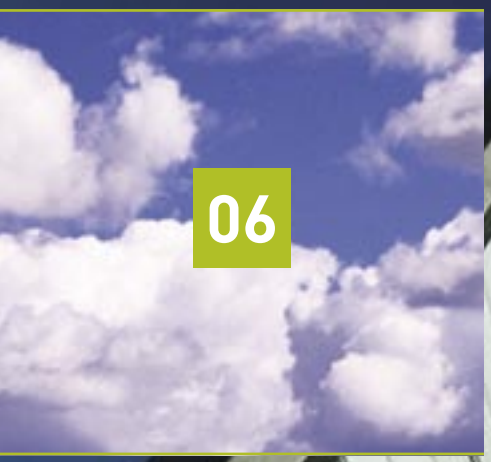
STRAIR
CONNECTING AIRPORT REGIONS



06

Analysis of flow of goods in the Oslo Airport Region

STRAIR report 3 B:
Models for analysis of flow of goods and services in airport regions

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presentation

STRAIR – Strategic development and cooperation between Airport Regions – is an Interreg IIIC project that involves seven airport regions across Europe.

The project period is from 2005 to 2007 with a budget of 2 million Euros financed on a 50/50 percent basis from the partner regions and from the INTERREG IIIC programme. The Lead Partnership of the project is shared by Stockholm and Oslo Airport Regions.

The STRAIR project is endorsed by the ARC (Airport Regions Conference) at the initiative of the ARC Interest Group for Economic Development. STRAIR involves ARC member regions as well as other medium sized European Airport regions.

Proximity to international airports and advanced infrastructure are strong sales & marketing issues for regions to attract investment and knowledge workers. The essence of STRAIR is to use the fact that well-functioning airports are driving factors for regional business development in the new global economy.

The aim of STRAIR is to improve the innovation systems for industrial and business development in airport regions and to develop airport regions networks with the intention of learning from each other's operations.

The common features of the partners in STRAIR are that they are the fastest growing regions of their countries. Because of the advanced infrastructure linked to the airport, the regions are also among the most accessible areas of their country.

STRAIR consists of four Components focusing on direct and indirect Innovation and Business development, Territorial and environmental effects of airport development, and Distribution and cooperation with airport networks.

This report: Analysis of flow of goods in the Oslo Airport Region is the second of five STRAIR reports published with ARC endorsement. The analysis is carried out in cooperation with The Norwegian Railway-, Aviation- and Road administration and Oslo Airport for STRAIR Component 3 Innovation and Business development indirectly related to airports.

This report is published as the 3B) STRAIR report: Models for analysis of flow of goods and services in airport regions.

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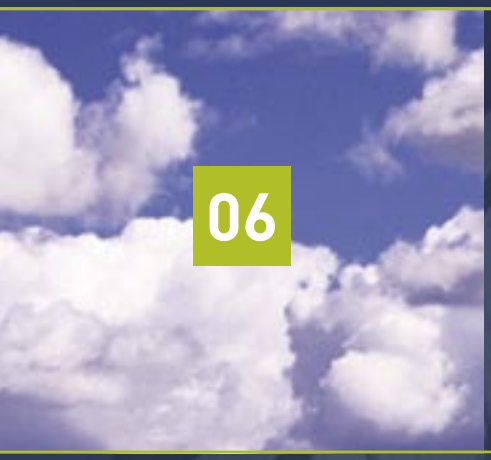
AIRPORT REGIONS CONFERENCE



06

acknowledgement

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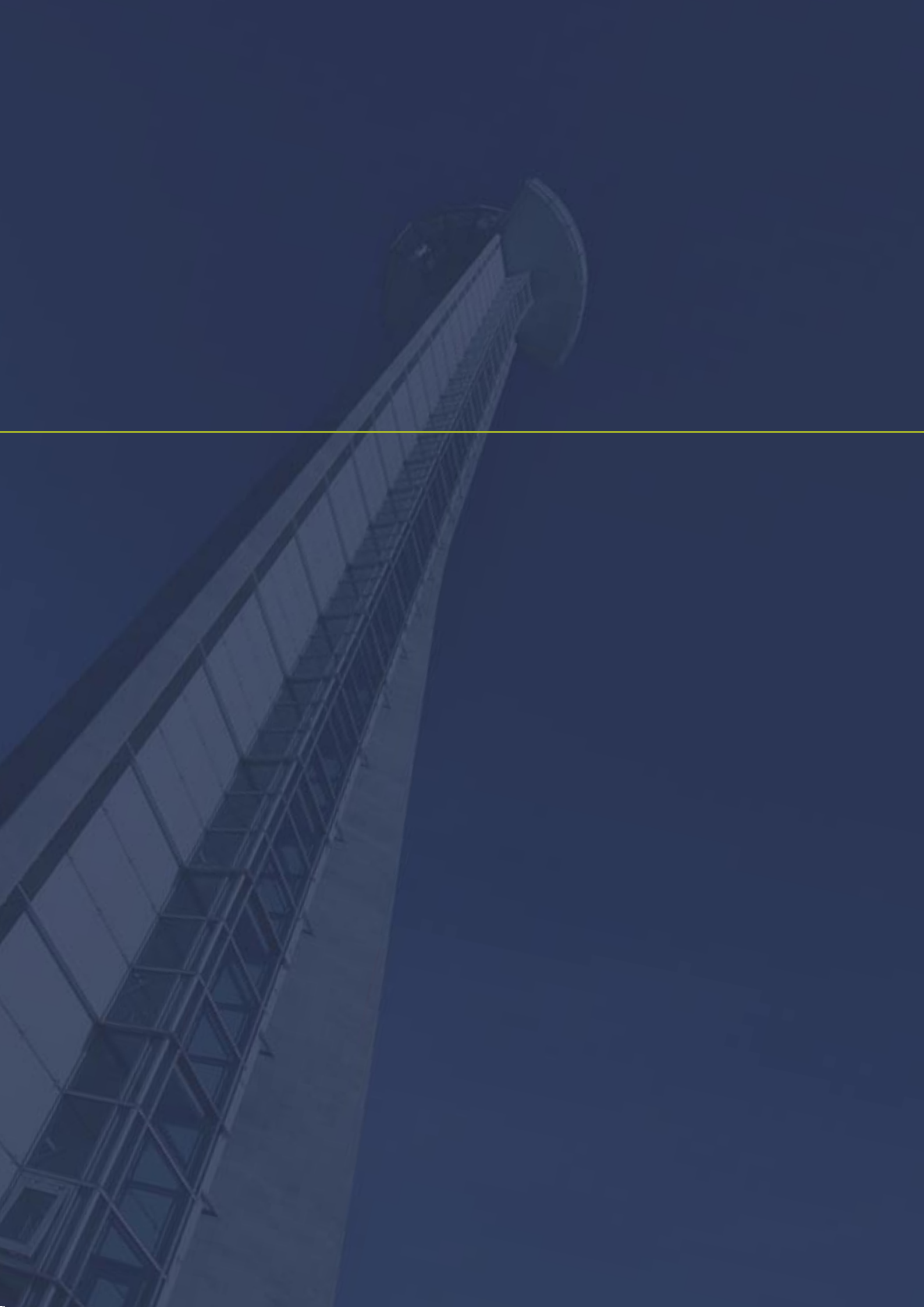

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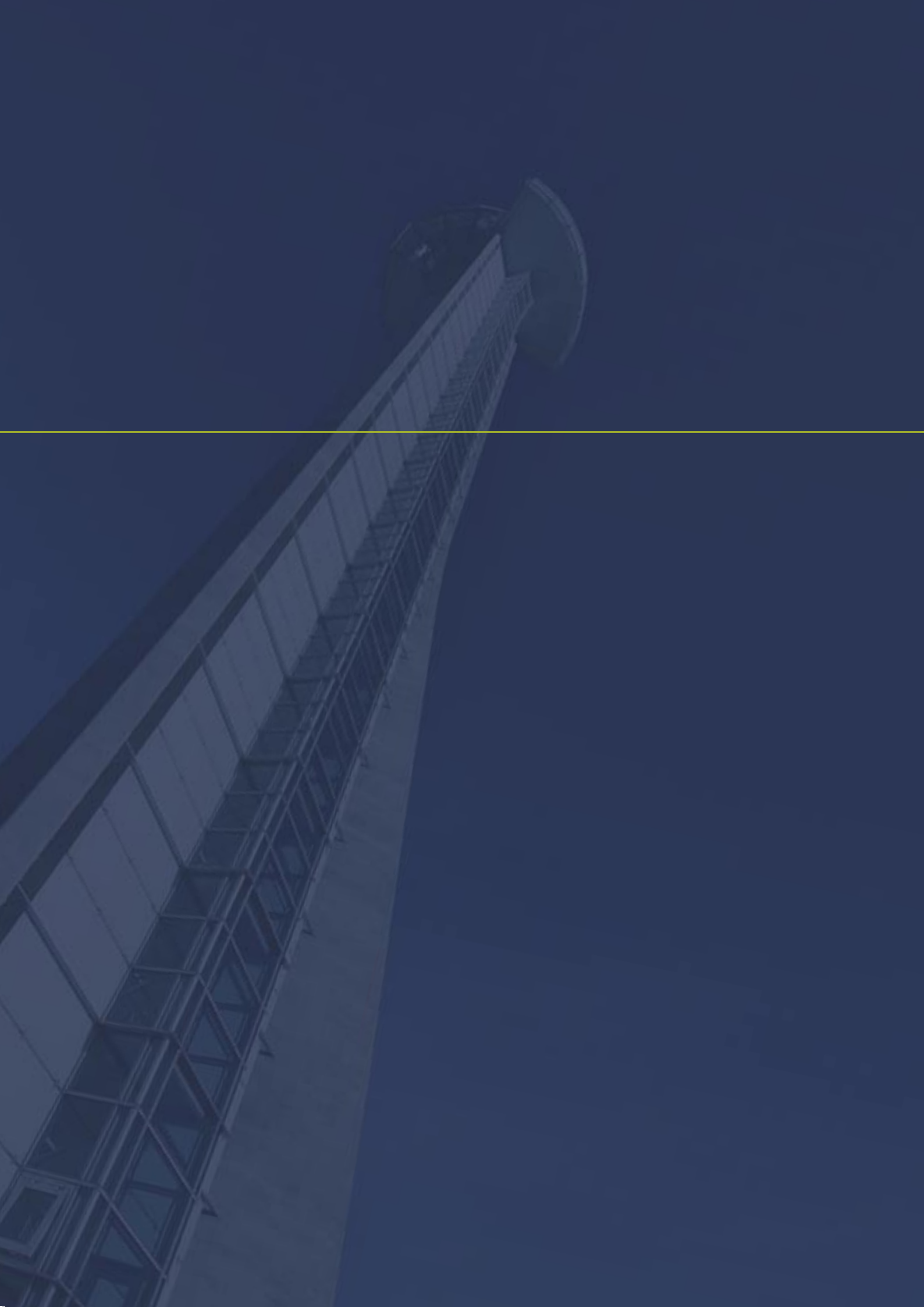


executive summary

Executive Summary

Abstract

This report investigates if a freight and logistic cluster has been developed in connection with the establishment of Oslo Airport Gardermoen in 1998. The main conclusion is that there are several indications on such cluster formation in the airport region. First, a relative high share of the firms that are established in the area demands advanced logistic solutions. Second, there are also indications on a well developed low cost and high quality supply of transport services in the region.
Official transport statistics also suggest that the airport area serves as an important hub in the Norwegian transport system. Annually almost 2 mill tons is transported through the region, whereas almost 70 thousand tons of freight have origin or destination within the airport area.

Background

Oslo Airport Gardermoen was established in 1998 in Ullensaker municipality, 50 km north of Oslo. Since the start of the construction work, the airport has generated economic growth in the region in many ways. Official statistics shows e.g. that the employment in airport area[1] is growing considerably. However, to our knowledge it has not been conducted analysis on to what extent the airport has contributed to a well functioning market for freight transport and logistics. Hence, in this report we will analyse Oslo Airport Regions role as a possible hub in the Norwegian freight transport and logistic networks.

Problem statement

To investigate if Oslo Airport Region serves as a transport and logistic hub, we have surveyed demand for transport and logistic in Eastern-Norway. The survey has been designed to provide us with two types of information:

- To delineate the airport area from surrounding regions from a freight transport and logistic point of view.
- To map the freight volumes going in, out and through the region.

1 In this report we'll use the phrase "Airport Area" as equivalent to Ullensaker municipality.

Conclusions

From an economic point of view, a regional delineation may be based on the existence of economic clusters. In the transport market, economy of scale may entail clustering mechanisms between the transport industry and firms that demands well developed transport and logistic services. Scale economics may entail both low costs and high transport quality, i.e. high frequency, precision, reliability, etc. It may therefore be favourable for firms demanding advanced logistic solutions to locate in areas where scale effects have entailed well developed transport service. Such localisation decisions may in turn contribute to realise even larger scale advantages. Hence, self-reinforcing mechanisms between supply and demand for logistic services may imply that it develops significant regional differences in the transport market. Some areas may accordingly be characterised as logistic clusters.

To investigate if clustering mechanisms are present in the transport market, we have conducted a telephone survey to map the demand for transport and logistic services in Eastern-Norway. A statistical analysis on the survey data indicates that the airport area along several dimensions may be characterized as a logistic cluster.

- A relative high share of the firms within the airport area demands advanced logistic solutions. By advanced logistic demand we mean firms that require daily deliveries, to have strategic control over the transport solutions, use third party transport providers and needs direct transport to customers and vendors. Several other regions, e.g. Oslo North, Drammen and Grenland are also characterised by a high share of advanced logistic firms.

- The transport services provided in areas with a high share of firms demanding advanced logistic solutions seems to be characterised by relative low costs. Further, it seems that the service is provided by relative few transport providers. Both findings indicate presence of logistic clustering based on realising scale economics in transport services.

The question then is if a logistic cluster in the airport area may be attributed to the presence of Oslo Airport Gardermoen. Our analysis indicates that one should be careful to draw the conclusion that access to infrastructure is a direct driver for logistic cluster formation. First, our respondents in areas where clustering seem to appear, are in general dissatisfied with the infrastructure. Second, it appears as locating near the airport has relative low importance for firms that are depended of air cargo.

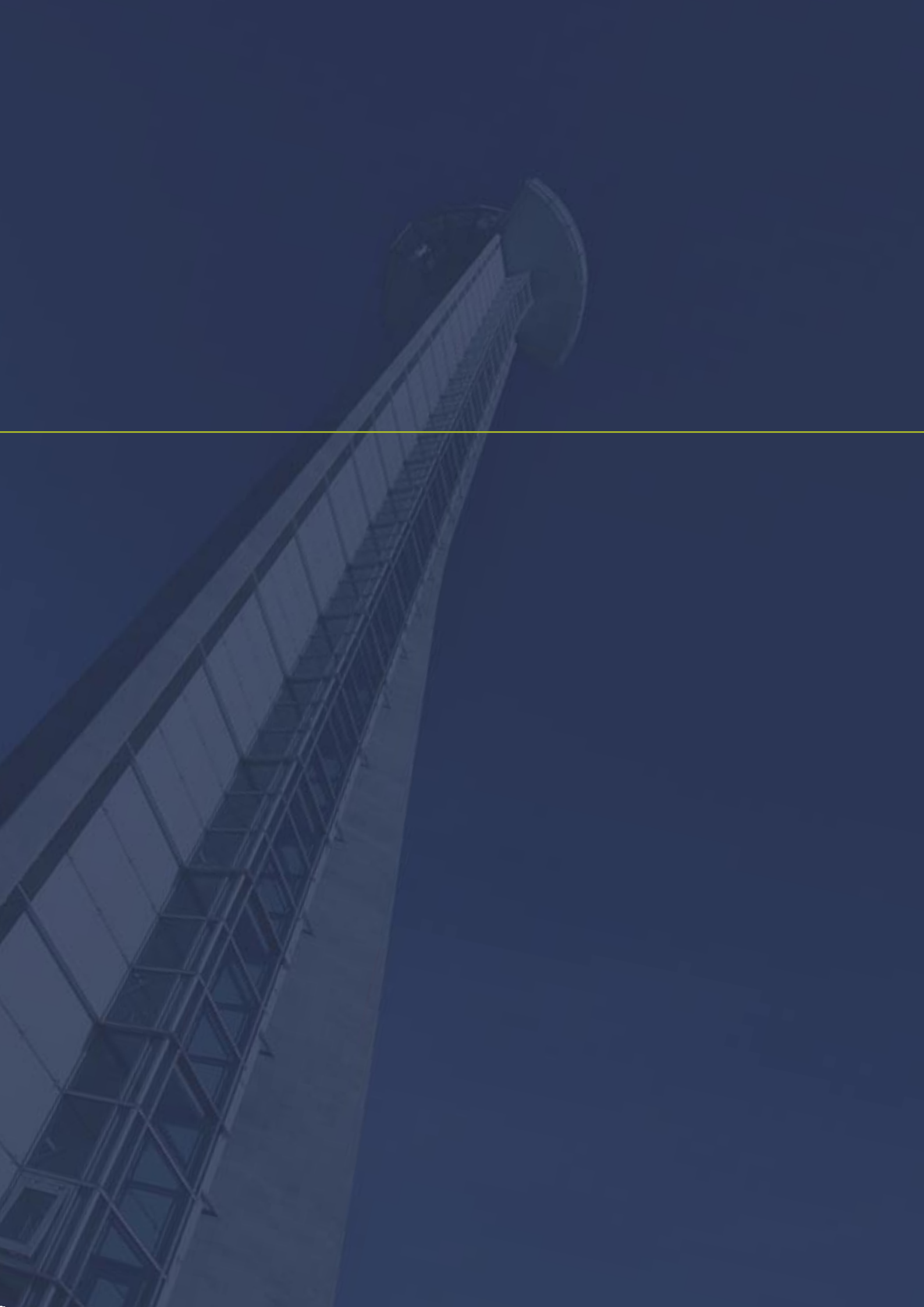
This does however not necessarily imply that the airport is insignificant as a main driver for logistic clustering in the airport area. On the contrary, our analysis shows that logistic clustering primarily occurs in areas with high economic activity and growth. The airport area has one of the fastest growing economies in eastern Norway. A significant share of this growth should most likely be attributed Oslo Airport Gardermoen. Hence, there seems to be a clear, but indirect connection between the airport and the presence of a well developed transport market in the nearby area.

The airport area is a hub in the transportation network from a freight volume perspective as well. The reason is that the major northbound road and railroad from Oslo goes through the area. In addition, air freights accounts for significant volumes. The table shows the annual tonnage that goes in/out and through the area:

Table A
Freight volumes in the airport area, 2005 (1000 tons per year)

Freight with origin/destination in airport area	*69*
Volumes transported through the area:	
- Roads	*1.730*
- Railroad	*134*
- Airborne	*83*

Source: Statistics Norway, Avinor, The Norwegian Public Roads Administration, ECON estimates



1 : background

Backgound

Oslo Airport Gardermoen was established in 1998. The old airport, Fornebu, was located near Oslo, in an area with little spare land and hence not enough capacity to meet a strong increase in air traffic during the 90-ies. Stortinget decided therefore, after years of debate, to move the airport to Gardermoen.

Oslo Airport Gardermoen is today a major airport in the Nordic region, both with respect to passenger and freight transportation.

Table 1.1
Passengers and freight volumes in the main Nordic airports

	Passengers (mill) 2005	*Freight, 1000 tons (2004)*
Oslo Airport Gardermoen	*15,9*	*83*
Copenhagen-Kastrup	*19,9*	*335*
Stockholm-Arlanda	*17,1*	*139*
Helsinki-Vantaa	*15,1*	*12*

The choice of Gardermoen as a location for the new airport was partly a political measure to create economic growth in a mainly rural area north of Oslo. The economic impacts related to the airport, i.e. increased employment and development of business in the region can be both direct and indirect. The direct effects are related to the activity on the airport and in the airline industry. Indirect effects are related to development of services located nearby the airport, such as hotels, restaurants and retailing on the airport, transport services, etc.

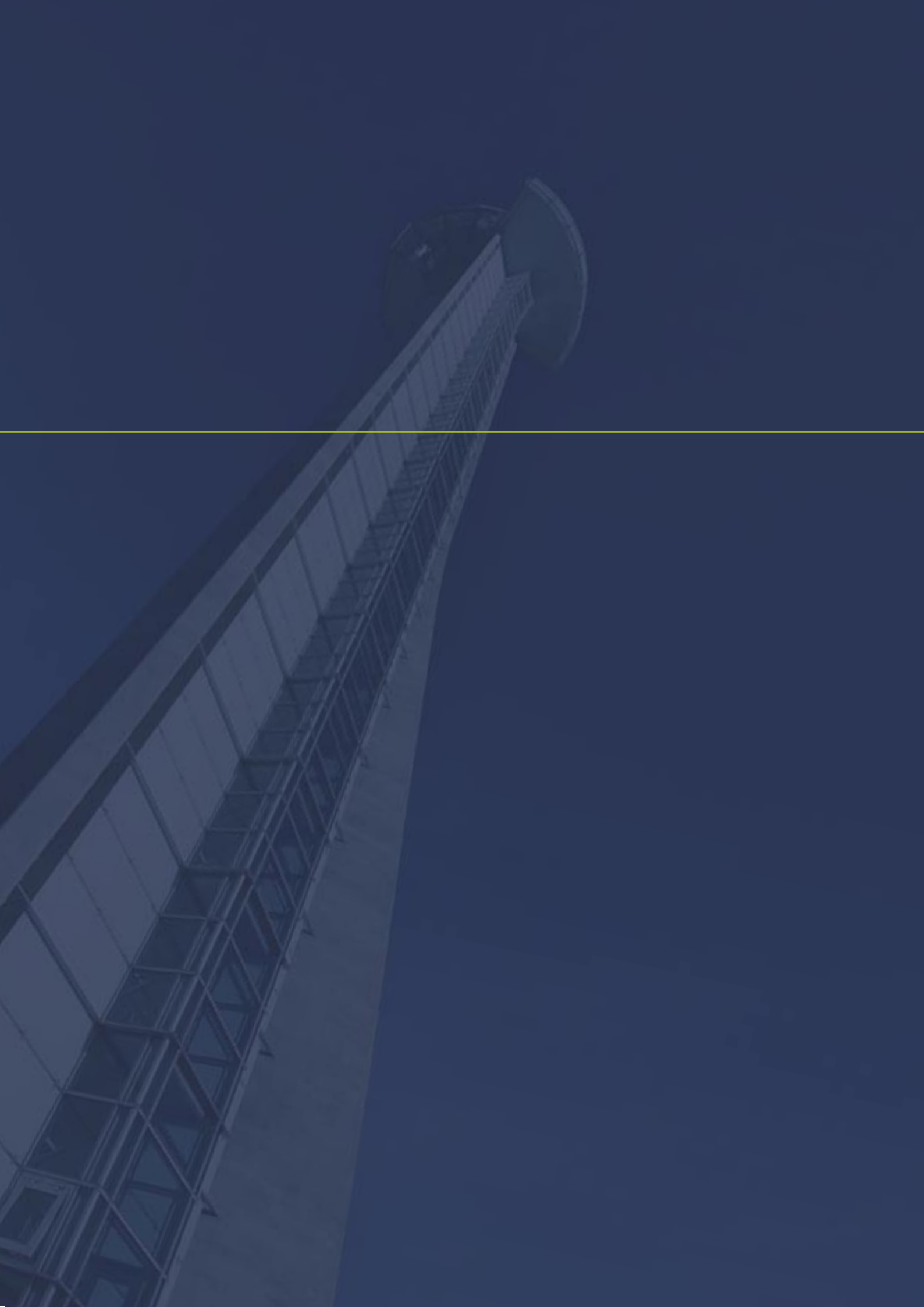
In this report we'll assess the indirect economic impacts related to Oslo Airport Gardermoens role as a hub in the Norwegian transport and logistic systems. Our main hypothesis is that access to airport, railroad and highways may make it advantageous for logistic intensive firms to locate in the region. The background for this hypothesis is that in parallel with the construction of the airport, both highways and the railroad were upgraded to ensure an efficient feed of both persons and freight to the airport. In addition, access to open land may make the area favourable for establishing new industry or relocating existing enterprises.

If the airport has generated economic growth indirectly, one should expect to find a certain industry structure near the airport, i.e. a set of key characteristics shared by the enterprises. In economic literature this phenomena is often referred to as industry clusters. This means that self-reinforcing mechanisms leads to a selection or specialisation in the economic activity in a certain area. Further on, such cluster mechanisms may also lead to a relatively high profitability for the enterprises involved.

Usually economists have focused on factors like a common labour market, technology and competence spillovers, etc. when analyzing industry clusters. The basic idea is that the firms in a cluster both share and contribute to a common set of resources. All firms will benefit on this dynamic, e.g. that access to a pool of skilled workers may entail a competitive advantage for all firms in a region. At the same time, employees may find it attractive to settle in an area with several job opportunities. Hence, a dynamic between the labour market and industry development may entail such self-reinforcing cluster effects.

In this report, we'll investigate if such clustering mechanisms may occur around a transport and logistic hub. If the enterprises in Oslo Airport Region region form a cluster, this may be uncovered in two steps. First we'll have to clarify from an economic theoretical point of view if there are mechanisms related to logistics and transportation that contribute as a common resource for the firms. We'll look more in to details on this subject in the next chapter. Second, we'll have to document empirically that self-reinforcing mechanism exists in the region. This is done in chapter 4 where we develop indicators to analyze the flow of goods in the region.

* Photo: Trond Isaksen / OSL



2 : on freight transportation clusters

On freight transportation clusters

Our main hypothesis is that enterprises which are strategically depended on transport and logistics may have incentives to locate in a specific area. There are several types of mechanisms that may lead to such a localisation pattern, in which some of them are more important than others with respect to generate economic growth.

2.1 Access to infrastructure

A region with access to a well developed transport infrastructure may be a favourable location for firms within the transport and logistic intensive industry. Such access may entail relatively low transportation costs due to low congestion. Low congestion may also imply both reduced lead times for freight and better reliability.

Access to public infrastructure is however usually not considered to be a driving force in an industry cluster, unless if the industry has contributed to the infra¬structure itself on a co-operative basis. The reason is that there is probably no self reinforcing market mechanism between public infrastructure development and industry clustering, because new infrastructure investments are not necessarily decided on commercial grounds. Infrastructure projects may generate an increased economic growth, but there are probably no mechanisms ensuring that this applies the other way around, i.e. economic growth will not necessarily be entailed by infrastructure development. Hence, it's doubtful if infrastructure and industry development is mutually dependent on each other and therefore may be considered as clustering mechanisms.

2.2 Transport networks economics

The choice of transport and logistic solution is complex and dependent on both transport costs/prices and quality. On a strategic level, a main decision for firms is whether to invest in own transport and logistic capacity or to outsource such services to professionals. Transport statistics indicates that 70-80 pct. of national freight transport on roads is outsourced to the transport industry[2].

Existence of clustering mechanisms is depended on whether own or third party transport is chosen. Own transport solutions will probably not contribute to a positive dynamic between firms in an industry environment. The reason is straight forward; by developing proprietary transport resources, en enterprise does not contribute to a common resource pool to the benefit of all firms in a region.
Outsourcing of transport and logistic to the transport industry may under some circumstances contribute to clustering mechanisms, i.e. a regional logistic marked may be developed in parallel with new transport intensive enterprises are localised in the region. The reason why transport and logistic services may contribute to clustering mechanisms is economics of scale. Economics of scale is a well known source to the development of clusters.
To understand why scale is of significant relevance in the transport industry, one should consider the basic features in a transport network. A transport operator that offers door-to-door freight services will normally establish a value chain with the following components;

• Terminal services, i.e. storage, cross docking, consolidation of freight transports and split-up of unitised cargo.
• Unitised transportation between the terminals, either by heavy goods vehicles or train transportation.
• In transportation and distribution between the terminals and consignees/recipients. This leg of the transport chain is usually operated by small and medium sized vehicles.

Both transport and terminal costs will be depended of scale. In general a low degree of capacity utilisation will imply a relatively high cost level. Capacity utilisation is determined by a number of factors such as direction balances, variations in transport volumes from day to day, the rate of empty vehicles, etc. In addition it may be costs efficient to operate a large scale network due to possibilities to operate larger vehicles and to automate terminal handling.

In addition to costs benefits, large scale may also entail a high-frequent service. High frequency may enable more flexible and reliable deliveries, as well as a higher accuracy in the transport service. From the consignees' point of view, the transport quality is important to be able to maximise economic profit in a supply chain perspective, e.g. in order to mini-

2 http:/www.ssb.no/english

mise storage and to ensure sufficient flexibility as to follow changing trends in the market development downstream.

The regional dimension, which is important to understand clustering mechanisms, is primarily related to the size and density of consignees/recipients in a distribution and in-transport area. A high density of firms with advanced logistical requirements in an area may lead to a development of advanced logistic and transport services, to mutual benefit for the firms located in the region. Hence, in a region there may develop self-reinforcing mechanisms between expansion of a logistic intensive industry on one hand and development of a low-cost high-quality transport service on the other.

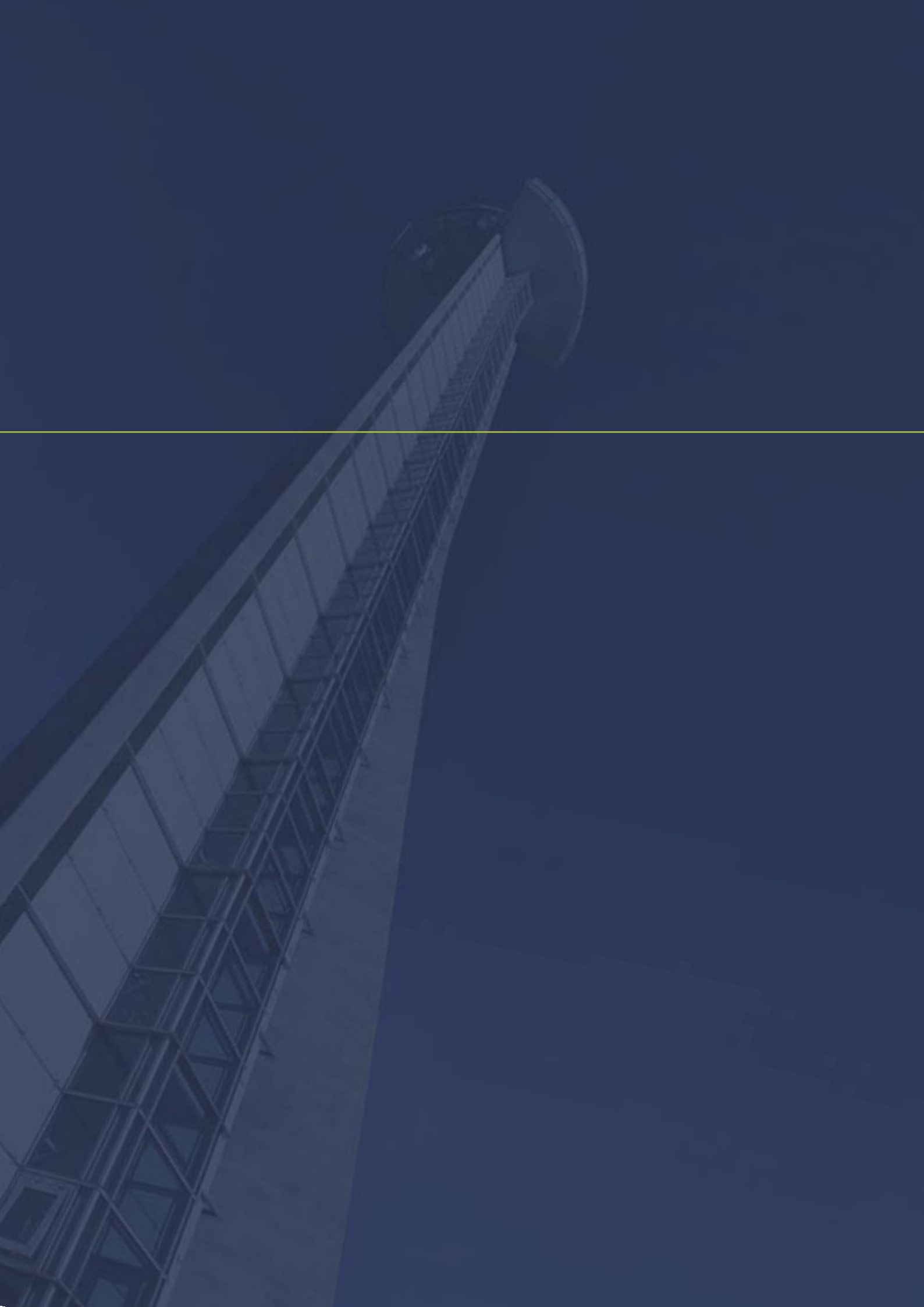
2.3 Clustering obstacles

Even though there is good reason to expect that clustering mechanisms exists, one should be careful to draw the conclusion that all areas around transport and logistic hubs may be characterised as economic clusters.

• The transport market is in general characterised by strong competition. A presence of many transport providers in one area will of course prevent realising economy of scale for each provider and hence clusters to be realised.
• Many transport providers applies standardised price and quality schemes. This implies that neither prices nor delivery terms are differentiated between different regions. The reason to this standardisation is to reduce transactions costs, especially towards small customers. If the terms are not differentiated, economics of scale will benefit all customers, i.e. independent of firm localisation. Hence, standardisation of price and quality schemes may prevent clustering to realise.

In addition; localisation of firms are dependent on many other factors than access to efficient transport services. We have already mentioned access to a well functioning labour market. In addition many firms prefer to localise near their customers, especially within the service sector. It must also be taken into consideration that that re-localisation is costly, implying that developing a cluster of any kind may take decades.

Hence, a valid analysis on whether there has developed a cluster of transport and logistic intensive enterprises in the Oslo Airport Region region must be based on empirical findings, not transport economic theory only. Accordingly we'll have to develop a set of indicators that illustrates to what extent transport and logistics are important for a firm. If we're able to develop such indicators, and if we're able to document empirically that there exists a spatial dimension in firms transport and logistic dependence, then we may have evidence for that transport and logistic services contribute for form clusters.



3 : methods

Methods

In this chapter we'll investigate if clustering mechanisms related to transport and logistic services exists in the Oslo Airport Region. We have chosen two different angles to analyse whether such mechanisms occur; case studies and a telephone survey covering 225 enterprises in eastern Norway.

3.1 Case studies

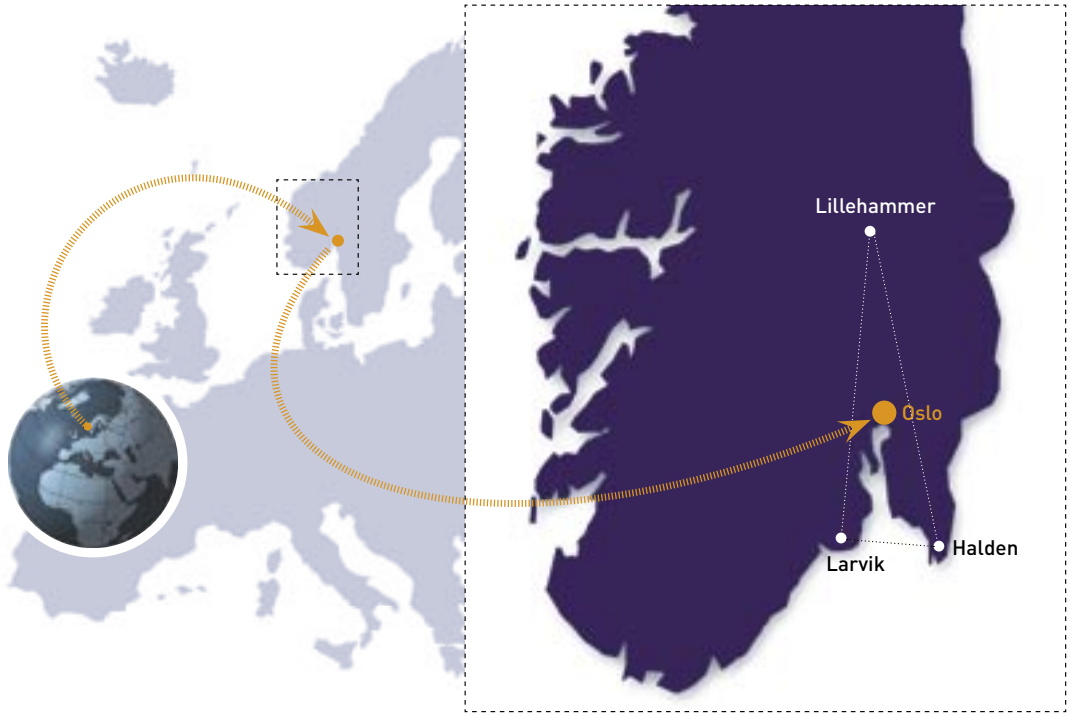
As an early stage of this analysis we conducted a series of case analysis to get an overview of the flow of goods from firms located nearby the airport. These interviews revealed that the firms typically either was connected to proprietary logistic networks or a part of the open national transportation networks.

Proprietary transport solutions
In-transportation and distribution of air cargo between shippers/receivers and airport terminals is typically conducted as part of a very tight integrated transport networks. The reason is that the demands to short lead times and high accuracy implies that this cargo cannot be consolidated with general cargo or be outsourced to third party transport services. Instead the service has been developed as a proprietary and specialised network covering the eastern Norway between Halden, Larvik and Lillehammer.

Another example on proprietary transport solutions is freight of bedclothes, towels, etc. between the hotels and cleaners. The reason why this solution is appropriate is partly that the volumes are large, that one cleaner serves all five hotels in the area through a framework agreement and because the agreement specify that the "cargo" shall be picked up and delivered inside the hotels at each floor. This freight is highly specialized and there is high demand on the accuracy of delivery and pick up. Hence, there are good reasons established a proprietary freight service.

A third example is freight of tax free articles to the airport terminal. Most of this freight is imported directly from large European distributors of liquor, tobacco, etc. Hence, large volumes combined by centralised logistic networks, does probably make it most efficient to establish proprietary solutions. In addition, security and customs treatment does also count in favour of developing specialised transport networks for this flow of goods.

In our context it's important to emphasise that proprietary freight solutions, as noted above in chapter 2.2, does not contribute to develop a common resource pool for firms located near the airport.



Open transport networks
There are several examples of firms that utilise open freight network solutions, e.g. one large wholesaler and freight of food and beverages to hotels and convenience stores located near the airport. Our interviews revealed that this freight transportation is an integrated part of the network provided by the national transport industry.

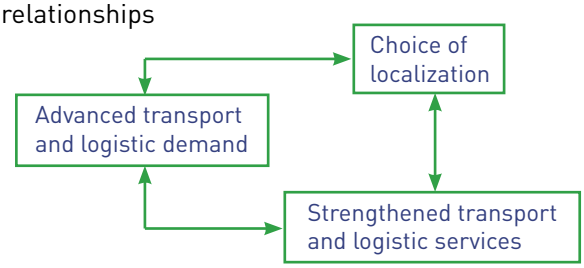
None of the respondents in this group indicated that the transport service around the airport differed in any sense from other parts of eastern Norway, neither with respect to costs or quality.

Conclusion and further analysis
The case interviews did not give any indications that the Airport Area forms a logistic cluster, rather the contrary. To be able assess whether clustering mechanisms occur, we have to take a broad perspective and gather information about logistic strategies from a large number of firms located in Eastern Norway.

3.2 Statistical survey

3.2.1 Econometric model

Through our more theoretical discussion above, we suggest to use a model that postulates to following relationships



The idea behind our model is that clustering mechanisms may create a relationship between localisation, demand and supply of logistic services. The firms' choice of localisation will be, among other, depended on the logistical requirements. If clustering mechanisms occur, we should expect to observe that enterprises in one region will tend to have the same logistical requirements and accordingly that there will be developed efficient transport services in the region.

To investigate if such mechanisms exist, we will make an assessment in three parts, first we'll determine a typology to measure if there are differences in firms' logistic strategy. Second; we'll assess whether there is a spatial dimension in logistical demand. Third; if such spatial differences occur, we'll investigate if there is corresponding differences in the supply of transport services.
To shed light over logistic strategy and localisation, we have conducted a survey covering 225 enterprises located in eastern Norway.

3.2.2 Questionnaire and data collection

The data has been collected from randomly selected firms in Eastern Norway based on public enterprise registers. The sample is stratified to cover the nearby municipalities to Oslo Airport Gardermoen. The register data covers industry belonging through NACE-codes (Classification of Economic Activities in the European Community), ZIP-code and the number of employees.

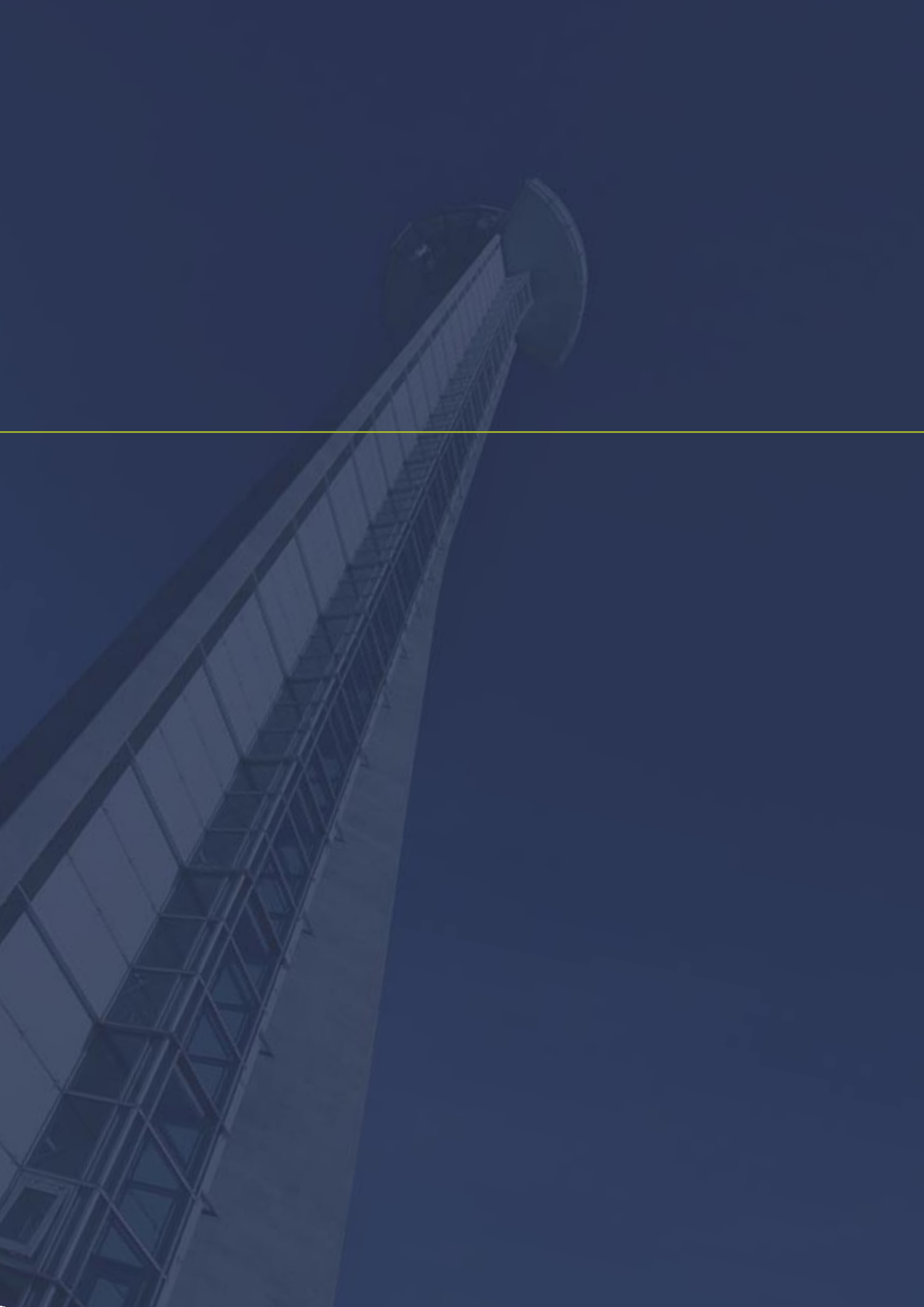
The area that is covered has been chosen to cover all firms that can receive and deliver air cargo at Oslo Airport Gardermoen the same day as the freight is booked on a flight, c.f. the interview with the distributors of air cargo in the case studies.

The main aim with the questionnaire is to survey differences in the firms demand for transport and logistic. Hence we have asked for key features in logistic strategy like:
• If one person have a formal responsibility for transport and logistic.
• If the firm have daily deliveries and the average size of each shipment.

Firms that not has attributed responsibility for logistics or have shipments at leased once a week is omitted from the survey.

Further on the survey covers
• If direct or consolidated transport is used
• If the freight terms are free onboard (fob) or ex works
• Transportation costs as share of turnover
• If third party providers are used and if so, which one
• If the firm is satisfied with the transport infrastructure
• If logistics has been important for firm localisation and if the firm is dependent on air freight.

The questionnaire is documented in an appendix behind. The data collection has been done through telephone interviews by Analysehuset AS.



4 : flow of goods analyses

Flow og goods analysis

As mentioned above, to document transport clustering mechanisms, we should ideally be able to conduct an empirical analysis. In this chapter we'll do so in three steps;

• Establishing a typology to be able to describe the demands for logistical solutions from the shippers' point of view.

• Conducting a spatial analysis to assess if the logistical requirements differ between regions.

• Assessing if such regional differences is accompanied with differences in the price and quality of the services provided by the transport industry.

4.1 Transport and logistic typology

To investigate cluster mechanisms empirically, we suggest in this chapter a typology describing the firm's demand transport and logistic services. A typology may be a fruitful way to analyse transport and logistic clusters, because the firms' solutions are complex and may be characterised along many dimensions. Hence, to be able to do statistical analysis and to provide a clear analysis, a good typology will be practical.

Our suggestion is to distinguish between advanced and basic demand for transport and logistic solution.

• **Basic logistic** will be preferable for firms that have a simple shipment pattern, e.g. regular unitised consignments to a few and predetermined locations. Minimising transport costs will be the main objective for such firms, and if possible, they will prefer to locate in uncongested areas.

• **Advanced logistic** is associated with firms with complex and variable shipment patterns. This will typically apply for enterprises with multiple and high value products, a high number of customers located in different areas, unpredictable and volatile demand, etc. Such firms need to control the flow of goods from a integrated supply chain point of view, and will need to establish integrated and flexible solutions for both production, storage and transportation. To reduce overall production costs, it may therefore be necessary give transport quality a relative high priority at the expense of minimised transport costs.

Through our questionnaire, a factor analysis between the following indicators should make us able to place each firm in our survey into our typology.

• **Frequency of deliveries (question 2).** One key feature of advanced logistic is a high frequency. This variable mirrors the one of the main objectives for such firms, i.e. to ensure flexibility, reliability and reducing storage in the supply chain.

• **Direct or consolidated transport (question 3).** Consolidated transport implies that several shippers share capacity and that each shipper has access to a large transport network. However, consolidation implies extra costs and increased probability for damages and delays compared to direct transportation. Large shippers will therefore choose direct transport solutions when possible and achieve an advantage, both with respect to reduced costs and increased quality.

• **Strategic logistic control (question 5).** How shipments are organised may be an important factor determining the transport quality. It may happen that senders and receivers have different preferences with respect to on what terms the transport is carried out. To ensure influence and control in the supply chain, it may therefore be of strategic importance for firms to determine the transportation terms. Such control may be obtained through offering free delivery to customers and to organise own in-transportation (so called ex-works) from vendors.

• **Own or third party transportation (question 6).** Using third party transport operators may be necessary to ensure a high capital utilisation and at the same time to be able handle a complex pattern of receiving and shipping freight.

A factor analysis on our data from our telephone survey suggests that our typology along these dimensions may be fruitful. Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. This method is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much larger number of manifest variables. Our analysis shows that the firms in our survey are clustering into two different groups, representing advanced and basic logistics respectively. This result is significant at a 95 pct level.

The following table summarizes how the firms in our survey allocate into the two typologies along the four dimensions.

Table 4.1
Share of firms after logistic typology

	Advanced	*Basic*
Daily deliveries	*100,0 %*	*58,6 %*
Third party transportation	*100,0 %*	*75,8 %*
Strategic logistic control	*22,4 %*	*11,1 %*
Direct transportation	*100,0 %*	*43,3 %*
Total number of firms in the survey	*99*	*125*

The table shows that there is a significantly higher share of firms that have responded positively to the four questions in the advanced logistic typology. Some of the firms in the basic group also have some of the advanced logistic characteristics, so what really characterize the firms in the advanced group is that they have a high score on all of the dimensions.

Our data shows[3] that the advanced logistic firms are relatively large, i.e. increased firm size seem increase the firms' requirements for advanced logistic solutions. Further our data shows that firms within the manufacturing industry seem in general to have higher requirements for advanced logistic solution compared to trade enterprises.

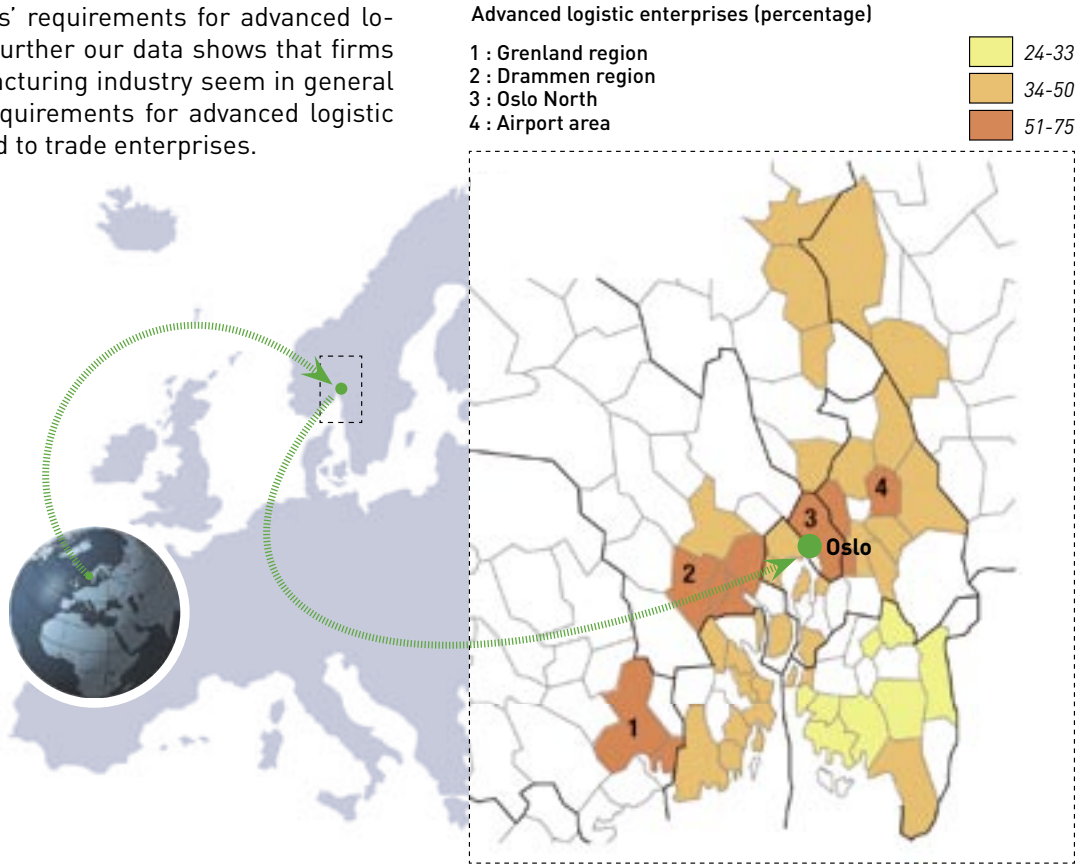
3 See appendix 1

4.2 Spatial analysis

The next step in our analysis is to assess whether firms tend to locate in certain areas dependent on their logistic strategy. It's not straight forward how to model such a relationship. The perhaps simplest version is to map the share of firms that applies advanced logistics within each municipality. This requires, however, a higher number of observations in each municipality than we have had resources to collect in our telephone survey. We have therefore grouped nearby municipalities through visual inspection. This procedure has resulted in the following map over eastern Norway.

Figure 4.1
Share of firms demanding advanced logistics

Note: A high share of advanced logistic firms may be found in: Airport area, Oslo North, Drammen region and Grenland region.



The map shows that there are considerable regional variations in the density of firms that require advanced logistic solutions. There are apparently three distinct groups of firms in our survey data. In most areas there is an equal distribution of firms applying advanced and basic logistic firms respectively, while in some areas there is apparently a clear majority applying either advanced or basic logistics. The areas with a majority of firms demanding advanced logistics is marked with dark red in the map above. The share of advanced logistic firms is significant higher on a 95-pct level in the "dark" areas. Interestingly, the airport area is one of the areas with a high share of firms requiring advanced transport solutions.

From our point of view, the interesting question is if the areas with a high share of advanced logistic firms may be associated with transport and logistic clusters. The regional differences are in itself an indication of clustering mechanisms, but the analysis is not sufficient to conclude that there is a casual relationship. Hence, we need to conduct further analysis on the supply of transport and logistic services.

4.3 Transport services

In our line of reasoning above, we have postulated that if clustering mechanisms exists, there should also be regional differences in the transport services provided. The basic idea behind our analysis is that increased demand for advanced logistics may make it possible to realize economics of scale in the transport industry and hence improve quality and reduce costs for deliveries in certain areas.

A regression analysis on our data shows that the areas marked dark in the figure above is characterized by a high market share for transport operators like DFDS Tollpost and Norway Post[4]. Such regional differences in market shares between transport operators may be a sign of clustering mechanisms. By this we mean that our data does not only show regional differences in the share of advanced logistic firms, but also that this is accompanied by certain choices of transport operators. This is important, because fragmentation on the supply side in the transport market may prevent clustering mechanisms. Hence, this finding may be interpreted that there exist self-reinforcing mechanisms between supply and demand of advanced transport services. Further on, an analysis of the firms' transport costs reveals signs of clustering mechanisms. The following table illustrates how location affects the cost level. The table shows the average cost share of firms in different regions, after we have controlled for differences in size and industry belonging through a regression analysis.

Table 4.2
Regional differences in transportation cost shares

Region	*Cost share (pct)*
Location in logistic clusters (ex Oslo)	*3.6*
Location in Oslo	*6.4*
Firms located outside clusters	*8.6*
Average for all firms	*7.9*

Note: The figures in the table are applies for an average enterprise, i.e. we have used a regression analysis to adjust for differences in firm size and industry belonging. The regression analysis is documented in the Appendix, 0.

The table shows that the average transportation cost share is between 3.6-8.6 pct. This is consistent with other surveys. From our point of view the interesting finding, is that firms that are located in areas with a high density of advanced logistic firms except in Oslo (c.f. Figure 4.1) in average have 4,9 percent point lower cost share than the firms located outside logistic clusters, i.e. 3.6 pct vs. 8.6 pct. This result is consistent with a hypothesis that economics of scale in transport services may give rise to clustering effects.

It must be admitted though that the regional differences in transportation cost shares are surprisingly high. This may in theory be caused by omitted variables in our regression analysis, e.g. that we haven't been able to control well enough for industry differences, firm size, etc. However as part of usual procedures in econometrics, we have tried different models, but no matter ended up with the same results.

4 See appendix 1

4.4 Conclusions

In this chapter we have done a statistical assessment in three parts to document if transport and logistic clusters exists.

• The first part was to assess if logistic strategy differs among firms, using factor or cluster analysis. Our conclusion was that such differences occurs, and that it makes sense both statistically and economically to distinguish between advanced and basic logistic as a typology.

• The second part was to see if enterprise localization differs between our logistic typologies. Our conclusion was that the share of advanced logistic firms is especially high in certain areas, and that these areas may represent possible transport and logistic clusters.

• The third part was to determine if scale effects may have contributed to a relative high efficiency and quality in transport services in the areas with a high share of firms following advanced logistic strategies. Again our data seem to confirm such mechanisms. First, we observe relative low transportation costs in these areas. Second, we it seems that some of the transport operators have a relative high market share in the same areas.

Hence, we have findings that consistently indicates that transport and logistic clustering mechanisms exists and contributes to that some areas is especially attractive for localizing firms that requires advanced logistic solutions.

4.5 Does Oslo Airport Region form a logistic cluster?

Our data indicates, as illustrated in the map above, that there is a transport and logistic cluster formation both in the airport area and in the Oslo North region (i.e. the municipalities of Oslo, Nittedal and Lørenskog). The question then rises if this may be attributed to the airport.

To assess this, we may analyze if there are special framework conditions (e.g. economical or demographical variables) that characterizes the areas where logistic clusters occur. Our analysis indicates that transport and logistic clusters occur in areas characterized by both a high employment and a strong growth in the employment. In other word, areas with both high economic activity and growth are especially favorable for firms requiring advanced logistic solutions.

There are several other possible interpretations to our finding:

• Advanced logistic firms may find it especially favorable to localize near customers and vendors in order to minimize transportation costs and to be able to have a near contact with the market.

• Scale economy in transport services may be a result of a generally high demand for transportation and not only from advanced logistic firms, but from all kind of industries.

Both factors may explain that we can observe a high share of advanced logistic firms in certain areas. It must though be emphasized that one should be careful to conclude that there exist self-reinforcing mechanisms between general economic growth and logistic clustering mechanisms. Logistic clustering will probably play a minor role in generating growth, i.e. economic growth must be understood as a product of many other factors than the conditions in the transport market.

If we see these two factors in connection, it may be different reasons why the airport area and Oslo North are attractive localization spots for advanced logistic firms. Oslo North includes the largest city and the capital of Norway. As illustrated in our map (c.f. Figure 4.1), Oslo municipality is one of the possible logistic clusters according to our analysis. Locating in the neighboring municipalities, i.e. in the outskirts of Oslo North region, gives both easy accesses to the city and provides opportunities for expansion and growth near the capitol area. Hence, our results may indicate that Oslo North may be viewed as an integrated logistic cluster.

The airport area is situated some 50 km north of the center of Oslo, and one should accordingly be careful to consider this area as an integrated part of a logistic cluster in the capital area. Hence, our data may therefore indicate that the existence of a logistic cluster is related to the airport.

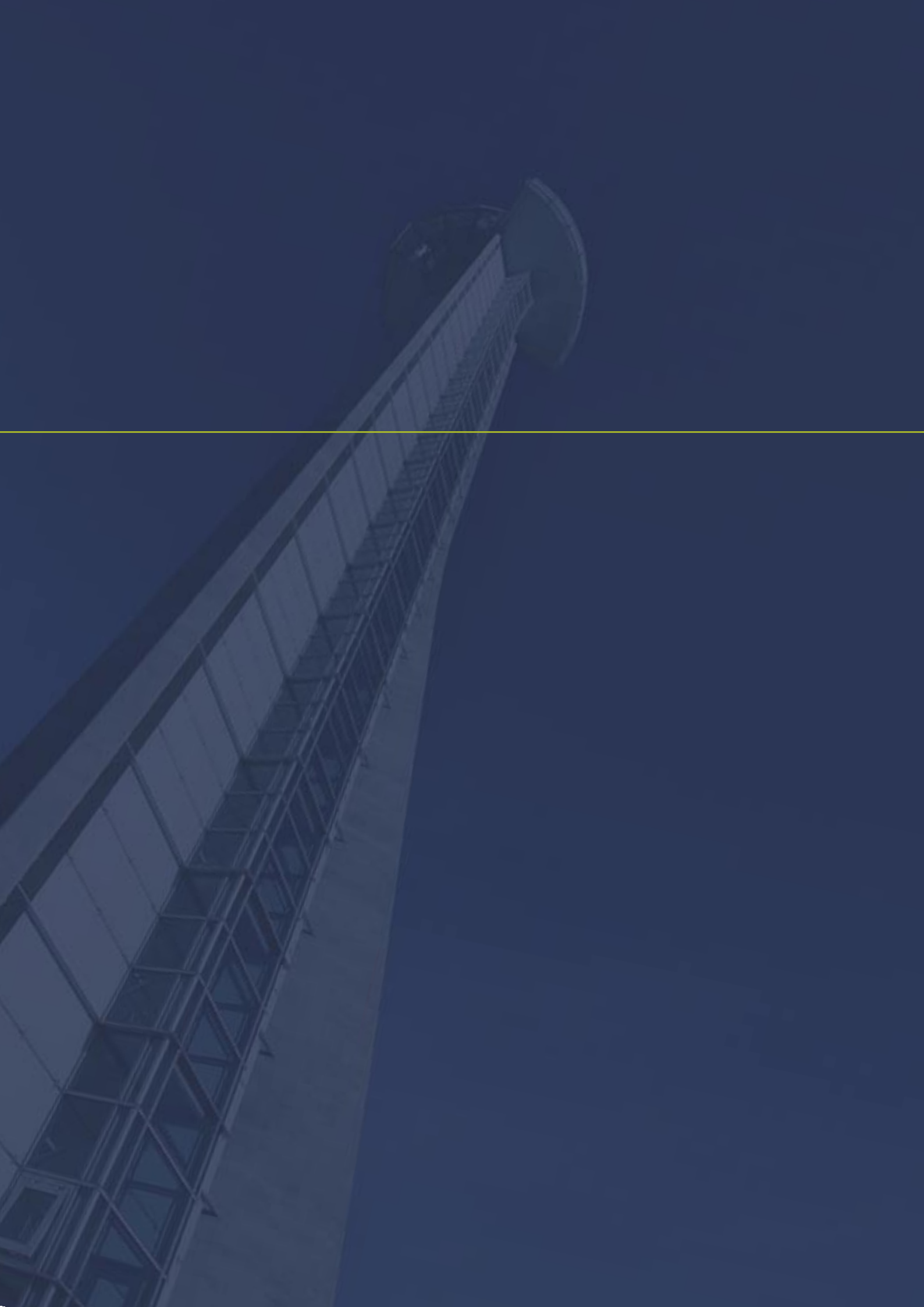
There are however several reasons to doubt that the airport area constitutes a logistic cluster because of good access to infrastructure. First; firms located in the logistic clusters tend generally to be relatively dissatisfied with transport infrastructure, both with

respect to accessibility locally and with the relations to customers. This is perhaps contra intuitive, since the infrastructure is well developed in the logistic cluster areas. The reason for the dissatisfaction that is expressed from our respondents may be that advanced logistic firms also have high demands for infrastructure, i.e. that they don't find the infrastructure to be of sufficiently high quality. Hence, it's difficult to see that our data supports that access to favorable infrastructure around in general is an important driver for localizing advanced logistic enterprises. Another argument for the same is that there is a strong tendency that firms that are heavily dependent on air freight find it favorable to locate in our logistic clusters (c.f. Figure 4.1) in general, and not especially near the airport. Hence, locating in the airport area does apparently not give any special advantage compared to the other logistic clusters.

To understand why the airport area apparently is a favorable place to locate advanced logistic industries, one should bear in mind that the industry growth in this area is very high, the economic activity is high and there is a relative high share of large firms. Hence, one should expect that there in general have been good conditions for a development of advanced transportation services. This may in turn have been a starting point for a logistic clustering mechanism, which over the last years have led to favorable conditions for firms with advanced logistic requirements lo localize in the area.

The high economic growth and activity level in the airport area may of course be attributed to the presence of the airport. The airport itself has created thousands of new jobs in the area directly, which in turn have given opportunities for an expansion of new service enterprises serving the local citizens and industry in general. Hence, the localization of the new airport may be seen as a catalyst for developing a logistic cluster in the nearby area. Our conclusion is therefore that the airport has contributed directly to a development of a logistic cluster in the area.


SAS



5 : freight volume statisics

Freight volume statistics

To illustrate the importance of freight transport in the Oslo Airport Region we have used our survey data in combination with official enterprise statistics from SSB to calculate the total freight volume shipped from firms in this area.

Our survey show that the average shipment size is strongly dependent on firm size and industry belonging. A regression analysis (see appendix 1) indicates that the elasticity of shipment size with respect to number of employees' equals 0.9, i.e. a firm which increases the number of employees with 10 percent, will increase shipment sizes with 9 percent.

Our analysis indicates further that there are significant differences in shipment size across different industries. Most of the manufacturing firms have generally larger shipment sizes than trade industry enterprises. In average manufacturing shipments are three times larger than shipments from trade industries. Our regression analysis also shows that firms located in logistic clusters generate larger shipment sizes than the average enterprise. The difference is in average 2:1.

Shipment frequency differs also between enterprises dependent of firm size and industry belonging, but the differences is far less than for shipment size. 80 percent of the respondents in our survey say that they have daily deliveries.

5.1 Freight volumes in the Oslo Airport Region

Based on this regression analysis and on Statistic Norway's information about the number of firms and employees on municipality level[5] we can calculate the overall tonnage related to firms localized in the airport area.

Manufacturing
The manufacturing industry in the airport area is quite small, and except for three firms within food products and beverages, wood and non-metallic minerals industries, the freight volumes are small as well.

The overall manufacturing related freight is estimated to **11 thousand tons** per year. The three firms mentioned accounts for two thirds of this volume.

5 See http://statbank.ssb.no/statistikkbanken/

Trade industries, hotels and restaurants
The number of employees in trade industries (wholesale and retailing), hotels and restaurants in the airport area is 4.300. This is about 1/3 of the total employment in the area. The statistics shows that there are 201 establishments with more than 5 employees in the municipality. These sectors are in general transport intensive, though not at the same level as manufacturing industries.

Based on the SSB statistics and our survey, we estimate that these firms accounts for **18 thousand tons** of freight transportation per year.

Other service industries and public sector
Our survey does not cover the public sector administration, healthcare, and education, general private business services and building and constructions. These sectors accounts for about 2/3 of the total employment in the airport area.

The construction sector is of course transport intensive and employs. 800 people in the airport area. Based on our survey data we estimate that some **30 thousand tons** of freight is handled by these firms each year. This estimate is uncertain, both due to a low number of observations in our survey and due to the fact that the construction work may take place outside the airport area.

To get a complete picture we have tried to estimate the freight demand from other services, i.e. general private and public services. The overall employment in these sectors is 8.500. A very rough estimate based on freight volumes in less transport intensive trade services is **10 thousand tons** per year.

Summary
The freight volume that is related to firms in the airport area is summarized below.

Table 5.1
Annual freight volumes and employment in the airport area (2005)

	Freight volumes (1000 tons)	*Employees*
Manufacturing	*11*	*655*
Trade industries, hotels and restaurants	*18*	*4.303*
Building and construction	*29*	*814*
Other	*9*	*8.548*
Total		*14.321*

Source: Statistics Norway and ECON estimates

5.2 Freight volumes through Oslo Airport Region

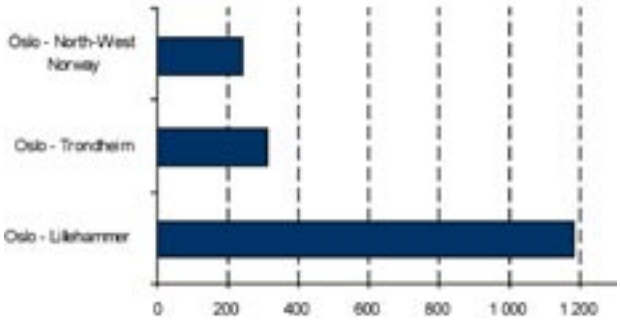
The Airport Area is centrally localized near the main railroad line and road (E6) between the capital area and the middle and northern Norway.

Figure 5.2
Transport corridors through the Oslo Airport Region

The figure shows that the corridor is defined between Oslo and North-West and Middle Norway. This does not mean that all freight have origin or destination within the corridor. On the contrary, Oslo area is recognized as the major hub in the Norwegian freight system. Hence, a significant share of the freight through the Oslo Airport Region has origin/destination outside the corridor, e.g. imported goods.

Land based transportation
From official freight statistics we can hence describe the freight volumes going through the airport area.

Figure 5.3
Freight volumes by road through Oslo Airport Region, tons per year (1999)



Source: http://www.vegvesen.no/ntp

All together, **1.730 thousand metric tons** goes through Oslo Airport Region region on E6 each year.

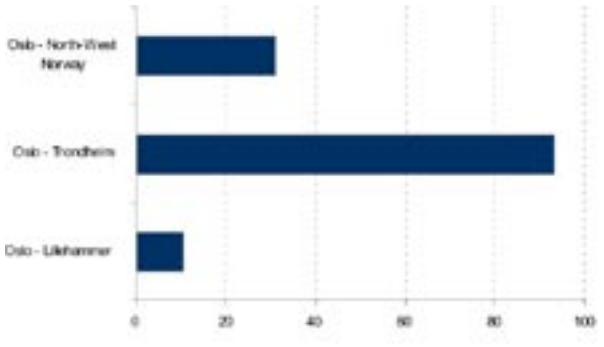
The land based transportation sector in the airport area is dominant and accounts for 1.255 employees. There are 108 different establishments, whereas half of them have more than 5 employees.

Based on our survey, we estimate that in average transportation firms handles about 3-4 tons of general cargo per employee. The total freight volume connected to the airport area based transportation firms are hence around 200-250 thousand metric tons per year. The number of observations is too small to provide a proper statistical analysis, so our estimate is connected with rather high uncertainty. Second; these volumes will not necessarily go through the region and is not necessarily relevant for our analysis of freight in the airport area.

Rail freight

Railroad freight has achieved increased competitiveness during the last years through the development of a high frequent transport network specially adapted to shipment of unitized cargo. The main carrier, CargoNet, does not publish freight statistic, so we have to use figures from the National Transportation Plan from 1999 to illustrate the importance of rail freight.

Figure 5.4
Freight volumes by rail through Oslo Airport Region, tons per year (1999)



Source: http://www.vegvesen.no/ntp

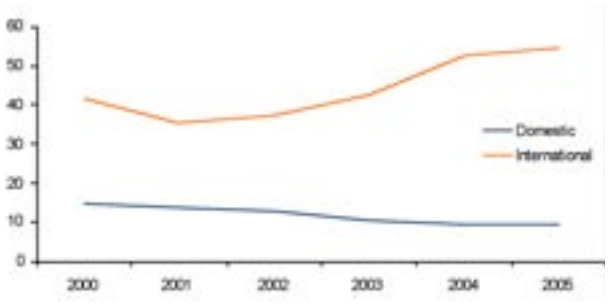
The figure shows that rail transportation are most competitive on long distance freight, i.e. between Oslo and Trondheim. The market share on this relation is around 30 pct.

Air freight

Freight

Air freight has traditionally been used for world wide express shipments like documents, spare parts, medical laboratory tests, etc. However, due to increased capacity, air freight has become attractive for other purposes as well. Today, exports of salmon to USA and the Far-East accounts for a significant share of the freight volumes.

Figure 5.5
Freight volumes through Oslo Airport Gardermoen, 2000-2005

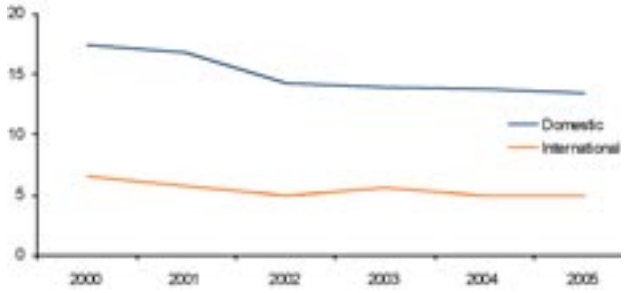


Source: Avinor

The figure above shows that in 2005 some 65 thousand tons was shipped through Oslo Airport Gardermoen. International freight accounts for 85 pct, and the domestic share has been falling in the whole 5-years period. The reason for this pattern is probably due to globalization and increased international trade combined with the fact that land transportation has been more competitive as the national road network has been improved.

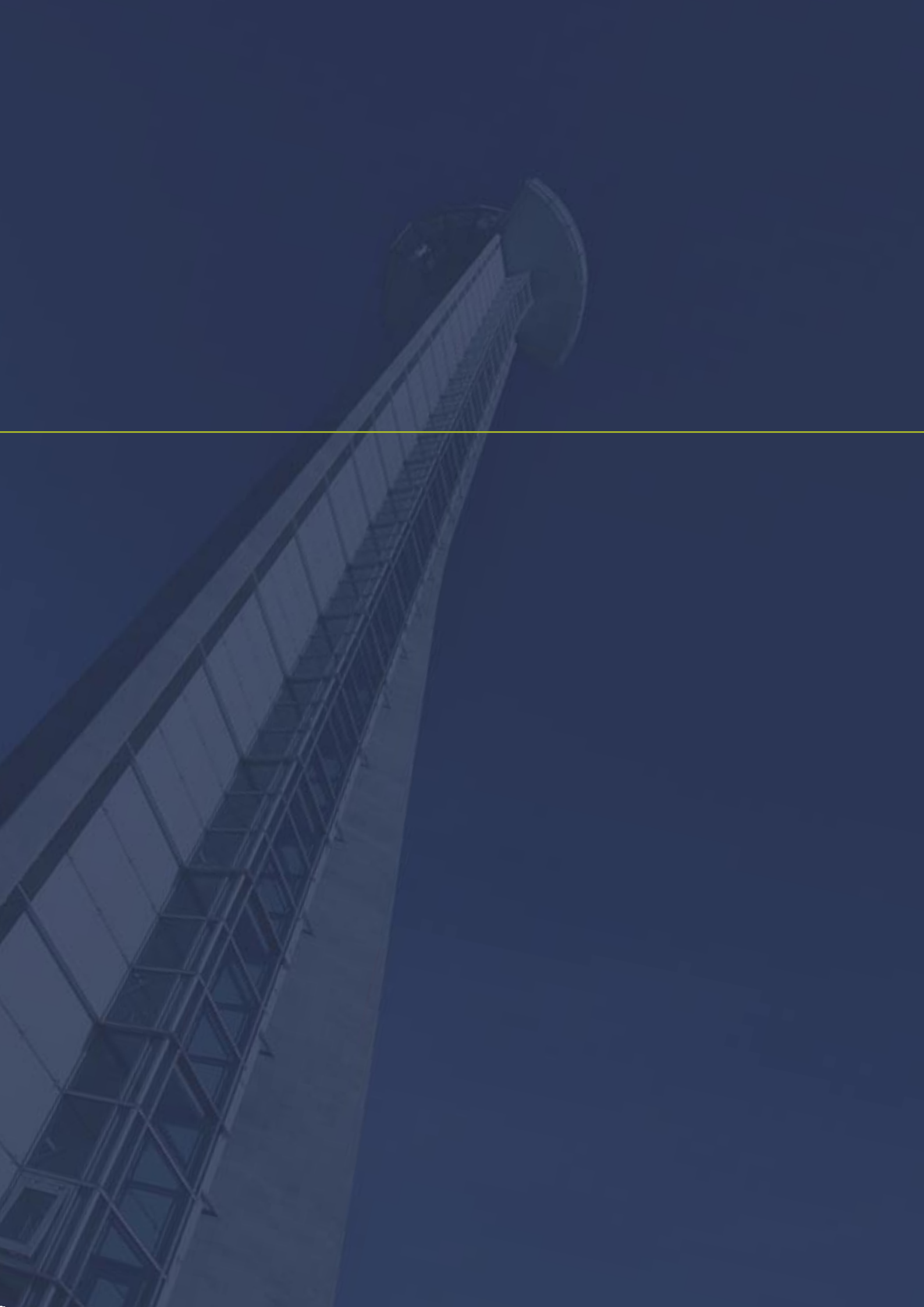
Mail
Airborne transport of mail has traditionally accounted for a significant share of total air freight volumes. To be able to deliver post on time Norway Post must use air transportation to be able to fulfill its universal service obligation, i.e. one day delivery of A-post in the whole country.

Figure 5.6
Mail volumes through Oslo Airport Gardermoen, 2000-2005



Source: Avinor

The figure above shows that airborne mail volumes accounted for 18 thousand tons in 2005. The volumes has decreased throughout in the whole 5 years period, partly due to reduced demand for mail services in general and partly due to the fact that land transportation has been more competitive.



6 : history and trends

History and trends

So far, the analysis has concentrated on a survey of logistic demands in Eastern-Norway as of today. However, an important aspect in a clustering analysis is how the demand has developed over time and possible future trends. This dimension has so far been treated more implicit in the more theoretical oriented discussion above (see chapter 2), were we highlighted the importance of self-reinforcing mechanisms where demand and supply of advanced logistic services were strengthened.

Hence, to be able to conclude whether the enterprises in airport area form a logistic cluster, we should ideally analyze changes in logistic demands over time empirically.

6.1 Historical development

As mentioned above, the airport area has been one of the fastest growing economies in Eastern-Norway in later years. Such growth is an important characteristic for all of the possible logistic clusters that has been identified in this report.

To shed some more light over the importance of economic growth for cluster formation, we have looked closer into the structure of the economical development in the airport area. The assessment is based on official enterprise statistics[6] from Statistics Norway. From this source we have historical figures on the number of establishments by municipality since 2002.

For the airport area there has been a strong increase in the number of firms and employees, but there are large differences across industries.

The table shows that most of the growth has come in other sectors than those that one should expect to be the most transport intensive. Both in manufacturing and in construction, where our survey shows that the shipment size per employee is generally high, the statistics shows a reduction in number of employees. In addition there has been a relative low growth in trade, hotels and restaurants, i.e. in sectors where we also find firms with relative high demands for transport. Further on, the number of firms in the transportation sector in the airport area has declined in the last 3-years period. Hence, the economic growth has come within the service sectors, among others within public services.

The question is then if the reduction firms in transport intensive industries contradict the existence of a logistic cluster in the airport area? In our opinion this is not necessarily the case for at least two reasons.

First, a development of a high share of firms demanding advanced logistic solutions in one area do not necessarily depend upon a migration of firms into the area. Clustering mechanisms may also be developed if existing firms develop more advanced logistic demands over time in parallel with an increased supply of advanced transport services.

Second, there are many factors in addition to logistics that determines firms' choice of localization. Firms may e.g. choose to re-localize if the availability of skilled labor is changed or if downstream market development makes other localizations more profitable. Hence, the existence of a logistic cluster does not guarantee that all relevant factors accounts for the airport area as a preferred spot for localization.

Table 6.1
Annual freight volumes and employment in the airport area (2002-2005)

	1000 tons 2002	*Employees 2002*	*1000 tons 2005*	*Employees 2005*
Manufacturing	*12*	*789*	*11*	*655*
Trade, hotels and restaurants	*17*	*4.227*	*18*	*4.303*
Building and construction	*33*	*929*	*29*	*814*
Transportation		*1.588*		*1.255*
Other	*7*	*6.635*	*9*	*8.548*
Total		*12.580*		*14.321*

Source: Statistics Norway and ECON estimates

6 http:/statbank.ssb.no/statistikkbanken/

6.2 Future trends

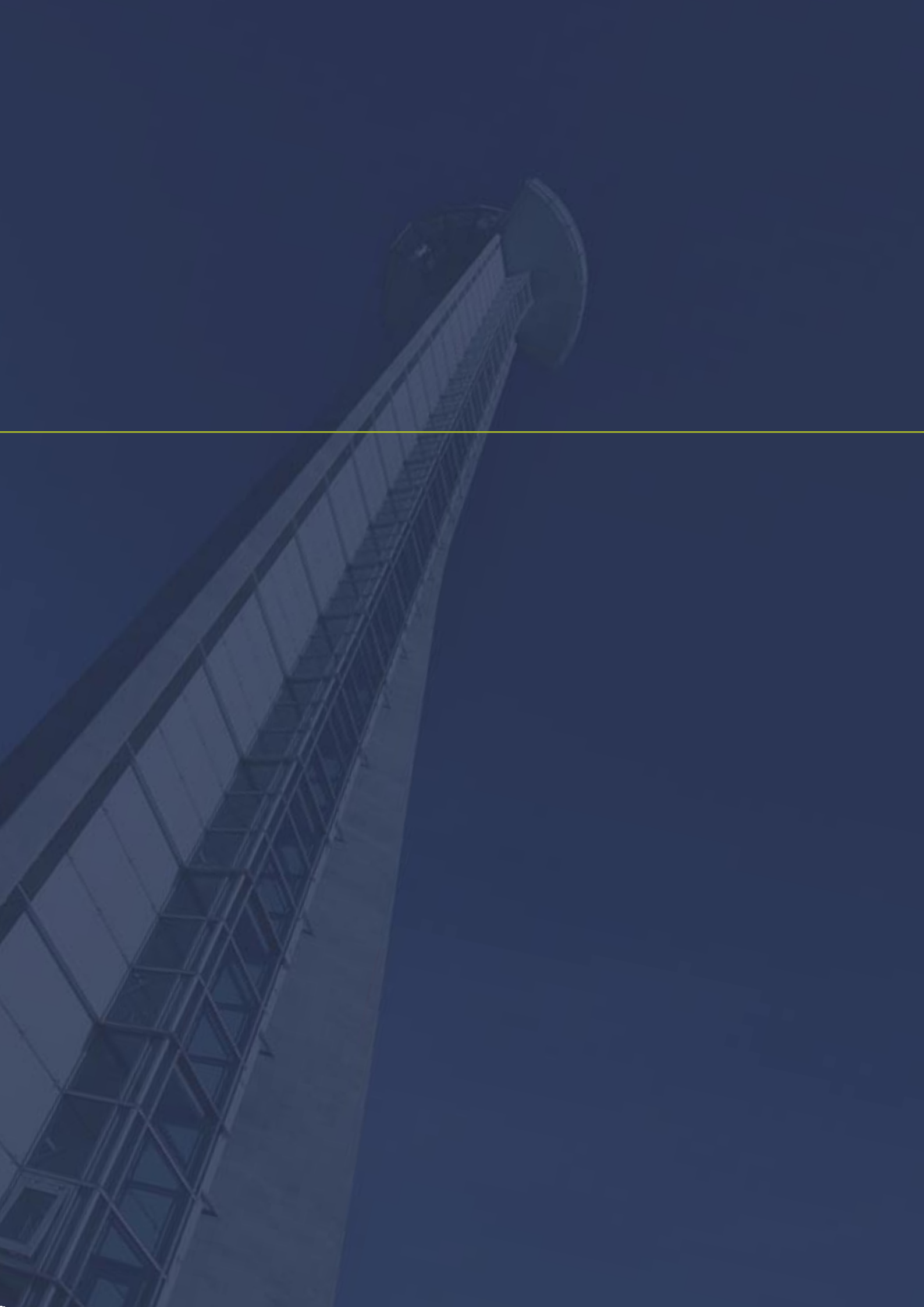
An interesting question is if one can spot some future trends based on the analysis above. Our conclusion is that there are some opportunities for the airport area to be developed further as a logistic cluster in the future.

First, all prognosis from Statistics Norway suggest that the whole area north of Oslo will benefit of a high growth in the population the next 20-years. This may entail that the Oslo North region may grow together with the airport area in this period. This will of course provide an opportunity for further business development in the airport area, since the market will "move" north and the airport area may in some time provide a good localization to serve the whole capital area.

Second, there are strong trends that the transport market is developed towards a higher share of small consignments and high frequency and flexible shipments. This may in turn strengthen air cargo, which in turn will at least not make it less attractive to localize near the airport.

Third; high growth in the central Eastern Norway may put more pressure on local infrastructure. There are some problems with congestion in Oslo today, especially through the rush hours. If the infrastructure is not upgraded along with the growth in the economy, it may develop significant differences between north and south of Oslo as possible spots for localization.

It will however be highly speculative to conclude on this ground that the airport area for sure will be the preferred alternative for localization for firms with high logistic demands and that the area will be developed further as a logistic cluster. In addition, one should also take into account that the future development also will reflect the trend over the last 3-4 years that transport intensive industry apparently is reducing its importance in the area. If the negative trend is continued, it may over time be less attractive for the transport industry to keep up with a development of even more advanced logistic services.



appendix 1

Detailed results from the statistical analysis

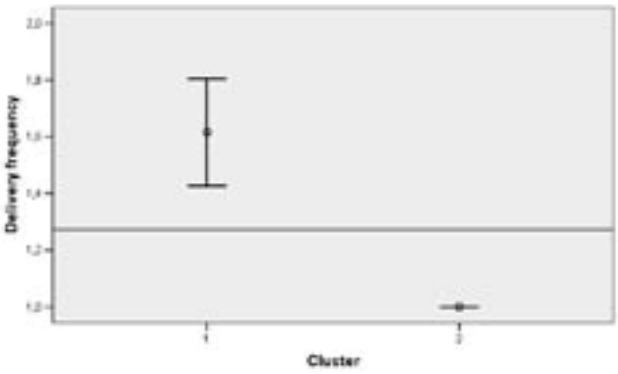
Detailed results from the statstical analysis

Logistic typology analysis

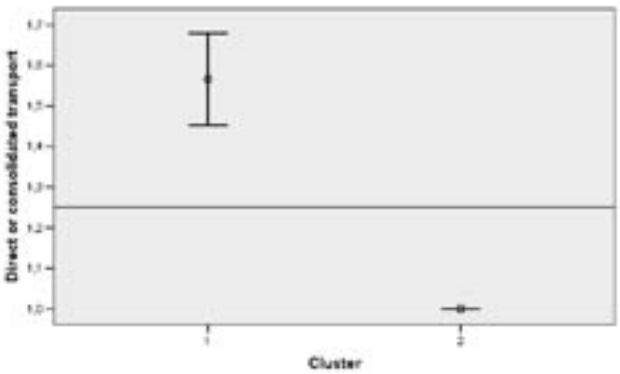
The figures below show the result from our factor analysis of logistic strategy. The factor analysis is conducted constrained to two clusters and by treating the response as continuous variables. The latter is chosen to ensure some flexibility in the analysis.

The figures show the mean value (o) and 95 pct confidence interval (upper and lower limit) for each indicator for the two clusters. With exception from the strategic logistic variable, all cluster means are significantly different. Cluster 2 corresponds to the advanced logistics typology, while cluster 1 corresponds to the basic logistic typology.

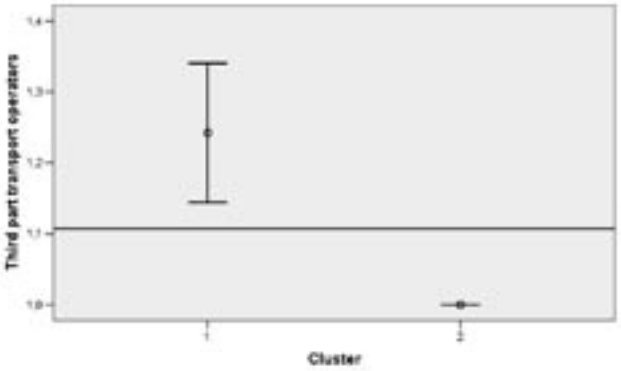
Figure V1.1
Results from factor analysis, Simultaneous 95 pct Confidence Intervals for Means



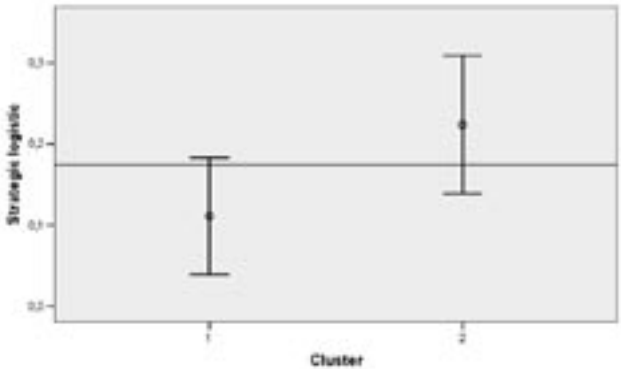
Delivery frequency:
Daily = 1, at least 3 times a week = 2, at least once a week = 3. Hence, a low parameter average indicates that in average the firms have a high-frequency delivery pattern.



Direct transportation = 1, consolidated transportation =2. A low parameter average indicates that most of the firms apply direct transport solutions.



Third party transportation = 1, own transport = 0. A low cluster mean indicates that the firms prefer third part solutions.



Strategic logistic = 1, if not = 0. A high cluster mean indicates that most firm have a high degree of control and influence over the transport solutions.

Firm characteristics in logistic clusters

The table shows the results from a regression of the probability that a firm is localized in a advanced logistic cluster (*Area*) as a function of average shipment size (*Size*), whether DFDS Tollpost or Norway Post is preferred as transport operator (*Operator*) and to the extent that air freight is important for the firm (*Air freight*).

Area	*B*	*SE*	*Wald*	*Sig*
Intercept	*-2.13*	*0.65*	*10.82*	*0.1 %*
Size	*0.22*	*0.07*	*9.68*	*0.2 %*
Operator	*2.38*	*0.82*	*8.46*	*0.4 %*
Air freight	*0.44*	*0.19*	*5.45*	*2.0 %*

The table shows that all variables are positively correlated with location in logistic clusters and all coefficients are significant at 95 pct level.

The next table shows an output from a multinomial regression of the probability that a firm requires an advanced logistic strategy as a function of shipment size (*Size*) and dummy variable identifying firms within the manufacturing industry (*Manufacturing*).

Logistic typology	*B*	*SE*	*Wald*	*Sig*
Intercept	*-0.88*	*0.38*	*5.18*	*2.3 %*
Size	*0.14*	*0.06*	*4.89*	*2.7 %*
Manufacturing	*0.84*	*0.38*	*4.93*	*2.6 %*

The table shows that all variables are positively correlated with requirements for advanced logistic and all coefficients are significant at 95 pct level.

Transport costs

The following table shows our regression analysis of transportation costs (log) as a function of the shipment size (log) and dummys to control for industry belonging (manufacturing and transport services) and location in logistic clusters (except Oslo) and location in Oslo.

EQ(19)
Modelling ln_Cost by OLS-CS (using Kostnader.xls).
The estimation sample is: 1 to 232
Dropped 164 observation(s) with missing values from the sample

	Coefficient	*Std.Error*	*t-value*	*t-prob*	*Part.R^2*
Constant	*0.958071*	*0.2749*	*3.49*	*0.001*	*0.1639*
ln_Size	*0.172434*	*0.03843*	*4.49*	*0.000*	*0.2452*
Manufacturing	*-0.329282*	*0.2513*	*-1.31*	*0.195*	*0.0269*
Transport service	*1.44910*	*0.5771*	*2.51*	*0.015*	*0.0923*
Logistic cluster	*-0.863846*	*0.2857*	*-3.02*	*0.004*	*0.1285*
Oslo	*-0.292238*	*0.2804*	*-1.04*	*0.301*	*0.0172*

sigma 0.927969 RSS 53.3898313
*R^2 0.353563 F(5,62) = 6.782 [0.000]***
log-likelihood -88.2636 DW 1.58
no. of observations 68 no. of parameters 6
mean(ln_kost) 1.4552 var(ln_kost) 1.21457

Normality test: Chi^2(2) = 0.38102 [0.8265]
hetero test: F(6,55) = 0.092515 [0.9968]
hetero-X test: F(13,48) = 0.63280 [0.8144]
*RESET test: F(1,61) = 6.4916 [0.0134]**

The table shows that the transport cost share is increasing in shipment size, i.e. one percent increase in the size implies 0.17 pct increased transportation cost share. This result reflects that transport intensive industries tend to spend more of their turnover to cover transportation costs. This is of course an expected result.

Further, the table shows that the transportation cost share differs significantly across industries, i.e. the cost share in transport services is of course very high, while the share in manufacturing is relatively low.

Our results indicate that firms located in other logistic clusters than Oslo have a significantly lower transportation cost share than other firms. Enterprises located in Oslo tend to have a lower transportation than outside logistic cluster, but this result is not significant at a 95 percent level.

Transport size and delivery frequency

An output of a regression analysis of log of freight size (*Size*) as a function of a dummy for firms located in a logistic cluster (*Logistic cluster*), a dummy for industry belonging (*Industry*) and log of the number of employees in the firm (*Employees*) is shown below:

Dependent Variable: Size of sending (ln)

	B	*SE*	*Beta*	*t*	*Sig*
(Constant)	*1.54*	*0.74*	*2.06*		*4.1 %*
Logistic cluster	*0.69*	*0.50*	*0.11*	*1.38*	*17.0 %*
Industry	*1.13*	*0.50*	*0.18*	*2.23*	*2.7 %*
Employees (ln)	*0.89*	*0.24*	*0.30*	*3.61*	*0.0 %*

The *Industry* dummy is constructed through a factor analysis as a measure to identify industries that has high transport intensity. Most industry sectors and the transportation sector has relative shipment size compared

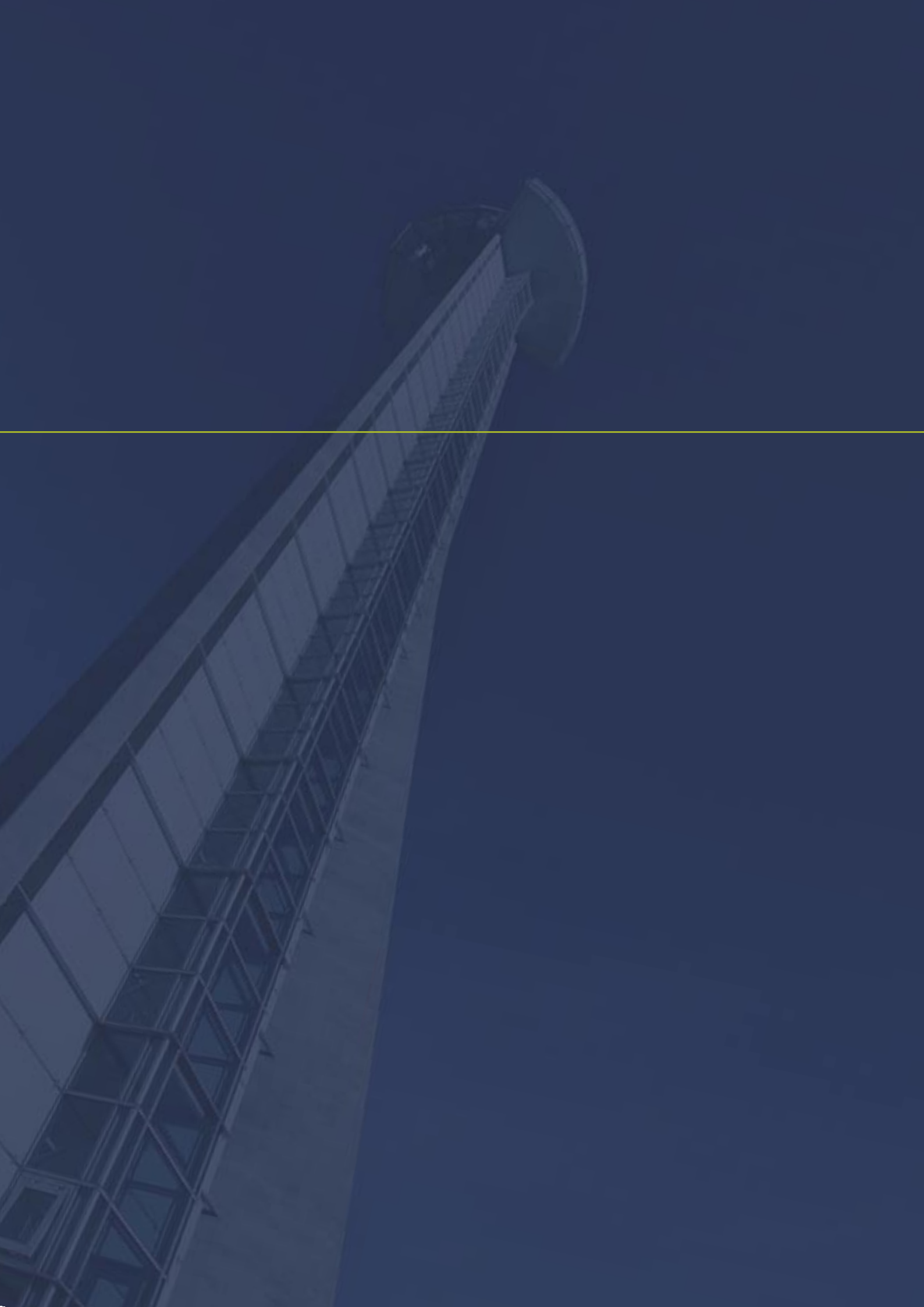
The table shows that all variable except location in a logistic cluster is significant and positive at a 95 percent level. Belonging to a logistic cluster is also positively correlated with shipment size, but this result is to some extent connected with a relative large statistical uncertainty.

The next table shows an output of a regression analysis of delivery frequency as a function of a dummy for firms located in a logistic cluster (*Logistic cluster*), a dummy for industry belonging (*Industry*) and log of the number of employees in the firm (*Employees*) is shown below:

Dependent Variable: Delivery frequency

	B	*SE*	*Beta*	*t*	*Sig*
(Constant)	*1.66*	*0.13*	*12.13*		*0.0 %*
Logistic cluster	*-0.09*	*0.09*	*-0.06*	*-0.916*	*36.0 %*
Industry	*0.16*	*0.09*	*0.11*	*1.697*	*9.1 %*
Employees (ln)	*-0.13*	*0.04*	*-0.20*	*-2.993*	*0.3 %*

Both the significance level and the degree of explanation is generally lower for the delivery frequency estimate than shipment size regression.



appendix 2

Questionnaire

Questionnaire

Question 8801

61L4

ZIP code

Question 8802

65L6

Number of employees

Question 8803

71L7

NACE-code

Question 1

78L1

Has the enterprise one person that is responsible for transport and logistics?

1 ❑ Yes
2 ❑ No
3 ❑ Don't know

Question 2

79L1

How many times per week does the firm have freight sending?

1 ❑ Daily
2 ❑ At least 3 times per week
3 ❑ At least 1 time per week
4 ❑ At least 1 time per moth
5 ❑ More seldom
6 ❑ Don't know

If [Q1 . 1 or Q2 . 1 TO 3] otherwise finish

80L1

Does the enterprise apply direct transport from vendors or to customers without consolidation with other shippers?

1 ❑ Yes
2 ❑ No
3 ❑ Don't know

Question 4

81L8

What is the approximate size in kg for an average/ typical shipment?

Question 5

Multiple answers allowed

89L5

What transportation terms suits best for your enterprise?

1 ❑ We collect mainly our freight from our vendors
2 ❑ We get mainly our freight freely delivered from our vendors
3 ❑ We deliver freely to our customers
4 ❑ Our customers pick up the freight by us (ex works)
5 ❑ Other

Question 5-1

Maximum 100

94L3

Can you estimate your transportation costs as a share of the firms total turnover in percent

Question 6

Question only asked. if [Q5 . 1 . 3]

97L1

Buys your enterprise transport services from third party

1 ❑ Yes
2 ❑ No
3 ❑ Don't know

Question 6-1

Question only asked. if [Q6 . 1]

98L1

From which operators does your company buy transport services?

1 ❑ Linjegods
2 ❑ DFDS Tollpost
3 ❑ DHL
4 ❑ Posten
5 ❑ Others
6 ❑ Don't know

Question 7

Multiple answers allowed

99L4

Does your company deliver or receive goods form firms localized in Oslo Airport Gardermoen

1 ❑ Yes, we deliver goods to Oslo Airport Region
2 ❑ Yes, we receive goods from Oslo Airport Region
3 ❑ No
4 ❑ Don't know

Question 7-1

Question only asked. if [Q7 . 1 TO 2]

Maximum 100

User defined button : 999 "Don't know"

103L3

What is the share of your company's inbound freight that has origin at Oslo Airport Region (in percent)

Question 7-2

Question only asked. if [Q7 . 1 TO 2]

Maximum 100

106L3

What is the share of your company's outbound freight that has Oslo Airport Region as destination (in percent)

Question 7-3

109L1

How satisfied are you with the local accessibility for freight transport, i.e. on local roads, conditions for loading and unloading, etc.

1 ❑ Very dissatisfied
2 ❑ Rather dissatisfied
3 ❑ Rather satisfied
4 ❑ Very satisfied
5 ❑ Don't know
6 ❑ Not relevant

Question 7-4

110L1

How satisfied are you with the overall accessibility for freight transport, i.e. with the national transport infrastructure

1 ❑ Very dissatisfied
2 ❑ Rather dissatisfied
3 ❑ Rather satisfied
4 ❑ Very satisfied
5 ❑ Don't know
6 ❑ Not relevant

Question 7-5

111L1

How important is efficient logistics for the firm's choice of localization?

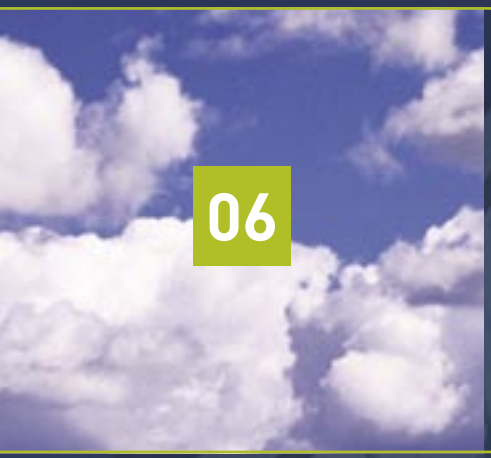
1 ❑ Unimportant
2 ❑ Less important
3 ❑ Rather important
4 ❑ Very important
5 ❑ Don't know

Question 7-6

112L1

How important is well developed air cargo services for the company?

1 ❑ Unimportant
2 ❑ Less important
3 ❑ Rather important
4 ❑ Very important
5 ❑ Don't know



06

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STRAIR report 3 B: Models for analysis of flow of goods and services in airport regions