest stops as of 31/12/2018.

The second type of attractions they have invested in are what they call flagship attractions. These attractions are major investments into viewpoints to enhance the experience of the surrounding nature. There exist 14 different ones as of 2018. For example the first flagship attraction to open was Likholefossen in 2006. This is an architecturally designed bridge going over the Gaular rivers, which leads to a walking path by the river. Other flagship attractions are other types of bridges such as Høse Bru, Myrbærholmbrua and Vøringsfossen as well as a hotel, some museums and viewpoints.

The final type of attraction are art pieces. These are different types of art along the routes and a total of 4 have been made by the end of 2018. The first one opened in 2012 and is called Vedahaugane which is a walkway into a den with some art pieces in. The newest art piece is Mirage, which opened in 2016 and consists of one well along the Gaularfjellet route (with nine other wells located in Malawi).

Throughout the analysis, we will exploit the variation in time and space of the opening of these locations to the public to estimate their impact on local development outcomes (more details below).

3.2 Data

We received an initial dataset from our supervisor, but this only included data up to 2016 and therefore needed updating. We have updated the data to 2018 since this is the latest year for which data was available for the variables of interest. All the data is on a yearly basis and at the municipality level. More specifically, we collected detailed information about the tourist routes themselves, as well as about the municipality-level outcome variable of interest. In this section, we discuss each of these in turn.

Firstly, a key part of our data set is variables from the 422 municipalities (as they existed in 2018). In this dataset we have information on the municipality number, year of observation going back to 1990 up until 2018, county, whether there is a tourist route there or not, and what year the municipality got a Tourist route. We also have data on the municipality's location with longitude and latitude of each municipality at its center. This is information that is available to us at SSB and through information from the National Tourist Routes website.

Further, the dataset contains data on the variables that are of interest to us. Firstly, we have data on population size of the municipalities starting from 1990 to 2018. Also there is data on unemployment, average price per square meter for house sales, average income, grants (or "Rammetilskudd") and consumer price index using 2015 as a base year. Where the data on average income starts from 1993, the data on grants from 1991, and the data on house prices from 2002. Furthermore, there is data on the number of traffic accidents in the municipalities. Here there is data in 1990 and 1991 and then a gap without data until 1999. The sources for this data are from SSB, Kommunedatabasen and KOSTRA which is an accounting system that municipalities use to report to the central government.

Table 1. Summary statistics of the variables of use. Only municipalities with a tourist route

Variable	Observation	Mean	Standard Deviation	Min	Max
Population	1 798	5 448,57	6 627,44	485	51 558
Unemployment (in percent)	1 788	1.406	0.891	0.064	9.766
Grants (In thousands)	1 724	24.874	13.825	0	74.891
Average income	1 612	309 786	65 442.32	185 493	474 700
Accidents (per 1000 inhabitants)	1 364	163.129	136.4249	0	1302
House Prices	428	13 922.63	4 503.56	5 030.68	27 987.68

In Table 1 we see some summary statistics on the different variables we are using for our analysis. As we see from the table the municipalities that have a tourist route going through them vary in many ways. Looking at the population variable we can see that there are mostly smaller municipalities included with a mean of 5 488 inhabitants, but that the largest municipality recorded has over 50 000 inhabitants. Also the average income varies by quite a substantial number and the same with housing prices. This shows that the municipalities included in the National Tourist Route project differ in many ways. The results from our analysis will benefit from this great variety of municipalities, since this can make them more easily generalizable to a broader set of sufficiently "similar" municipalities.

3.3 Empirical methodology

To draw any conclusions there is a need for setting up a methodology and strategy to analyze the variables of interest and how they have been impacted by the investments into National Tourist Routes. The decision on which roads become tourist routes was not randomly chosen but based on the road's access to beautiful nature and surroundings, and whether they were suitable for investment purposes. Hence, the choice of analytical method needs to be based on an econometric strategy that does not require random selection. Another important thing to mention is that the choice of what roads became Tourist Routes were unrelated to the outcome variables of interest. The criteria for becoming a tourist route were as follows; "The roads need to have variation and go through landscapes with unique natural qualities, through coasts, fjords, mountains and waterfalls. The routes shall be a good alternative to the main roads and the drive itself shall be of good experience" (National Tourist Routes, 2019). Based on these criteria the choice of road is unrelated to our variables of interest. Though they also state their long term goals are "to make Norway a more attractive destination to strengthen businesses and settlement in the local districts" this is not a criteria for the choice of Tourist Route, thereby still making our outcome variables unrelated to choice.

One important question in the case of National Tourist Routes relates to the actual treatment. Is it the roads becoming an official tourist route, or is it the investment into attractions along the routes that is the treatment? 14 of the routes were officially given Tourist Route status in 2012, with the first four in 1997, but this in and of itself only gave them a sign at each end of the road with no other specific investment done into the infrastructure at this point. The attractions on the other hand meant significant investment into infrastructure such as facilities for viewpoints, restrooms and art works that would make it more attractive for tourists. The investment into the attractions puts money into the local municipalities' economy, as well as creates a new appeal for tourists to travel the routes. Comparatively, giving the status of a tourist route to the road does not give it any specific new appeal to tourists. What becoming a tourist route indicates to the world is that the road has beautiful scenery and one can expect the road to get significant investments in the future. This does not in and of itself give the municipalities anything new that they did not already have, since the road has always been there in the years before becoming a National Tourist Route. Therefore, what is the actual treatment in this case should be considered the finalization of the different attractions built along the routes.

3.4 Empirical Strategy

The method we find most applicable in this setting is Difference-in-Differences (DID). With DID there is no need for randomization of who gets treatment and the results are easy to interpret, but there are some assumptions that need to be fulfilled. Firstly, the standard ordinary least squares (OLS) assumptions must hold. Secondly, there is the parallel trend assumption that must be fulfilled. This means that in the absence of treatment, the treatment and control groups should follow common trends, we will come back to this later. We start by specifying a baseline model as follows;

$$Y_{m,t} = \boldsymbol{\alpha} + \boldsymbol{\delta}(\text{Top})\text{Attraction}_m + \boldsymbol{\gamma}\text{Post}_t + \boldsymbol{\beta}((\text{Top})\text{Attraction}_m * \text{Post}_t) + \boldsymbol{\epsilon}_{m,t} \quad (1)$$

Here $Y_{m,t}$ is our outcome variables, population growth, accidents, house prices and unemployment. $\boldsymbol{\alpha}$ is a constant. (Top)Attraction$_m$ is a dummy variable for if the municipality has an attraction or top attraction opening sometime in the sample. This specification gives us the opportunity to run regressions with all attractions as treatment or only top attractions. Top attractions are those attractions that have been categorized as flagship attractions by National Tourist Routes themselves. Post$_t$ is a dummy for being the period after the attraction has opened. $\boldsymbol{\beta}$ is the causal effect of interest indicating the relationship between treatment and the outcome variable. Finally, $\boldsymbol{\epsilon}_{m,t}$ is an error term. This follows the Difference in Differences model described by Angrist and Pischke (2014, 187-189).

Since we use panel data we need to cluster the standard errors. The reason for this is that otherwise one would ignore that each observation is dependent on the previous year's observation. Serially correlated data is described by Angrist and Pischke as; “data (that are) persistent, meaning the values of variables for nearby periods are likely to be similar” (2014, p 205). Therefore, by clustering standard errors on municipalities we solve the dependency problem in our data. This will lead to higher standard errors, but will make our estimates more correct.

A problem with the specification in equation (1) is that the treatment in our setting does not come at the same period for all treated municipalities. With attractions opening at different time periods the $Post_t$ dummy will not be able to identify properly when treatment comes in for all the municipalities since they open over multiple different years. This means there is a need for some modifications to the standard DID. Specifically, we create a new baseline model following the approach described by Andrew Goodman-Bacon (2018) and call it a Generalized Difference-in-Differences approach:

$$Y_{m\,t} = \boldsymbol{\delta}_t + \boldsymbol{\gamma}_m + \boldsymbol{\beta}^{DD}((Top)Attraction_m * Open_{m,t}) + \boldsymbol{\epsilon}_{m,t} \qquad (2)$$

Here $Y_{m,t}$ still is the outcome variable of interest. $\boldsymbol{\delta}_t$ is time fixed effects correcting for differences across different time periods, for example in some years unemployment might be higher across all municipalities compared to other years. $\boldsymbol{\gamma}_m$ is municipality fixed effects correcting for different levels of the outcome variables for the different municipalities. The term $(Top)Attraction_m$ still is a dummy for whether the municipality has an attraction or not, but the term $Open_{m,t}$ is now a dummy for whether that specific municipality's attraction has opened or not. This means that $((Top)Attraction_m * Open_{m,t})$ will only be equal to 1 when the municipality has an attraction and it has opened.

With this type of treatment identification $\boldsymbol{\beta}^{DD}$ is the weighted average treatment effect of all possible 2x2 DID estimators as explained by Goodman-Bacon (2018). Integrated into $\boldsymbol{\beta}^{DD}$ there are many different 2x2 $\boldsymbol{\beta}$'s that are given different weighting depending on their treatment variance. This effectively means that the earlier the municipality gets treated the more weight it gets and the more it affects $\boldsymbol{\beta}^{DD}$. Observe that this setup also makes use of comparison between municipalities that were already treated and those not yet treated. This means that by design municipalities that have already been treated also will work as controls in the periods after the first municipality was treated. As a result, one would not necessarily need a specific control group in this research design. Yet, having one strengthens the robustness of the regression as long as the parallel trends assumption is fulfilled, which we will get back to later.

One thing equation (2) does not take into consideration is the fact that municipalities do not necessarily follow the same trends across time. This might lead the results to be biased towards municipalities whose trends are on a much higher or lower level. We therefore specify equation (3) as follows:

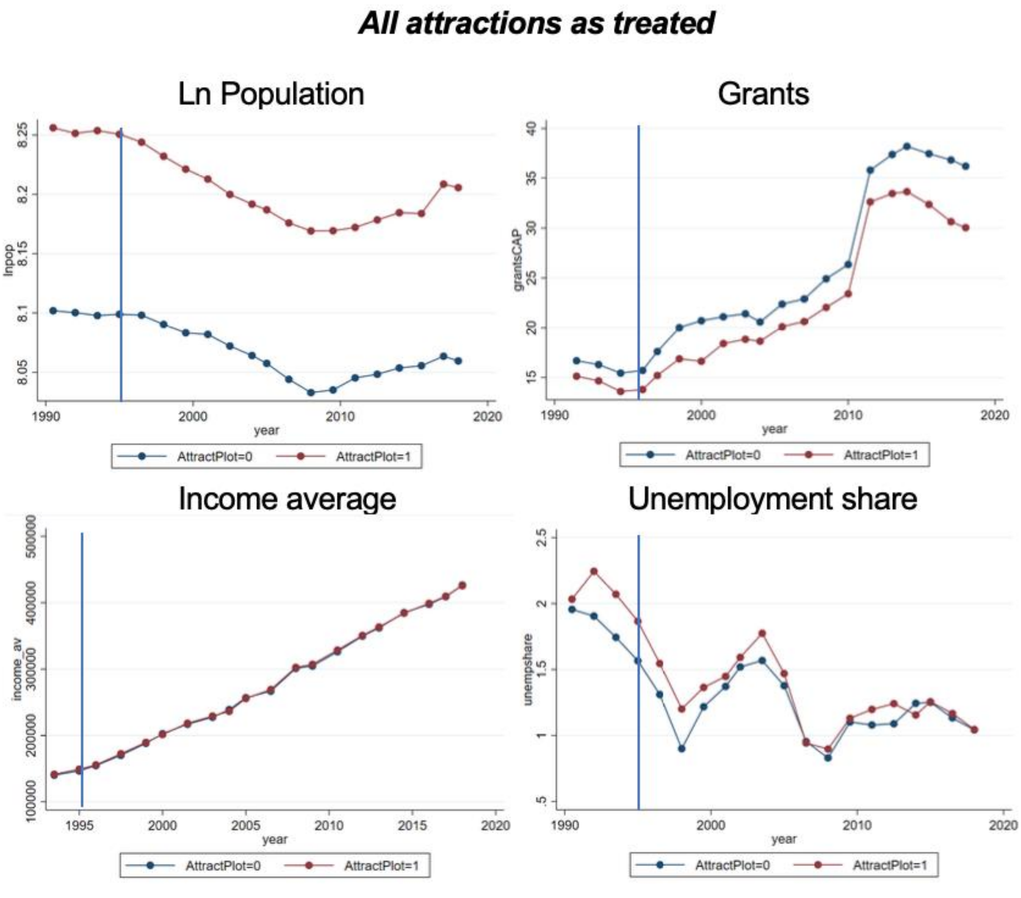
$$Y_{m,t} = \boldsymbol{\gamma}_m + \boldsymbol{\delta}_t + \boldsymbol{\alpha}(\boldsymbol{\gamma}_m * Trend_t) + \boldsymbol{\beta}^{DD}((Top)Attraction_m * Open_{m,t}) + \boldsymbol{\epsilon}_{m,t} \quad (3)$$

The $Trend_t$ variable takes the values 1, 2, 3… and so on depending on the year we are in in the sample. By multiplying $\boldsymbol{\gamma}_m$ and $Trend_t$ we generate municipality specific time trends so that each municipality is allowed to follow its own time trend. We do this since if we were to multiply $\boldsymbol{\gamma}_m$ with $\boldsymbol{\delta}_t$ we would get municipality-specific year effects which would not be feasible to do due to the lack of degrees of freedom. This therefore generates a much more stringent regression model since we are then looking at deviations from municipality-specific time trends to derive inferences with respect to our outcome variables.

Another point to be made regarding our model specification is when treatment is to come in. Since the data at hand is on a yearly level one must decide on whether treatment starts the year the attractions open or if it is the year after. This could have some impact on what effect treatment has on some variables such as car accidents, unemployment and population growth. By looking through all the data we find that most of the attractions open in the summer or fall of the year they open. This means that by setting treatment to 1 in the year the attractions open would also include data on the variables that might not yet have been impacted by the treatment. By setting the treatment variable to 1 the year after opening, we see the full impact of the attractions opening. By doing so one loses out on some of the effects that the attractions had in the opening year, but that arguably biases our results towards zero (and therefore makes it harder to find a significant effect).

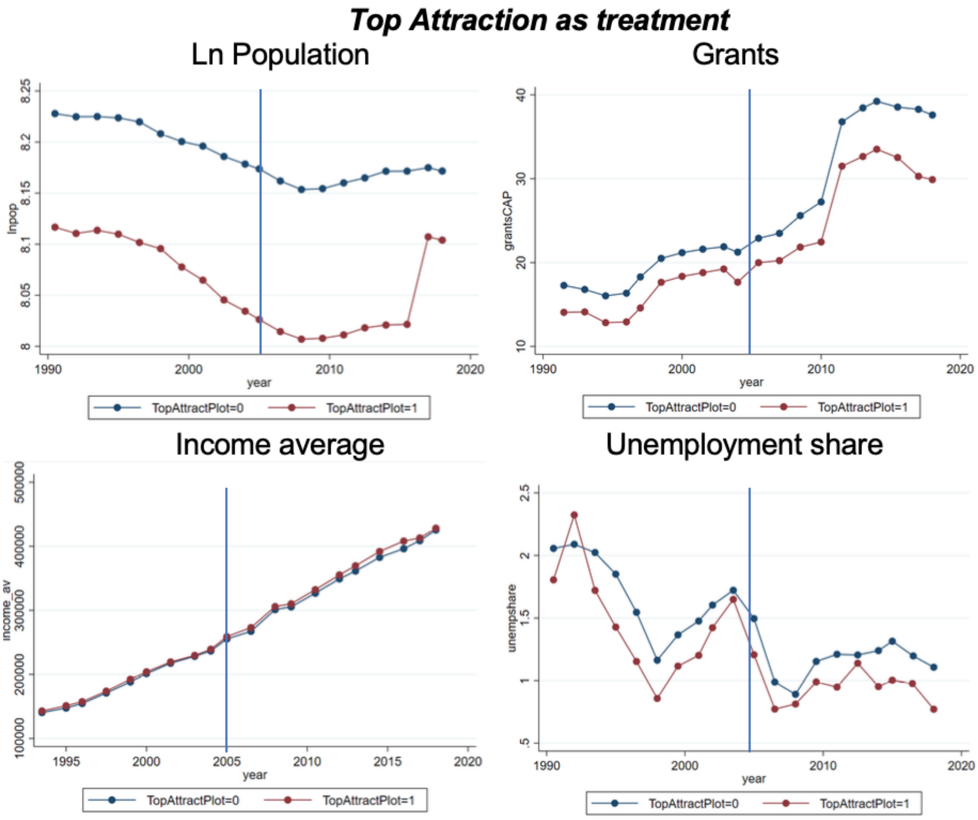
Other than specifying a model we still need to make sure that the DID assumptions hold. At the core of DID lies the parallel trends assumption where in the absence of treatment the trends between the comparison groups needs to be as good as equal. Therefore, the municipalities we are comparing also need to be comparable. We therefore find it most reasonable to only compare municipalities that have a tourist route going through them. This is because these are more likely to have similar characteristics and growth paths as most of them lie in the same regions and are more rural than for example municipalities in the eastern parts of Norway. So to check the parallel trends assumption we plot population, grants, average income and unemployment share against time and get the results as seen in figure 1 and 2. Using these variables gives us an indication as to whether there are parallel trends or not. Seeing as our data on house prices and car accidents starts later than 1996, when the first attraction opened, we use grants and average income instead to see whether they have similar trends. In the graphs, the blue line is the average of municipalities with a tourist route that never get an attraction (in Figure 1) or never get a top attraction in (Figure 2). The red line is the average of municipalities with a tourist route that get an attraction or top attraction some time during the observed period. The blue vertical line indicates the year the first attraction opened.

Figure 1. All attractions as treated



Note: This figure shows different variables, and compares municipalities with a tourist road that do not get an attraction (AttractPlot=0) with municipalities that at some point in time get an attraction (AttractPlot=1). The blue vertical line indicates a threshold when the first attraction came. Period 1990-2018.

Figure 2. Top Attraction as Treatment



Note: This figure shows different variables, and compares municipalities with a tourist road that do not get a top attraction (TopAttractPlot=0) with municipalities that at some point in time get a top attraction (TopAttractPlot=1). The blue vertical line indicates a threshold when the first top attraction came. Period 1990-2018.

Since there is large variation over time in when attractions open to the public, it is challenging, and perhaps impossible to compare the trends over the whole period of 1990-2018. This may lead to unreliable results. As the first attraction opened in 1996, in Figure 1 we use the period 1990-1995 as the period indicating absence of treatment (left of the blue vertical line). In the period after 1995, some municipalities were getting attractions, and the treatment and control group are no longer comparable to the same extent. Overall, the variables and groups seem to follow somewhat similar trends. Income average and population growth is as good as identical in terms of the trends, and follow each other year by year. The only difference is that the municipalities that later are getting an attraction are on average larger in population size. However, the growth is similar. The same applies for grants, where in the period 1990-1995 the trends are parallel. Regarding the unemployment share variable, we look at the average trend growth in the period 1990-1995 since the year-on-year changes in unemployment rates appear quite volatile. By doing this, the average trends in this respective time period is as good as parallel.

The intuition behind Figure 2 is the same as in Figure 1. As the first Top Attraction opened in 2006, we find it most reasonable to use the period 1990-2005 as a way of comparing the groups, as this period corresponds to the period in absence of treatment (left of the blue vertical line). Just by eyeballing, we can see that both for population growth, grants and income average the trends seem to follow trends that are as good as parallel. We do the same on unemployment share in Figure 2 as we did in Figure 1 where we look at the average growth trend during the period 1990-2005. Again, the data seem to follow similar trends, or at least as good as.

Table 2 compares the means between the municipalities with and without attractions and top attractions for the years predating the first attraction opening (1996). This is done via a difference-in-means t-test assuming unequal variance for all our outcome variables except for housing prices (this is because we do not have data on housing prices from 1990 to 2002). Seeing as most of the results from the t-test yields insignificant results, meaning that their difference in means between municipalities are not different from zero, we can conclude that the different municipalities are comparable since they do not have any clear difference in means. But with car accidents we get significantly different means, but only when looking at all attractions, not for top attractions. The reason for this can come from a smaller sample size biasing the results, where with car accidents we only have data from two years in the pre-attraction period, meaning we only get two observations for each municipality. With the municipalities being quite different in size, large outliers will have more impact on the means making it more likely for the means to be significantly different.

Table 2. Pre-Attraction (1996) differences between municipalities with and without Attractions and Top Attractions, only municipalities with a tourist route

Variables	Without attraction (1)	With attraction (2)	Diff (1) - (2) (3)	Without Top Attraction (4)	With Top Attraction (5)	Diff (4) - (5) (6)
Population growth	8.100 (0.179)	8.253 (0.135)	-0.153 (0.224)	8.225 (0.127)	8.112 (0.184)	0.113 (0.224)
Unemployment	1.770 (0.102)	2.014 (0.150)	-0.244 (0,182)	1.984 (0.118)	1.730 (0.262)	0.254 (0.288)
Accidents	177.156 (19.584)	241.858 (22.030)	-64.701** (29.476)	215.393 (18.895)	244.295 (34.309)	-28.902 (39.168)
N	20	42	62	50	12	62

Notes: This table compares average characteristics of municipalities that have got an Attraction and Top Attraction to those that did not get one, where all municipalities have a Tourist Route going through them. Columns 1,2,4 and 5 reports means and standard deviations (in parentheses) and column 3 and 6 reports difference-in-means. Statistical significance is denoted by *** p < 0.001, ** p< 0.05, * p< 0.10.

A final concern that needs to be taken into account is that some municipalities have multiple attractions opening across different times. Since some municipalities get more than one attraction they will get treated multiple times. This might affect how much of an impact the opening of a new attraction has on our outcome variables. Since a second attraction in the municipality might have a smaller effect (or maybe much larger effect if it is a top attraction), this will affect $\boldsymbol{\beta}^{DD}$ as it is constructed to average out all the different 2x2 DD $\boldsymbol{\beta}$'s as mentioned earlier. Although it gives a lower weighting to the treatments coming later in the sample it might still bias our results towards zero. To correct for this, in a robustness check we edit the data so that all municipalities get treated only once. By removing attractions that open after another has already opened in the municipality we should get clearer estimates of the true effect of opening a new attraction. We will therefore use two different datasets when running our regressions, one including all attractions and one correcting for what we call multiple attraction bias.

The way we generate the new data set is by removing some data from the municipalities that get more than one attraction. We remove the data from the year the second attraction opens and onwards so that some municipalities will have a shorter time frame than the others. By doing so we get clear pre and post treatment periods for all municipalities so that the effects we see are of opening the first attraction in the municipality. A caveat with doing this is that it will lead to removing some top attractions, more precisely going from 12 to 7 top attractions. This will limit what the true effects from opening top attractions might be as we now will have an even smaller treatment group. Still, this is a price we are willing to pay to make the effects of opening the first attraction more clear (as the effects of the second attraction are no longer in the model).

4. Main results

In the following tables are our results from our two main equations, equation (2) and (3). With Table 3 containing the results for all attractions as treatment, and Table 4 containing the results for only top attractions as treatment. The results from the two different data sets are reported in Panel A and B, where Panel B controls for multiple attraction bias and Panel A does not. Following below each table comes our analysis and discussion on the results.

Table 3. Results of Equation (2) and (3) with All Attractions as Treatment

	Equation (2). Generalized DID only Municipalities along routes, All Attraction as Treatment							
	Panel A				Panel B			
Variables	Population Growth	Unemployment	Traffic accidents	House prices	Population Growth	Unemployment	Traffic accidents	House prices
Coefficient	-0,0037 (0,0211)	-0,1487 (0,0962)	-2,4377 (10,7923)	-378,156 (650,435)	-0,0008 (0,0207)	-0,1538 (0,1003)	-1.5562 (10,4430)	-232.537 (700.375)
R^2 within	0,1305	0,3370	0,1400	0,7146	0,1302	0,3360	0,1347	0,7132
N	1798	1788	1364	428	1709	1701	1275	381
Number of Municipalities	62	62	62	44	62	62	62	44

	Equation (3). Generalized DID only Municipalities along routes with Municipality-Specific Time Trend, All Attractions as Treatment							
	Panel A				Panel B			
Variables	Population Growth	Unemployment	Traffic accidents	House prices	Population Growth	Unemployment	Traffic accidents	House prices
Coefficient	0,0101 (0,0094)	-0,0753 (0,0929)	0,3692 (16,1327)	-510,4718 (912,7331)	0,0097 (0,0093)	-0,0753 (0,959)	3.985 (17.257)	-465.444 (930.179)
R^2 within	0,9984	0,7344	0,5845	0,9314	0,9983	0,7409	0,5928	0,9364
N	1798	1788	1364	428	1709	1701	1275	381
Number of Municipalities	62	62	62	44	62	62	62	44

Notes: This table shows the regression estimates following equation (2) and (3) having Attraction as treatment, with standard errors in the brackets. The right side of the table (Panel b) shows the regression estimates when we control for multiple attraction bias. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

In Table 3, Panel A, we present the regression estimates of equation (2), including all attractions as treatment. This shows that getting an attraction does not have any significant short run effects on our outcome variables. When controlling for municipality-specific time trends in the second part of Table 3, Panel A, the results are unchanged in the sense that they remain insignificant. One potential reason might be that the vast majority of attractions are small rest stops and art sculptures. Even though these may have high intangible value, the tangible effects might be negligible (Rosentraub, & Joo, 2009). This can possibly be the case here as well with the rest stops and art sculptures.

The only variable coming close to a statistically significant effect in some estimations is unemployment. This shows a negative estimate, indicating a positive effect on the local employment. A reason for this might be an increase in part-time employment opportunities after the attractions open, part-time since many of the attractions are only open certain months of the year. Another point to be made in regards to unemployment is that even though the businesses benefit from the attractions opening, as shown in the Menon reports (2017, 2019), it does not mean that there will be need for more workers. Rather than hiring new workers, the already existing workers might work more hours than before, something we do not capture in our analysis. According to Rosentraub & Joo (2009), the only small direct effects of similar investments are due to the fact that they heavily rely on part-time and voluntary labor, which also might be a reason for the insignificant effects from Table 3. Hence, there is no evidence for a measurable impact.

As some of the municipalities are getting access to multiple attractions they are treated several times. This may lead to biased results. Hence, we are controlling for this in Panel B in the tables of results. This robustness check does not change the results notably when having all attractions as treatment. The estimates remain insignificant, and this applies for both the baseline model (equation 2) and when controlling for municipality-specific time trend (equation 3).

Table 4. Results of Equation (2) and (3) with Top Attractions as Treatment

	Equation (2). Generalized DID only Municipalities along routes, Top Attraction as Treatment							
	Panel A				Panel B			
Variables	Population Growth	Unemployment	Traffic accidents	House prices	Population Growth	Unemployment	Traffic accidents	House prices
Coefficient	0,0256	0,0790	20,2370*	-544,2330	0,0441*	-0,0141	21.8270**	-114.509
	(0,0289)	(0,1275)	(12,1011)	(409,6644)	(0,0246)	(0,1715)	(11,0852)	(444.638)
R^2 within	0,1332	0,3336	0,1412	0,7148	0,1357	0,3320	0,1357	0,7128
N	1798	1788	1364	428	1709	1701	1275	381
Number of Municipalities	62	62	62	44	62	62	62	44
	Equation (3). Generalized DID only Municipalities along routes with Municipality-Specific Time Trend, Top Attractions as Treatment							
	Panel A				Panel B			
Variables	Population Growth	Unemployment	Traffic accidents	House prices	Population Growth	Unemployment	Traffic accidents	House prices
Coefficient	0,0213	-0,0903	22,0979*	767,1289*	0,0384	-0,3417	23.0991	972.7594
	(0,024)	(0,2715)	(12,9576)	(444,3434)	(0,0389)	(0,4056)	(17,6508)	(854.7405)
R^2 within	0,9984	0,7343	0,5849	0,9314	0,9983	0,7418	0,5930	0,9364
N	1798	1788	1364	428	1709	1701	1275	381
Number of Municipalities	62	62	62	44	62	62	62	44

Notes: This table shows the regression estimates following equation (2) and (3) having Top Attractions as treatment, with standard errors in the brackets. The right side of the table (Panel b) shows the regression estimates when we control for multiple attraction bias. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

As Table 3 did not provide any statistically significant results, we are in Table 4 looking specifically into Top Attractions as the treatment of interest. This narrower focus on the most important tourist investments makes an important difference to the results. While the effects in terms of population growth and unemployment are weak (though largely in the expected direction), municipalities that are getting a top attraction seem to experience an increase in the number of traffic accidents. The estimated effect corresponds to an increase in approximately 20 to 22 accidents per 1000 inhabitants. This result is significant at a 90% level in Panel A and 95% level in Panel B. A plausible explanation of this increase in traffic accidents might be an increase in the general traffic in the area. As the tourist routes and the connected top attractions are intended to increase tourism and attractiveness in the area, an increase in traffic is expected and the increase in traffic accidents is a negative external effect of the increased tourism.

In the second part of Table 4, we are again controlling for municipality-specific time trends as a robustness measure. Panel A gives reasons to believe that the increase in traffic accidents is not just a spurious result. The results indicate the same as the results from equation (2) in Table 4, namely that the traffic accidents increase by 22 accidents per 1000 inhabitants when opening a top attraction. This is again statistically significant at 90%. While the point estimate is consistent also in Panel B, it loses significance in this case. However, it might be important to keep in mind that in Panel B, when controlling for multiple attraction bias, the number of top attractions goes down - which might have implications for the power available in our analysis.

Another interesting result is that when taking into account municipality-specific time trends, as in equation (3), the result suggests that the house prices are increasing with almost 800 to 900 NOK per square meter. This is statistically significant at 90% as well in Panel A, though missing out on significance at that level in Panel B. House prices do have fewer observations compared to the other outcome variables, but we do think that 428 and 381 observations still are sufficient to give plausible indications. As we touched upon in the review of the previous literature, our thoughts are that this increase in house prices reflects the area getting more attractive. We did not get similar significant and positive results when checking for all attractions in general (Table 3), but top attractions yield more impact and so this difference in results sounds intuitive and plausible to us. It is, based on the results, clear that the pros (attractiveness) of getting a top attraction exceeds the cons (traffic) when looking at the effect on house prices.

4.1 Robustness check: relevance of distance?

To further test our results from the previous section we also want to look at how the distance to the nearest attraction affects the different municipalities, similar to how Berger & Enflo (2007) looked at how distances to the railroad affected population composition in surrounding towns. In this case, we no longer focus only on municipalities along the tourist routes (as has been the case up to now), but instead include all municipalities located within a minimal distance to the attractions. This is calculated using the longitude and latitude of each attraction and a radius set to the different distances (in our case 50, 75 and 100 kilometers), and including all the municipalities within the radius. In this case, we adjust our empirical specification to the following model:

$$Y_{m,t} = \boldsymbol{\gamma}_m + \boldsymbol{\delta}_t + \boldsymbol{\beta}_1\,((\text{Top})\text{Attraction}_m{*}\text{Open}_{m,t}) + \boldsymbol{\beta}_2(\text{Distance}) + \boldsymbol{\beta}_3\,(((\text{Top})\text{Attraction}_m * \text{Open}_{m,t}) * (\text{Distance})) + \boldsymbol{\epsilon}_{m,t} \quad (4)$$

Here the first two variables are the same as in our previous model, but the $\boldsymbol{\beta}$'s differ. $\boldsymbol{\beta}_1$ is the effect of opening an attraction at distance zero, meaning the municipality it opens in. $\boldsymbol{\beta}_2$ is the effect of the distance to the attraction before the attraction opens. While $\boldsymbol{\beta}_3$ is how the effect of opening an attraction changes with changing distance. Hence, $\boldsymbol{\beta}_1 + \boldsymbol{\beta}_3$*(Distance) is the effect at a given distance of an attraction being opened. This means that by setting $\boldsymbol{\beta}_1 + \boldsymbol{\beta}_3$*(Distance) = 0 we can find at what distance the opening of an attraction no longer has any effect according to the regression results.

The results from these regressions can be seen in Tables 5 to 12 in the appendix. Here we see how the sample differs from our baseline sample with a minimum of 114 different municipalities compared to a maximum of 62 in the baseline sample. As the distance increases the number of municipalities increases as well. This is not problematic as we still use difference-in-differences to estimate the results. For the parallel trends assumptions to hold the municipalities must be as equal as possible. Therefore, it is important to be aware of that as the distance from the attraction increases, and the higher it gets, there will be a high probability that some larger municipalities are included in the data set, and this will potentially affect the results (e.g., Bergen is included in the sample when distance is set to

100 km). Due to this, the most interesting distance to look at is the lower distances.

From the results population growth seems to increase when the distance from attraction increases, shown in Table 5 and 9 (see appendix). The estimates are significant at 95% level at distance 50, and this applies for both attraction and top attraction. The estimates are again significant at distance 100, however, only significant at 90% level. Even though the results are significant, the effects are rather small, and perhaps not noticeable. $\boldsymbol{\beta}_1$ in the same tables indicate that when an attraction opens, it results in a negative impact on population growth in that area. This is to some extent a surprise, as we initially thought the opposite would happen, and this goes against what Berger and Enflo (2017) suggested in their paper. A potential reason for this might be the negative external effects from increased traffic and noise in the area, which in turn are perhaps due to increased tourism.

When looking at Table 7 and 11 (see appendix), traffic accidents give us an outcome corresponding to our initial expectations. $\boldsymbol{\beta}_1$ suggest a significant increase in accidents near the attraction, but this effect gradually vanishes as the distance increases (captured by $\boldsymbol{\beta}_3$). The vanishing effect is significant at 99% level when looking at all attractions at distance 50, but slightly missing out on significance when only looking at the effect of top attractions. The latter is significant at distance 75 at a 90% level. This indicates that the opening of new attractions will increase traffic near the attractions causing more accidents, while this effect diminishes the further away from the attraction the municipality is. This can be seen from $\boldsymbol{\beta}_1 + \boldsymbol{\beta}_3$*(Distance) = 0, where for all attractions the effect vanishes between 23 to 33 kilometers away from the attraction, and for top attractions vanishes between 33 to 44 kilometers away.

The two last outcome variables, unemployment and house prices, do not bring any results of interest as the estimates are not significant. The only exception is house prices which according to Table 8 and 12 (see appendix) indicates that when distance exceeds 100 kilometers from the attraction, it will have a significant positive effect on prices, significant at 95% level. However, as commented above, this might be due to the inclusion of larger cities as the distance radius increases, and these cities might pull up the average estimates a lot, resulting in potential spurious results.

5. Conclusion

This thesis analyzes the short-term effects of the investment into the Norwegian National Tourist Routes. By looking at our four main outcome variables (population growth, unemployment, traffic accidents and housing prices), we are able to give some suggestions regarding whether the local municipalities are affected by the investments.

The results indicate an observable significant increase in traffic accidents in the nearby areas connected to top attractions, while no effect in areas connected to smaller attractions such as rest stops and art sculptures. This is consistent with our initial thoughts and hypothesis that increased tourism and traffic may lead to an increase in accidents. Our baseline model including all attractions does not give evidence for any effects on either unemployment, house prices or population growth, but some of our modified models give slightly significant effects on population growth and house prices in areas connected to a top attraction, although the estimates are rather weak. Hence, we do not have enough evidence to conclude that the effects are noticeable and consistent. The one result that seems to be consistent throughout our analysis is that traffic accidents increase in the areas having top attractions. This corresponds to our hypothesis and indicates that with the top attractions comes an increase of tourism and traffic flow.

Based on these findings, we cannot conclude that the investments into attractions along the tourist routes has had any clear impact on population growth, unemployment and house prices, at least in the short run. The only clear effect is a slight increase in traffic accidents around top attractions which can be caused by increased traffic from visiting tourists. Our thesis does not capture the long run-effects of this investment as the project is still ongoing. Hence, the long-run effects may be larger or different than the short-run effects that we have been able to capture here.

5.1 Directions for further research

To get a better view of the effects of the National Tourist Routes we recommend doing similar research as done in this thesis in the years after the project has been finalized in 2023. By doing so one will get results not only taking in the short run effects but also the long run effects of the attractions. This would be interesting to see since by then all the attractions will be finished and given some time after opening to estimate their effects. It is also interesting as by the time the project is finished the attractions may become more recognized on a national and international scale. As our thesis is more an impact assessment, it might also be interesting looking at the project from a cost-benefit perspective. More specifically, assessing the costs of the project relative to whether it has yielded any long-run profitable outcomes.

Another interesting topic to look at in regards to National Tourist Routes is how the attractions might affect workers, not only through the general unemployment numbers, but also other variables such as hours worked and number of new hires. Seeing whether the new attractions make businesses adjust at the intensive margin (i.e. existing staff works more hours) or rather at the extensive margin (i.e. hiring extra people). This might be interesting to know for decision makers when choosing where to invest in new potential attractions.

Furthermore, there is a need for more research into tourism based infrastructure investments. By this we mean investments into tourism attractions as the ones in the National Tourist Routes project (that is, investments specifically designed to increase tourism and tourists experience), and how it impacts local communities and businesses. This is important to get a broader overview of the effects of such infrastructure investments.

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Appendix

Table 5. Results for *Population Growth* from Equation (4) with all Attractions as treatment

	Equation (4). Generalized DID including interaction with minimal distance to nearest open attraction					
Minimal distance in km	β_1	β_2	β_3	R^2 within	N	Number of Municipalities
Distance = 50	-0.0545*** (0.0198)	-0.0013** (0.0006)	0.0014** (0.0007)	0.0691	1 792	159
Distance = 75	-0.0571*** (0.0149)	-0.0005 (0.0004)	0.0007 (0.0005)	0.1228	3 080	244
Distance = 100	-0.0660*** (0.0158)	-0.0004 (0.0003)	0.0019* (0.0011)	0.1038	4 033	309

Note: This table shows the regression estimates following equation (4) with 3 different distance measures and having all Attractions as treatment, with standard errors in the brackets. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

Table 6. Results for *Unemployment* from Equation (4) with all Attractions as treatment

	Equation (4). Generalized DID including interaction with minimal distance to nearest open attraction					
Minimal distance in km	β_1	β_2	β_3	R^2 within	N	Number of Municipalities
Distance = 50	-0.1917* (0.1097)	-0.0147*** (0.0032)	0.0042 (0.0033)	0.2188	1 770	159
Distance = 75	-0.1179 (0.0912)	-0.0114*** (0.0018)	0.0020 (0.0022)	0.2482	3 048	244
Distance = 100	-0.0536 (0.1082)	-0.0046** (0.0012)	-0.0015 (0.0048)	0.2336	3 992	309

Note: This table shows the regression estimates following equation (4) with 3 different distance measures and having all Attractions as treatment, with standard errors in the brackets. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

Table 7. Results for *Traffic Accidents* from Equation (4) with all Attractions as treatment

	Equation (4). Generalized DID including interaction with minimal distance to nearest open attraction					
Minimal distance in km	β_1	β_2	β_3	R^2 within	N	Number of Municipalities
Distance = 50	75.745*** (22.954)	1.096** (0.5071)	-3.2408*** (1.1770)	0.1356	1 767	159
Distance = 75	43.6223** (18.5634)	0.2418 (0.2520)	-1.3382* (0.7625)	0.1509	3 019	244
Distance = 100	8.6626 (25.0194)	0.0295 (0.1923)	-0.4422 (0.8526)	0.1518	3 925	309

Note: This table shows the regression estimates following equation (4) with 3 different distance measures and having all Attractions as treatment, with standard errors in the brackets. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

Table 8. Results for *House Prices* from Equation (4) with all Attractions as treatment

	Equation (4). Generalized DID including interaction with minimal distance to nearest open attraction					
Minimal distance in km	β_1	β_2	β_3	R^2 within	N	Number of Municipalities
Distance = 50	-262.26 (1622.09)	46.1561 (56.8819)	7.1116 (51.3535)	0.3594	884	114
Distance = 75	-820.30 (748.34)	26.0121* (14.1212)	27.8774 (24.6109)	0.5062	1 589	187
Distance = 100	-1576.42** (732.67)	-1.1973 (11.3825)	44.9148** (20.8629)	0.5279	2 004	234

Note: This table shows the regression estimates following equation (4) with 3 different distance measures and having all Attractions as treatment, with standard errors in the brackets. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

Table 9. Results for *Population Growth* from Equation (4) with Top Attractions as treatment

Minimal distance in km	Equation (4). Generalized DID including interaction with minimal distance to nearest open top attraction					
	β_1	β_2	β_3	R^2 within	N	Number of Municipalities
Distance = 50	-0.0198* (0.0115)	-0.0005 (0.0043)	0.0018** (0.0008)	0.0565	1 792	159
Distance = 75	-0.0571*** (0.0149)	-0.0005 (0.0005)	0.0007 (0.0005)	0.1228	3 080	244
Distance = 100	-0.0660*** (0.0158)	-0.0004 (0.0003)	0.0019* (0.0011)	0.1038	4 033	309

Note: This table shows the regression estimates following equation (4) with 3 different distance measures and having Top Attractions as treatment, with standard errors in the brackets. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

Table 10. Results for *Unemployment* from Equation (4) with Top Attractions as treatment

Minimal distance in km	Equation (4). Generalized DID including interaction with minimal distance to nearest open top attraction					
	β_1	β_2	β_3	R^2 within	N	Number of Municipalities
Distance = 50	-0.0855 (0.1226)	-0.0119*** (0.0029)	0.0096 (0.0077)	0.2178	1770	159
Distance = 75	-0.1179 (0.0912)	-0.0114*** (0.0018)	0.0020 (0.0022)	0.2482	3048	244
Distance = 100	-0.0536 (0.1082)	-0.0046*** (0.0012)	-0.0015 (0.0048)	0.2336	3992	309

Note: This table shows the regression estimates following equation (4) with 3 different distance measures and having Top Attractions as treatment, with standard errors in the brackets. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

Table 11. Results for *Traffic Accidents* from Equation (4) with Top Attractions as treatment

	Equation (4). Generalized DID including interaction with minimal distance to nearest open op attraction					
Minimal distance in km	β_1	β_2	β_3	R^2 within	N	Number of Municipalities
Distance = 50	49.4896*** (16.7599)	0.2652 (0.4831)	-1.1275 (0.9096)	0.1307	1 767	159
Distance = 75	43.6223** (18.5634)	0.2418 (0.2520)	-1.3382* (0.7625)	0.1509	3 019	244
Distance = 100	8.6563 (25.0194)	0.0295 (0.1923)	-0.4422 (0.7526)	0.1518	3 925	309

Note: This table shows the regression estimates following equation (4) with 3 different distance measures and having Top Attractions as treatment, with standard errors in the brackets. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

Table 12. Results for *House Prices* from Equation (4) with Top Attractions as treatment

	Equation (4). Generalized DID including interaction with minimal distance to nearest open top attraction					
Minimal distance in km	β_1	β_2	β_3	R^2 within	N	Number of Municipalities
Distance = 50	-593.436 (605.261)	50.757 (38.567)	63.633* (36.984)	0.3607	884	114
Distance = 75	-820.304 (748,344)	26.012* (14.121)	27.877 (24.611)	0.5062	1 589	187
Distance = 100	-1 576.423** (732.668)	-1.197 (11.382)	44.915** (20.861)	0.5279	2 004	234

Note: This table shows the regression estimates following equation (4) with 3 different distance measures and having Top Attractions as treatment, with standard errors in the brackets. Statistical significance is denoted by *** p<0.001, ** p<0.05, * p<0.10.

Stata .do file All Attractions

```
clear all
use "C:\Users\TrymE\OneDrive\Dokumenter\Masteroppgave\Tourist roads\STATA\Dataset_K_2018.dta"

gen ATTRACT = 0
forvalues i = 1 (1) 76 {
	replace ATTRACT =1 if kommune==kname`i' & year>year`i'
	* (this way ATTRACT is 1 only in years AFTER the attraction opens)
	*replace ATTRACT =1 if kommune==kname`i' & year>=year`i'
	* (this way ATTRACT is 1 in the year an attraction opens and all years afterwards)
}

gen topATTRACT = 0
forvalues i = 1 (1) 76 {
	replace topATTRACT=1 if kommune==kname`i' & flagship`i'==1 & year>year`i'
	*replace topATTRACT=1 if kommune==kname`i' & flagship`i'==1 & year>=year`i'
}

gen AttractionTown=0
gen topAttractionTown=0
forvalues i = 1 (1) 76 {
	replace AttractionTown =1 if kommune==kname`i'
	replace topAttractionTown =1 if kommune==kname`i' & flagship`i'==1
}


gen TimeToRoad = year - tourist_road_year

gen TimeToAttract = .
gen TimeToTopAttract = .
```

```
forvalues i = 1 (1) 76 {
	replace TimeToAttract = 0 if kommune==kname`i' & year==year`i'
	replace TimeToTopAttract = 0 if kommune==kname`i' & flagship`i'==1 &
year==year`i'
}
replace TimeToAttract = . if year==1997 & knr==514
replace TimeToAttract = . if year==2005 & (knr==514 | knr==1860)
replace TimeToAttract = . if year==2006 & knr==2018
replace TimeToAttract = . if year==2007 & knr==1860
replace TimeToAttract = . if year==2010 & (knr==1524 | knr==1421 | knr==1449
| knr==1865 | knr==1929)
replace TimeToAttract = . if year==2012 & knr==544
replace TimeToAttract = . if year==2013 & (knr==430 | knr==1134 | knr==2018)
replace TimeToAttract = . if year==2014 & (knr==1238 | knr==1554)
replace TimeToAttract = . if year==2015 & (knr==430 | knr==514 | knr==1134 |
knr==1929 | knr==2003)
replace TimeToAttract = . if year==2016 & (knr==1135 | knr==1548 |
knr==1551)
replace TimeToAttract = . if year==2012 & (knr==2003)
replace TimeToAttract = . if year==2018 & (knr==1134 | knr==1449 | knr==1860
| knr==1871)
replace TimeToTopAttract = . if year==2010 & knr==1524
replace TimeToTopAttract = . if year==2014 & knr==1554

gen TopAttraction=.
forvalues i = 1 (1) 76{
	replace TopAttraction =0 if tourist_road==1
	replace TopAttraction =1 if topAttractionTown==1
	}

gen Attraction=.
forvalues i = 1 (1) 76{
	replace Attraction =0 if tourist_road==1
	replace Attraction =1 if AttractionTown==1
	}
```

```
* Test for characteristics of municipalities selected by Statens Vegvesen

collapse longitude latitude tourist_road tourist_road_year area a300_599
a600_899 a900_1199 a1200_1499 a1500_1799 a1800 high300 high1200 pop
women age05 age615 age1619 age2066 age67 netimmigr_nat net_immigr_int
unemployment_gen unemployment_young income_av income_med freerev taxrev
grants cpi2015 newbusiness newhotelsbars bankrupthotelsbars houseprice
housesales traffic_accident fatal_acc injured_total law_violate traffic_violate
Attraction TopAttraction if year <=1996, by(knr)

gen femshare=(women/pop)*100
gen babyshare = (age05/pop)*100
gen youngshare = ((age615 +age1619)/pop)*100
gen workageshare = ((pop-age05-age615-age1619-age67)/pop)*100
gen oldshare = (age67/pop)*100
gen immignatshare = (netimmigr_nat/pop)*100
gen immigintshare = (net_immigr_int/pop)*100
gen unempshare = (unemployment_gen/pop)*100
gen unempyoungshare = (unemployment_young/pop)*100
gen freerevCAP = freerev/pop
gen taxrevCAP = taxrev/pop
gen grantsCAP = grants/pop

gen newbusshare = (newbusiness/(pop/1000))*100
gen newhotelshare = (newhotelsbars/(pop/1000))*100
gen bankruptshare = (bankrupthotelsbars/(pop/1000))*100
gen housesalesshare = (housesales/(pop/1000))*100
gen accidshare = (traffic_accident/(pop/1000))*100
gen fatalshare = (fatal_acc/(pop/1000))*100
gen injuredshare = (injured_total/(pop/1000))*100
gen lovbruddshare = (law_violate/(pop/1000))*100
gen trafficlawshare = (traffic_violate/(pop/1000))*100
gen lnpop = (ln(pop))
```

```
gen realhouseprice = houseprice/cpi2015



ttest lnpop, by( TopAttraction ) unequal
ttest unempshare , by( TopAttraction ) unequal
ttest accidshare , by( TopAttraction ) unequal

ttest lnpop, by( Attraction ) unequal
ttest unempshare , by( Attraction ) unequal
ttest accidshare , by( Attraction ) unequal

************************************
************************************
******** Analysis section  ********
************************************
************************************

clear all
set matsize 7500
use "C:\Users\TrymE\OneDrive\Dokumenter\Masteroppgave\Tourist
roads\STATA\Dataset_K_2018.dta"

xtset knr year

gen lnpop = (ln(pop))
gen femshare=(women/pop)*100
gen youngshare = ((age615 +age1619)/pop)*100
gen workageshare = ((pop-age05-age615-age1619-age67)/pop)
gen babyshare = (age05/pop)*100*100
gen oldshare = (age67/pop)*100
gen immignatshare = (netimmigr_nat/pop)*100
gen immigintshare = (net_immigr_int/pop)*100
gen unempshare = (unemployment_gen/pop)*100
gen freerevCAP = (freerev/cpi2015)/pop
gen taxrevCAP = (taxrev/cpi2015)/pop
```

```
gen grantsCAP = (grants/cpi2015)/pop

gen realincome_av = income_av/cpi2015
gen realincome_med = income_med/cpi2015
gen realhouseprice = houseprice/cpi2015

gen newbusshare = (newbusiness/pop)*100
gen newhotelshare = (newhotelsbars/(pop/1000))*100
gen bankruptshare = (bankrupthotelsbars/pop)*100
gen housesalesshare = (housesales/(pop/1000))*100
gen accidshare = (traffic_accident/(pop/1000))*100
gen fatalshare = (fatal_acc/(pop/1000))*100
gen injuredshare = (injured_total/pop)*100
gen lovbruddshare = (law_violate/(pop/1000))*100
gen trafficlawshare = (traffic_violate/(pop/1000))*100

summ pop unempshare grantsCAP realincome_av accidshare realhouseprice if
(tourist_road==1)

* generate key tourist route attraction variables

gen ATTRACT = 0
forvalues i = 1 (1) 76 {
	replace ATTRACT =1 if kommune==kname`i' & year>year`i'
	* (this way ATTRACT is 1 only in years AFTER the attraction opens)
	*replace ATTRACT =1 if kommune==kname`i' & year>=year`i'
	* (this way ATTRACT is 1 in the year an attraction opens and all years
afterwards)
}

gen topATTRACT = 0
forvalues i = 1 (1) 76 {
	replace topATTRACT=1 if kommune==kname`i' & flagship`i'==1 &
year>year`i'
```

```
	*replace topATTRACT=1 if kommune==kname`i' & flagship`i'==1 &
year>=year`i'
}

gen AttractionTown=0
gen topAttractionTown=0
forvalues i = 1 (1) 76 {
	replace AttractionTown =1 if kommune==kname`i'
	replace topAttractionTown =1 if kommune==kname`i' & flagship`i'==1
}

** Calculate time before/after FIRST (flagship) attraction

gen TimeToRoad = year - tourist_road_year

gen TimeToAttract = .
gen TimeToTopAttract = .
forvalues i = 1 (1) 76 {
	replace TimeToAttract = 0 if kommune==kname`i' & year==year`i'
	replace TimeToTopAttract = 0 if kommune==kname`i' & flagship`i'==1 &
year==year`i'
}
replace TimeToAttract = . if year==1997 & knr==514
replace TimeToAttract = . if year==2005 & (knr==514 | knr==1860)
replace TimeToAttract = . if year==2006 & knr==2018
replace TimeToAttract = . if year==2007 & knr==1860
replace TimeToAttract = . if year==2010 & (knr==1524 | knr==1421 | knr==1449
| knr==1865 | knr==1929)
replace TimeToAttract = . if year==2012 & knr==544
replace TimeToAttract = . if year==2013 & (knr==430 | knr==1134 | knr==2018)
replace TimeToAttract = . if year==2014 & (knr==1238 | knr==1554)
replace TimeToAttract = . if year==2015 & (knr==430 | knr==514 | knr==1134 |
knr==1929 | knr==2003)
replace TimeToAttract = . if year==2016 & (knr==1135 | knr==1548 |
knr==1551)
```

```
replace TimeToAttract = . if year==2012 & (knr==2003)
replace TimeToAttract = . if year==2018 & (knr==1134 | knr==1449 | knr==1860
| knr==1871)
replace TimeToTopAttract = . if year==2010 & knr==1524
replace TimeToTopAttract = . if year==2014 & knr==1554

forvalues i = 1 (1) 28 {
        replace TimeToAttract = f`i'.TimeToAttract-`i' if f`i'.TimeToAttract==0
        replace TimeToAttract = l`i'.TimeToAttract+`i' if l`i'.TimeToAttract==0
        replace TimeToTopAttract = f`i'.TimeToTopAttract-`i' if
f`i'.TimeToTopAttract==0
        replace TimeToTopAttract = l`i'.TimeToTopAttract+`i' if
l`i'.TimeToTopAttract==0
}



* Generate variables that are defined when there is a tourist road and equal to 1 if
there is an attraction opening some time in the dataset. For plotting purposes.
gen TopAttractPlot=.
forvalues i = 1 (1) 76{
        replace TopAttractPlot =0 if tourist_road==1
        replace TopAttractPlot =1 if topAttractionTown==1
        }

gen AttractPlot=.
forvalues i = 1 (1) 76{
        replace AttractPlot =0 if tourist_road==1
        replace AttractPlot =1 if AttractionTown==1
        }



* (Code up to here puts value 0 in the year of the attraction opening, which could
be Jan or Dec of the year...)
replace TimeToAttract = TimeToAttract-1
* (this way year 0 is the first full year AFTER the attraction opens)
```

```
* Calculate distances to OPENED attractions (in km; as the crow flies)

run "C:\Users\TrymE\OneDrive\Dokumenter\Masteroppgave\Tourist
roads\STATA\vincenty.ado"

forvalues i = 1 (1) 76 {
	vincenty latitude longitude latitude`i' longitude`i' if year>year`i',
v(distance`i') inkm
}

egen Mindist = rowmin(distance*)
egen Meandist = rowmean(distance*)

* Plots of those municipalities with tourist routes comparing those with top
attractions to those without.
binscatter lnpop  year, by (TopAttractPlot) linetype(connect)
binscatter income_av year, by (TopAttractPlot) linetype(connect)
binscatter unempshare year, by (TopAttractPlot) linetype(connect)
binscatter grantsCAP  year, by (TopAttractPlot  ) linetype(connect)

* Plots of those municipalities with tourist routes comparing those with attractions
to those without.
binscatter lnpop  year, by (AttractPlot) linetype(connect)
binscatter income_av year, by (AttractPlot) linetype(connect)
binscatter unempshare year, by (AttractPlot) linetype(connect)
binscatter grantsCAP  year, by (AttractPlot  ) linetype(connect)


***********************************
***********************************
******** Regression models ********
***********************************
***********************************
```

```
egen city = group(knr)
gen trend =year-1989

* Generalized DiD estimate using only municipalities along tourist routes in
estimation sample ATTRACT

xtreg lnpop ATTRACT i.year if tourist_road==1, fe cluster(knr)
xtreg unempshare ATTRACT i.year if tourist_road==1, fe cluster(knr)
xtreg accidshare ATTRACT i.year if tourist_road==1, fe cluster(knr)
xtreg realhouseprice ATTRACT i.year if tourist_road==1, fe cluster(knr)
* Generalized DiD estimate using only municipalities along tourist routes in
estimation sample topATTRACT

xtreg lnpop topATTRACT i.year if tourist_road==1, fe cluster(knr)
xtreg unempshare topATTRACT i.year if tourist_road==1, fe cluster(knr)
xtreg accidshare topATTRACT i.year if tourist_road==1, fe cluster(knr)
xtreg realhouseprice topATTRACT i.year if tourist_road==1, fe cluster(knr)

* Generalized DiD estimate with municipality-specific time trends ATTRACT

reg lnpop ATTRACT i.year i.knr##c.trend if tourist_road==1, cluster(knr)
reg unempshare ATTRACT i.year i.knr##c.trend if tourist_road==1, cluster(knr)
reg accidshare ATTRACT i.year i.knr##c.trend if tourist_road==1, cluster(knr)
reg realhouseprice ATTRACT i.year i.knr##c.trend if tourist_road==1,
cluster(knr)

* Generalized DiD estimate with municipality-specific time trends topATTRACT

reg lnpop topATTRACT i.year i.knr##c.trend if tourist_road==1, cluster(knr)
reg unempshare topATTRACT i.year i.knr##c.trend if tourist_road==1,
cluster(knr)
reg accidshare topATTRACT i.year i.knr##c.trend if tourist_road==1, cluster(knr)
reg realhouseprice topATTRACT i.year i.knr##c.trend if tourist_road==1,
cluster(knr)
```

```
* Generalized DiD estimate including interaction with minimal distance to nearest
open attraction ATTRACT

xtreg lnpop ATTRACT##c.Mindist i.year if Mindist<50, fe cluster(knr)
xtreg lnpop ATTRACT##c.Mindist i.year if Mindist<75, fe cluster(knr)
xtreg lnpop ATTRACT##c.Mindist i.year if Mindist<100, fe cluster(knr)


xtreg unempshare ATTRACT##c.Mindist i.year if Mindist<50, fe cluster(knr)
xtreg unempshare ATTRACT##c.Mindist i.year if Mindist<75, fe cluster(knr)
xtreg unempshare ATTRACT##c.Mindist i.year if Mindist<100, fe cluster(knr)

xtreg accidshare ATTRACT##c.Mindist i.year if Mindist<50, fe cluster(knr)
xtreg accidshare ATTRACT##c.Mindist i.year if Mindist<75, fe cluster(knr)
xtreg accidshare ATTRACT##c.Mindist i.year if Mindist<100, fe cluster(knr)

xtreg realhouseprice ATTRACT##c.Mindist i.year if Mindist<50, fe cluster(knr)
xtreg realhouseprice ATTRACT##c.Mindist i.year if Mindist<75, fe cluster(knr)
xtreg realhouseprice ATTRACT##c.Mindist i.year if Mindist<100, fe cluster(knr)

* Generalized DiD estimate including interaction with minimal distance to nearest
open attraction topATTRACT

xtreg lnpop topATTRACT##c.Mindist i.year if Mindist<50, fe cluster(knr)
xtreg lnpop topATTRACT##c.Mindist i.year if Mindist<75, fe cluster(knr)
xtreg lnpop topATTRACT##c.Mindist i.year if Mindist<100, fe cluster(knr)


xtreg unempshare topATTRACT##c.Mindist i.year if Mindist<50, fe cluster(knr)
xtreg unempshare topATTRACT##c.Mindist i.year if Mindist<75, fe cluster(knr)
xtreg unempshare topATTRACT##c.Mindist i.year if Mindist<100, fe cluster(knr)

xtreg accidshare topATTRACT##c.Mindist i.year if Mindist<50, fe cluster(knr)
xtreg accidshare topATTRACT##c.Mindist i.year if Mindist<75, fe cluster(knr)
```

```
xtreg accidshare topATTRACT##c.Mindist i.year if Mindist<100, fe cluster(knr)

xtreg realhouseprice topATTRACT##c.Mindist i.year if Mindist<50, fe cluster(knr)
xtreg realhouseprice topATTRACT##c.Mindist i.year if Mindist<75, fe cluster(knr)
xtreg realhouseprice topATTRACT##c.Mindist i.year if Mindist<100, fe cluster(knr)
```