Wider economic benefits of major Norwegian road investments

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Abstract

This study presents results from a statistical analysis of wider economic benefits of 102 major road projects in Norway completed 1993-2005 and findings from three selected case studies. A quantitative analysis reveals a rather weak relationship between investment level and population development. Effects of infrastructure investments on employment, income and industrial development were not found. Case studies show that linking together regional centres within a travel time of 45-50 minutes may lead to a consolidation of the local supply of services and the local labour market and reduced leakage to nearby larger cities. The success of economic base industries, such as maritime industries, offshore supplies and tourism, is to a large extent determined by international trends rather than local infrastructure projects. Nonetheless, road investments seem to be a necessary requirement for the adoption of contemporary just-in-time production patterns, which rely heavily on road transport.

1. Introduction and overview

The wider economic benefits of transport infrastructure investments may be studied through case studies or by macroeconomic models. Macroeconomic models have revealed a positive and modest economic contribution of transport infrastructure, but the macroeconomic approach has limited utility due to the sharp differences and conflicts among these models on the magnitudes and direction of economic impacts of infrastructure. Further, these macro-economic models do not give insight into the mechanisms linking transport improvements and the wider economy. Case studies may be applied to provide the needed insight, but new problems arise when it comes to generalisation and the "counter factual problem".

In the present study a combination of micro- and macro methods have been applied. A statistical analysis of impacts of 102 major road projects completed during the period 1993-2005 is carried out and supplemented by three case studies of larger road investment:

1. The triangle link completed in 2000 is a tunnel and bridge system connecting the islands Bømlo and Stord to the mainland and the nearby city Haugesund.
2. Road improvements during the period 1995-2005 between Førde and Florø that has reduced travel time between the two centres from 80 to 50 minutes.
3. Fixed link to the North Cape opened 1999.

The purpose of the study is to investigate:

- Wider economic benefits of large road investments on adjacent areas in terms of population, employment and industrial development.
- Development mechanisms at play in economic base industries and in local service sectors and labour markets.

The objective is thus partly quantitative tests of local and regional impacts of a national road investment program and partly explorative in search for the most important mechanisms at play at the local and regional level through case studies.

2. Literature

A large literature has examined the relationship between infrastructure investments and economic development (from Ashauer 1989 to Lakshmanan 2010). There has been a focus on productivity effects on the economy as a whole or on manufacturing industries. Macroeconomic models have been criticised for how infrastructure properties are measured, large differences in magnitudes of effects and the lack of justifying the causal direction of effects. Further, they give little insight into the mechanisms linking transport improvements to the wider economy (Lakshmanan 2010).

Later work have focussed on wider economic effects, like how transport infrastructure improvements open up markets and stimulate agglomeration economies. In addition there has been more focus on the service sectors. Graham (2007) shows how transport investments stimulate agglomeration economies. In a UK-based study he finds particularly large agglomeration effects (i.e. increased productivity) for the transport and communication sector, finance sector and business services. However, some of these sectors might locate to large cities, not only due to agglomeration aspects but due to their central position in long distance transport networks.

Jiwattanakulpaisarn et al (2010) have met some of this criticism by separating into three sectors and allowing for ‘reversed’ causal directions from the economy to road investments. They find that interstate and non-interstate road investments in the US are determinants of state employment growth in the service sector. However, gains from improvements in interstate highways may have negative spillovers, shifting services and construction jobs away from other states.

Further, Jiwattanakulpaisarn et al (2010) found that effects are bi-directional. State highway investments is at the same time a response to service sector growth and may also trigger manufacture industries to relocate into larger and more productive units leading to state employment losses. They argue that it is essential to distinguish between growth (nationwide) and redistributive effects, even though it might be difficult since these effects are interrelated.

This type of distributional effects combined with increased productivity is also likely to occur in the service sector. If small businesses previously protected by distance become open for competition after road investments, the result might be concentration of services and retail due to scale economy and the attractiveness of large centres with a broader supply. However, productivity is likely to increase due to increased sales per employee.

Graham (2007) argues that agglomeration effects exist at all region levels. However, in the service sector, a certain minimum level of centre size is required in order to become viable. In this paper we search to clarify the question of necessary size of viable service centres in order to limit the leakage to nearest large cities. Distance to the nearest large city will most likely also be of importance. Our setting, remote regions in Norway, is at the lower end of the urban hierarchy.

Johansson (2007) argues that since infrastructure investment affects spatial organisation, this aspect has to be addressed in a more direct way like firm's accessibility to labour supply, input suppliers, customers, and to knowledge providers. For households, accessibility to jobs and services is relevant. Further, he emphasises the physical aspects of the infrastructure investment such as time distances, travel costs, capacity and comfort.

Johansson (2007) makes a distinction between intra-regional and extra-regional market phenomena. The local markets are characterised by local competition and face-to-face contact between buyers and sellers. The growth in such markets is endogenous, self-generated and depends on population growth and regional enlargement (which in turn might be dependent on localisation changes of local activity). Extra-regional market phenomena are characterised by exogenous demand, global competition, infrastructure designed to establish accessibility to global networks, low transaction costs, and scheduled delivery systems.

We believe the distinction between local markets, such as service and retail industries and the local labour market on one side, and economic base industries exporting products out of the region on the other is fruitful. Export industries have long transport distances and local investments covers only a very small part of the transport distance. Thus, economic impacts of changes in local infrastructure are likely to be small. Changes are more likely to occur due to economic fluctuations and global trends. On the other hand, improved transport links may replace previous bottlenecks such as ferry links or roads exposed to occasional winter closure. Such bottlenecks can prevent firms from implementing just-in-time production, and hence, meeting the requirements from costumers and achieving higher productivity. A classical argument in these cases is that improved roads providing flexible and safer transport with high regularity may be a necessary but not sufficient condition for economic growth.

In the service and labour markets infrastructure improvements change local /regional spatial competition by opening up new opportunities through enlarged geographical range of firms and households. Increased regional centralisation is often a consequence as larger and more centrally localised units tend to win at the expense of peripheral units. On the other hand, there are ongoing centralisation processes both at the national and regional level and local/regional concentration of activities and enlarged labour markets might be a strategy to consolidate smaller regions and reduce /postpone the drain to larger cities, at least for a decade or two.

Johansson et al (2002) found that diminishing time distances increases the spatial size of labour markets, but the propensity to commute over time distances larger than 45 minutes is limited. Further, they found that municipal population growth can be predicted by accessibility to household services. However, population size had a more important effect than high growth in accessibility. Lian (1995) reported a similar finding – municipalities

within 1 hour travel time from regional centres experienced population growth 1970-1990, while there was no relationship between reduced travel time and population growth in the same period. A parallel observation, presented in section 3, is that population growth to a large extent is determined by the centrality of a municipality defined as distance to a centre and the size of centre, and is to a lesser extent influenced by road investments.

Another issue is the spread of economic impacts. How far do they reach? Holl (2007a) found that after massive motorway investments in Spain 1980-2000, the average distance (measured as a straight line) from the 7939 Spanish municipalities to the nearest inter-regional motorway is reduced from 60 km to 20 km. However, the relation between motorway access and industrial location is complex and depends on type of industry, distance to large cities etc. After the completion of the whole network, there seems to be a spread of activities from large urban agglomerations to sites along the motorway. Thus, in this latter phase of infrastructure development impacts occur close to the motorway corridors. Thus for manufacturing industries the importance of nodes is reduced while distance to corridors is important. For other sectors where agglomeration effects are important, clustering at nodes is the trend (see Graham, 2007).

For export industries a network perspective is useful as transport users over large networks may benefit from the new motorway system. Impacts would then affect the whole nation and in particular those industries dependent on the whole network.

On the other hand, average trip length is short and most users of the road will be local and regional. In Norway, more than 80 % of all passenger car trips are less than 20 km, and more than 80 % of all freight car trips are less than 60 km. Thus, effects are most likely manifest close to the investments.

3. Quantitative analyses of 102 major road project in Norway

The present study focuses on the wider economic impacts of major road investments in Norway during the period 1993-2005. A list of 102 major road investments was made in cooperation with the National Road Authority (NRA). Investments above € 25 million were characterised as major. The projects add up to an investment of more than € 6 billion. Road projects have a certain length and there might be several projects along the same corridor. The splitting up into single projects is done by NRA, but do not influence conclusions since we are measuring investment levels within a certain range from the municipalities.

Ideally, one should measure physical aspects of the road, like travel time, capacity and so on. Such data are not available. We do not have reliable figures for the initial road capital. Thus our measure of road supply is simply the investment level.

Small investments are excluded. They are usually more widespread throughout the country. Thus, a focus on large investments should facilitate identification of significant impacts.

Road investments have a certain impact range. Even if the investments enter into a network, trips are fairly short and impacts typically local. As mentioned, Holl (2007a) analysed industrial development within 40 km from the Spanish motorways. We have tested different ranges and found that investments within 1 hour travel time distance (after the investment) give better results than applying a large range such as 2 hours.

The analysis is carried out at municipality level. There are 430 municipalities of varying size in Norway. Distances to the 102 road projects are calculated for all municipalities. Impact variables are collected for all municipalities from Statistics Norway. Impact variables are:

- Population change 1990-2000, 200-2008 and 1990-2008
- Population 20-44 years, change 1990-2000, 200-2008 and 1990-2008
- Income per taxpayer, change 1993-2007
- Employment, change 1995-2000, 2000-2008, 1995-2008
- Changes in industrial space floor 1990-2005 by industry

Norwegian municipalities are by Statistics Norway classified into four levels of centrality:

3: Level 3 centre (NUTS 3 centre) or municipalities within 75 minutes travel distance
2: Level 2 centre or municipalities within 60 minutes travel distance
1: Level 1 centre or municipalities within 45 minutes travel distance
0: Peripheral municipalities, do not satisfy above requirements

Many of the 102 major road projects were undertaken in central parts of Norway, but there are also examples of large investments in remote areas. There has been a shift towards investments in central areas since mid-1980s when toll financing of major urban roads became popular.

Table 1: Large road investments by centrality of municipality

Centrality	Investment (billion €)	No of projects
3 Central	4.0	57
2 Partly central	0.6	11
1 Less central	0.4	12
0 Peripheral	1.1	22
Total	6.1	102

Since population growth is clearly strongest in central areas there is seemingly a relationship between population development and major road investments.

Table 2. Population growth and average major road investments within 1 hour travel distance.

Centrality	Population growth 1990-2008 (%)	Major road investments 1993-2005* (million €)
0 Peripheral	-7	21
1 Less central	3	41
2 Partly central	6	94
3 Central	19	711
Total	13	278

*Un-weighted average.

Investment variables are expressed in four ways:

Invest60 and Invest120 are aggregate investments within 60 and 120 minutes travel time respectively. I/D_60 and I/D_120 are investments divided by distance to the investment

aggregated within 60 and 120 minutes travel time respectively. Travel time is calculated by the national transport network model, road network per 2006.

The dependent variables are listed below. The periods might vary due to data availability.

Centrality	
Pop9008	Population 2008 / population 1990
Emp9508	Employment 2008/ employment 1995
Inc9307	Income per taxpayer 2007/ income per taxpayer 1993
Ci-0008	Commuting into the municipality 2008 / commuting 2000
Co-0008	Commuting out of the municipality 2008 / commuting 2000
Floor9007	Floor space for industrial activity

An examination of partial correlations is useful when doing regression analysis. The investment variables are highly correlated. They are used one at the time and the best explanatory variables are used. In all cases Invest60 proved best. The investment variables are high correlated with population growth, while correlations with other variables are low.

Table 3. Partial correlations between variables, un-weighted figures.

	Invest60	Invest120	I/D_60	I/D_120	Centrality	Pop9008	Emp9508	Inc9307	Ci-0008	Co-0008
Invest 120	0,84									
I/D_60	0,91	0,70								
I/D_120	0,74	0,68	0,84							
Centrality	0,51	0,58	0,47	0,47						
Pop9008	0,52	0,48	0,52	0,46	0,63					
Emp9508	0,21	0,19	0,19	0,17	0,30	0,49				
Inc9307	-0,20	-0,15	-0,18	-0,14	0,01	-0,18	0,12			
Ci-0008	0,02	0,03	0,02	0,02	0,15	0,10	0,34	0,07		
Co-0008	-0,04	-0,08	-0,02	-0,02	0,19	0,20	0,06	0,06	-0,08	
Floor9007	0,02	0,03	0,00	0,01	0,03	0,03	0,05	0,04	0,05	0,14

* Correlations > 0.1 are significant at 5 % level.

Centrality influences population and employment development. In regressions centrality is used as a control variable. When controlling for centrality, the major determinant of population growth, the relationship between investments and population development more or less disappears. There is a weak but significant relationship (t-values above 2 are significant at 5 % level).

Table 4. Regression results on population development 1990-2008.

	B	Std. Error	Beta	t-value
(Constant)	0,8892	0,0088		101,06*
Centrality	0,060136	0,00509	0,49275	11,81*
Invest_60	0,00000948	1,47912E-06	0,26736	6,41*
Model summary: Adjusted R^2=0.445 F=173, p<.000				

*p<.05. Investments in million NOK.

The interpretation is as follows. When centrality increases by one level, population increases by 6 %. When large investments within 1 hour travel time increase by 1 billion NOK (€ 125 million), population increases by 1 % over the whole period 1990-2008.

If the investment period is divided into two (1993-1999 and 2000-2005) and impacts on population development are also measured in two phases (1990-2000 and 2000-2008), we find that the first period of population development is a less extent explained by investment levels. The second period has the highest adjusted R^2 but this is mainly explained by centrality. T-values for the coefficient is at the same level as regressions for the whole period.

Table 5. Regression results, in two periods of investments and population development.*

	Pop 1990-2000		Pop 2000-2008		Pop 1990-2008	
	Adjusted R^2	t-value	Adjusted R^2	t-value	Adjusted R^2	t-value
Invest_60	0,313	5,15	0,475	6,02	0,445	6,41
Invest_60 p1	0,304	4,56	0,483	6,64	0,445	6,39
Invest_60 p2	0,313	5,15	0,464	5,16	0,438	5,92

* Centrality is included as control variable in all regressions.

If we single out the younger adults (25-44 years) that many regions seek to attract, we still get significant results but the explanatory power is reduced compared to regressions on the whole population.

Table 6. Regression results on population change 25-44 years 1990-2008.

	B	Std. Error	Beta	t
(Constant)	0,7731089	0,01085		71,23*
Centrality	0,0668746	0,00628	0,48026	10,65*
Invest_60	0,0000075	0,00000	0,18445	4,09*
Model summary: Adjusted R^2=0.351 F=117, p<.000				

*p<.05

If logarithms are included in regressions the explanation falls (adjusted R^2 =0.368). A linear model gives the best result.

There seems to be no effects on employment, income levels, commuting or industrial growth. Adjusted R^2 are between 0.00 and 0.09 and no coefficients are significant.

If we analyse only coastal municipalities from Stavanger and further north, explanation falls to 35 % and t-values falls to about 3.

In order to control in more detail for centrality, regressions are made separately for all four centrality groups. For central and partly central municipalities explanation is about 13 %. For less central areas explanation is lower and coefficients not significant. This implies that impacts on population development seem to be low or absent in remote areas where the national policy of investing in infrastructure in order to achieve a positive development is particularly emphasised.

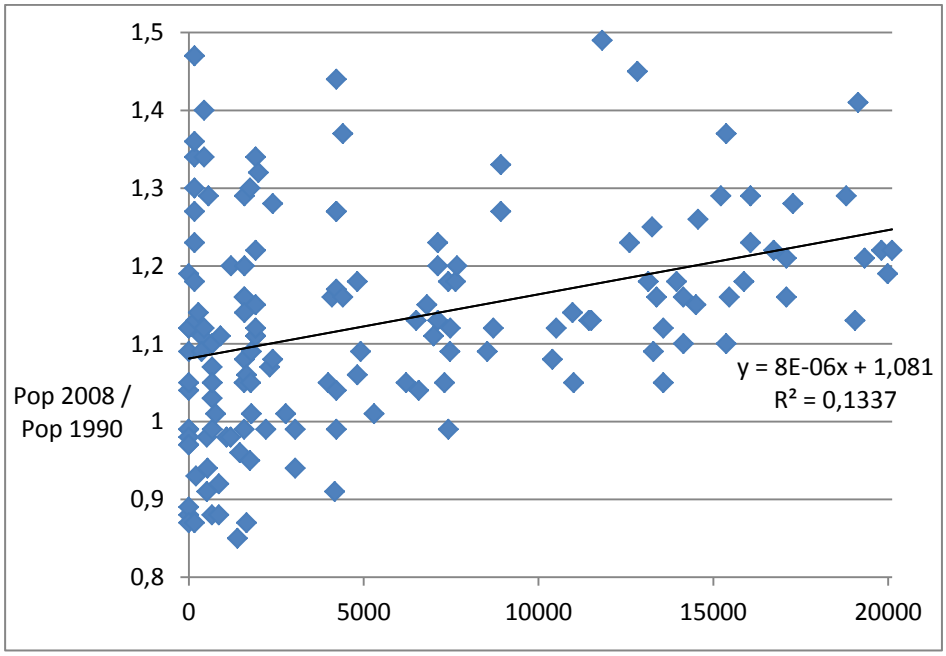

Figure 1. Population development 1990-2008 (y-axis) by investment level (million NOK) within 1 hour travel distance from the municipality. Central municipalities.

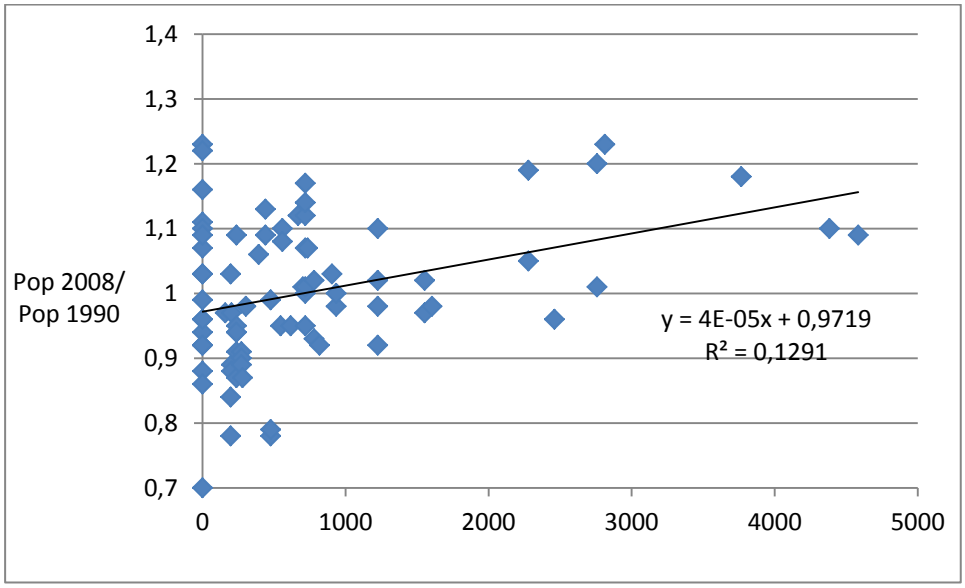

Figure 2. Population development 1990-2008 (y-axis) by investment level (million NOK) within 1 hour travel distance from the municipality. Partly central municipalities.

5. Case studies of three major road investments

As a supplement to the quantitative analysis, three case studies of major road investments were carried out. Case studies can contribute to enhanced insights into the mechanisms linking transport improvements to the wider economy. Interviews with representatives from local businesses and municipalities, and statistics from Statistics Norway, form the basis of the case studies.

The case studies - the Triangle link, road improvement between Førde-Florø and the North Cape link - portray different characteristics when it comes to type of project and location. The

Triangle link is located on the Southwest coast of Norway, while the RV5 project is located in the North West. The North Cape link is to be found in the northern part of Norway (figure 5.1).

Figure 3: Geographical localization of case-studies.

5.1 Case study characteristics

The Triangle link and the North Cape link represent fixed links, while the RV5 Førde - Florø project is a step by step improvement over a 10-year period (table 7). Further, the Triangle link and the RV5 project connect regions of about 30 000 inhabitants within travel times of 50 minutes, whereas the North Cape link affects only 3000 inhabitants and the distance to the nearest centre, Alta, is about 3 hours.

Table 7: Case study characteristics.

Project attribute	Triangle link	RV5 Førde-Florø	North Cape link
Type of project	Fixed link	Step by step improvement	Fixed link
Opening year	2001	1995-2005	1999
Travel-time saving	30 min	25 min	½ - 1 hour
Affected municipalities	Bømlo, Stord, Fitjar	Florø, Bremanger, Naustdal, Førde	Nordkapp
Population*	31 000	30 000	3 200
Economic base	Industry, some service	Industry and service	Fishery and tourism
Centrality	Less central	Less central	Least central
Travel-time to centre /larger city	50 min to Haugesund, 2 ½ h to Bergen /Stavanger	Førde – Florø 50 min Førde – Bergen 2 h 45 min	Honningsvåg – Alta approx. 3 timer

* Island region/affected region

The affected island region of the *Triangle link* has 31 000 inhabitants. Stord is the largest municipality with a population of 17 000 inhabitants, followed by Bømlo with 11 000 inhabitants and Fitjar with 3 000 inhabitants. The islands have substantial supply activity to the oil and gas industry and the maritime industry. In addition, Bømlo has relatively high employment in fishery and aquaculture sector, whereas Stord has higher employment in the service sector.

The improvement of the road between the municipalities of Førde and Florø (*RV5 Førde-Florø)* has also affected the municipalities of Bremanger and Naustdal. The region has a total of 30 000 inhabitant, where Førde and Florø are about equal in population size (11-12 000 inhabitants). Førde is the regional centre and has high employment in public and private service. In Florø important industries are shipbuilding and service, supply services for the oil- and gas industry and fishery and aquaculture.

The North Cape link connects the municipality of Nordkapp to the mainland. Nordkapp has approximately 3 200 inhabitants. Honningsvåg is the community center. The municipality has also several populated fishing villages. The North Cape plateau attracts around 200 000 tourists yearly, and is an important source of income. Fishery is also an important industry.

The following presentation of impacts applies to the distinction between intra-regional and extra-regional markets as discussed above.

5.2 Intra-regional market: Effects on local service and labour markets

The road investment projects reviewed in the case studies have resulted in travel-time savings. After the road improvements both Bømlo-Stord and Florø-Førde regions have experienced a consolidation of the local supply of services and the local labour market. In both regions

commuting has increased. Larger labour markets give more opportunities for qualified and specialised labour; especially when labour markets differ from each other, like in Førde with public administration and hospital, and Florø with maritime industries, oil and gas sector supplies. In addition, since the maritime industries are vulnerable to fluctuations, alternative jobs not too far away make the region as a whole more robust and prevent depopulation in periods of recession.

In the retail and service sector larger catchment areas have contributed to local concentration processes that result in consolidation of local markets, favouring established centres. Stord and Førde are strengthened at the expense of Bømlo and Florø respectively. The establishment of shopping centres with chain stores has been a central element in this development, which contributes to restraining the drain to distant larger cities.

Public service is not concentrated to same extent. There have been some reductions and relocation of activities in the hospital sector. Otherwise, relocation and cooperation seems difficult in the public sector due to fear of losses of local jobs.

Thus, when peripheral regions are linked within a travel time of 45-50 minutes, local service supply and the local labour markets seem to be consolidated. With reference to other studies (Eriksen and Kvinge, 2004) there seem to be a threshold of 10 000 - 30 000 inhabitants that is necessary in order to reduce leakage to nearby cities. Regions above this threshold are large enough to offer an attractive level of household services and employment possibilities for the inhabitants, as well as business/producer services and job supply for business activity.

The travel-time from Honningsvåg to Alta is approximately 3 hours, and there are no consolidation effects of the North Cape link. However, the fixed link has reduced the travel time to Alta, leading to increased use of household services in Alta. In addition; more air travellers avoid the local regional airport and use the main airport Alta in order to obtain competitive air fares. The same tendency is also found in Bømlo/Stord were people travel to Haugesund airport instead of to the local airport.

5.3 Extra-regional market: Effects on base industries – maritime, offshore supplies and tourism

Export oriented economic base industries are transport intensive and the goods travel long distances. Thus, the relative importance of local road investment is lower. However, Holl (2007b) points out that infrastructure improvements and lower transport costs may change the organization of industrial activity towards just-in-time production and outsourcing, and thus, create more transport intensive production patterns.

Case study base industries, such as aquaculture, maritime industries, oil and gas sector supplies have become more dependent on road transport and JIT-production. In the Stord-Bømlo region the trend with more road transport started prior to the Triangle link, but the volumes transported on road have multiplied since the opening of the fixed link. Semi-manufactured goods is for instance sent from Aker Stord to Poland for completion, due to a lower wage level, and thereafter returned to Stord. Larger components such as living units for installation on offshore installations are also transported on road from Finland to Stord. Wärtsila transports 25-meter long propeller shafts on truck from the plant at Bømlo to customers on the European continent. For these industries, transport investments are seen as a necessary but not sufficient requirement for continuing business. Economic fluctuations and global trends are the main determinants for the development in these industries.

Cost savings related to improved transport infrastructure is not only associated with the goods transport itself, but also the reliability of the deliveries, the possibility of reduced inventory, economies of scale, and the ability to save an intermediary in the commodity supply (Bråthen et al, 2003).

Base industries as oil and gas supply and maritime industry stress the importance of flexible, efficient and reliable goods transport for their competitiveness. This is particularly evident for incoming transports of intermediate goods, as production delays are costly. Reliable and flexible outward transport on road is also important in relation to the ability to deliver on time and has an impact on the relationship with the customers. The customers are keen to get the goods at the right time and right price, and are not concerned with where the business is located.

For export of fresh fish, regularity and flexibility are important in order to reach the markets at the right time. A safe road during the winter and fixed links replacing ferries are effective measures to enhance transport quality to the level required for the transport of fresh fish, thereby obtaining higher prices on the market. Reliable transport is also important when the fish is being sent to the Asian or North-American market with air transport from Oslo Airport Gardermoen or via other international hub for air transport.

In recent years there have been structural changes in the aquaculture industry in Norway. The number of fish harvesting plants is declining, but the size of the plants are increasing, favouring locations with good logistics solutions. Improved transport infrastructure has laid the foundation for economies of scale for one of the harvesting plants (Brandasund) on Bømlo, which receives fish by well boat from producers in the region. The plant is preferred due to good logistics solutions, capacity to load several trucks at the same time, and possibilities to sell directly to the customers, and hence, get better paid for the fish. Cape Fish in Nordkapp also sells directly to the customers without intermediaries. Since the North Cape link regular freight routes for general cargo to Nordkapp has been established, enabling Cape Fish to sell smaller shipment of salted fish to the customers, according to customer demand.

The North Cape link has not resulted in significant changes in the volume of tourists to the municipality and the North Cape plateau. Representatives from the tourist industry point out that the ferry did not constitute an obstacle, but rather a positive experience for the tourists on their way to the North Cape plateau. However, the fixed link has contributed to less stress, both for tourists and employees in the tourist industry. With the fixed link the tourists are more flexible, and the flows of incoming and outgoing tourist are more evenly spread during the day. In addition, the fixed link provides opportunities for developing short stay adventure tourism targeted towards business tourist arriving at Alta airport.

6. Conclusions and discussion

The Norwegian geography is characterised by long distances, difficult topography, and dispersed population. Hence, investments in transport infrastructure have been perceived as important for economic development and public welfare. The quantitative analysis showed that there is a weak relationship between road investment and municipal population growth. However, centrality is a far stronger determinant of population growth, and effects seem not to be statistically significant in the most remote regions were infrastructure investment as stimuli to regional development is most emphasised.

Findings from the case studies summarised in table 8, indicate that changes are more evident in local labour and service markets than in export industries. However, a certain population

size, for instance 10 000 – 30 000 inhabitants within a travel time of 50 minutes, seems to be necessary to achieve a strengthening and consolidation in local service supply and labour markets and to hamper leakage to the nearest larger cities. In addition, a certain distance, such as 2 hours or more, from a large city is also advantageous. Findings are in line with Johansson et al (2002) stating that large size of the attractor (number of jobs, labour supply and supply of business/producer services and household services) is a more important determinant of municipal population growth than high growth in accessibility. However, more empirical studies are needed in order to elaborate on threshold size and distance to larger cities.

Table 8. Summary of impacts in case studies.

Impact	Triangle link	RV5 Førde-Florø	North Cape link
Traffic development	Opening year: +40 %, strong increase afterwards	Stronger increase after opening in 2005	Opening year: +20 %
Population development	Weak growth, internal centralisation, not influenced by the road investment	Stable , internal centralisation, not influenced by the road investment	Decreasing, not influenced by the road investment
Extra-regional markets	Flexible, reliable and cheaper transport, competitive industries, higher fish prices	Reliable transport, increased in-transport of intermediate goods	Flexibility with resp. to party size, fresh fish export increased, potential tourism growth
Commuting	Increased, especially towards Haugesund, greater flexibility to firms and households	Increased in both directions, greater flexibility to firms and households	Unchanged, too long distances
Services	Consolidation to Stord, reduced leakage to Haugesund	Strengthening of Førde as regional centre	Increased service leakage to Alta
Competition, cooperation	One labour market, some public service relocation/ cooperation but resistance	One labour market, supplementary characteristics, hospital cooperation but resistance	Increased service leakage
Households	Work opportunities for both, better access to services and Haugesund airport	Work opportunities for both, better access to services	Increased airport leakage to Alta, more convenient trip to second homes

Export industries have long transport distances and global trends and economic fluctuations seem more important for development than local road improvements. However, almost all export industries (fish farming, maritime industries, oil and gas sector supplies) have become more dependent on road transport and JIT-production. Transport of intermediate goods is especially critical. For these industries road improvements, especially increased regularity and flexibility, are seen as a necessary but not sufficient requirement for continuing business and improving productivity. However, more knowledge is needed on which road properties, like axle load, travel time, regularity, travel time and so on, is important for scheduled and well organised transport systems.

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