

44th European Transport Conference 2016, ETC 2016, 5-7 October 2016, Barcelona, Spain

## Work place location, transport and urban competitiveness: the Oslo case

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### Abstract

This paper examines where firms and industries locate in the Oslo region, how this relate to land-use and transport needs and, how the interplay between localisation and transport may have impact on urban competitiveness. It focuses on why some parts of a city region or a city, seems to be more attractive for businesses and people than other parts and, discuss if and how the development can be related to location, proximity and accessibility.

The paper draws on several theoretical approaches and data sources. The analytical framework builds on economic geography, agglomeration and location theory. Data comes from both quantitative and qualitative sources, such as register data on firms and industries, commuting and travel survey data, interviews with industries and policy makers and planners.

The paper discusses some main factors, which may explain the complex relations between urban competitiveness, firm localisation and transport systems. Accessibility and transport system are undoubtedly important for city attractiveness and industrial development and this may vary between industries. An efficient transport system, therefore, is probably necessary but not sufficient for making specific parts of a city attractive for specific industries. Several other location factors related to labour, land, capital, and managerial and technical skills etc., will also shape firm's locations and city attractiveness and competitiveness.

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Peer-review under responsibility of the Association for European Transport

*Keywords: Urban competitiveness, attractiveness, workplace location, transport system*

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### 1. Introduction

The Oslo region aims to be an attractive city region for both businesses and people (Florida 2002), and to be an “engine of growth” (Acs 2002) with a particular focus on growth in knowledge industries. The vision in the regional Plan for Innovation is that the Oslo region should become among the most sustainable, smart and innovative regions

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in the world (Regional Innovation Plan 2015). In order to achieve the vision of being both competitive, liveable and sustainable, the city region is eager to upgrade its business environment and skill base (Martin & Simmie 2008). Renewal and improvement of its transport infrastructures is regarded as particularly important for attracting and retaining innovative and profitable firms and industries and a well-educated and creative workforce (Hickman & Banister 2003, Banister 2012). Transport plays an important role in firms' choice of inputs factors and production processes for maximizing profits (production theory) and for their choice of location or re-location (localisation theory). Transport infrastructure will thus affect how and why economic activity develops in different city-regions (Holl 2007). A successful city region will achieve both a high productivity and employment rate, high wages and high GDP per capita (Ratsø 2014).

The paper takes the following research questions as its points of departure:

- How important is the presence of transport hubs for the attractiveness of urban areas when firms search for both competitive and environmental friendly location?
- How does commuting, travel pattern and access to transport systems vary between urban areas in the Oslo region with regard to environmental friendly location?

### 1.1. Data sources

The paper employs several data sources, both quantitative and qualitative sources, such as register data on firms and industries, commuting and travel survey data, interviews with industries and policy makers and planners.

The Central Register of Establishments and Enterprises (CRE) is the main database for Statistics Norway for all units in Norway with economic activity. The register covers basic variables, such as employees, industry (NACE), localisation and sector, for both enterprises and local activity units from year 2000.

The Norwegian Travel Survey comprises reports from about 60,000 persons nationwide about their travel behaviour, including access to transport, travel mode and distance etc. This survey provides very detailed data for analysis of e.g., commuting, business and shopping travel patterns from the demand side. The survey used was conducted in 2013-2014 (Hjorthol, et al. 2014).

Register based commuting statistics at basic statistical unit (BSU)<sup>†</sup> level. This is data that shows where all employees reside, at BSU level, and yearly developments in this.

In-depth interviews with enterprises from different industries in selected case areas in the Oslo region.

The paper is mainly based on data collected and analysed as part of a project of the Oslo region, documented in Langeland et al. (2016).

The paper is organised as follows: The analytical framework is presented in section 2. Section 3 includes the empirical findings and analyses. Section 4 concludes the paper.

## 2. Analytical framework

The analytical framework builds on several theoretical approaches, such as economic geography, agglomeration and location theory. Although there is no consensus on the definition of the concept (Jiang & Shen 2013), regional or urban competitiveness often refers to agglomeration, spatial clustering and specialization. According to Storper (2010) competitiveness reflects the capability of an economy to attract and maintain firms with stable or rising shares in activity, while maintaining stable or increasing standards of living for those who participate in it. This definition emphasizes attraction and retaining of successful firms and high standards of living.

There are several possible advantages related to agglomeration and spatial proximity, such as; shared costs for infrastructure, the build-up of a skilled labour force, transaction efficiency, and knowledge spillovers leading to firm learning and innovation. Location of firms and industries, therefore, is important for urban competitiveness and, transport infrastructure may foster economic development through its ability to nurture agglomeration in related

<sup>†</sup> "Grunnkrets" in Norwegian, also translated "Census tract level". There are 589 BSUs within the city of Oslo.

industries (Graham 2007, Porter 2000, Storper 2013). Knowledge industries are, for instance, assumed to be particularly dependent on a well-functioning transport system, which promote high mobility of labour and competence (Moretti 2013).

In a compact city/city-region, the various activities and uses are located close together and agglomeration and cluster formation are usually regarded as important for promoting urban competitiveness (Storper 2013). Proximity minimizes the time and energy required to reach different activities and it maximizes the potential for interaction. An urban spatial structure with a high level of centralisation and clustering has a significant share of its activities in its centre and a concentration of activities around specific focal points, often a transport hub. Creating “economies of density” (OECD 2012, 2013) and economic variety around public transport hubs are positively correlated with productivity, and with more efficient and clean transport (Glaeser 2011). Dense urban regions also generate less traffic per capita (Newman and Kenworthy 2015, Næss, 2012, Ewing and Cervero 2010). In order to minimize car-use and traffic volumes, activities attracting most people (employees, visitors) per square metre should be located in central parts of a city or in locations with excellent public transport accessibility and with many people living within walking- and bicycling distance (IPCC 2014). Land-use planning, transport systems and urban qualities hence affect how climate-friendly the mobility patterns are and, accordingly, how attractive the city is to current and potential inhabitants and firms. In short, dense urban areas with short commutes can make up a smart and sustainable transformation pathway for competitive and climate-friendly cities.

The analytical framework based on agglomeration and location theory will be used to interpret the empirical findings in the paper, to examine if and how location and mobility patterns are in accordance with theoretical assumptions or not. Agglomeration and clustering of industries will often create specific urban location patterns which may have significant impact on the development of cities, on transport and travel patterns, and accordingly for urban competitiveness and sustainability.

### **3. Empirical evidence and analyses**

#### *3.1. The Oslo region*

The Oslo region and city has experienced strong urban economic and demographic growth the past decades and accordingly face challenges related to managing growth while reducing environmental impact. The city region also has large intra-urban differences, which create a need for better understanding of the interplay between the different urban areas in terms of land-use, firm location, transport and environment. At an overall level the Oslo city region is dominated by services as most larger cities are, manufacturing industries make up a tiny part of employment.

#### *3.2. Selected case areas*

In this paper, we focus on areas with high employment growth and a concentration of specific industries (clusters) and how they are related to transport hubs, figure 1. We have constructed our case areas using basic statistical units (BSU) as building blocks. We identified BSUs with high density and growth of employees, e.g. they are considered attractive for business. We used two main criterions for selection the case areas; they should have different types of communication services (trains, trams and bus lines) and, they should be differently located in the urban structure, particularly with regard to dwelling areas and accessibility for the employees. The different BSUs are then aggregated into larger areas corresponding with our field observation of what constitute the relevant case area.

All case areas are considered attractive for business. Still, they have different histories, are located differently in the urban landscape and illustrate different approaches on how to achieve urban development and, possibly to urban competitiveness.

Oslo centre is highly attractive for businesses depending on good access to a large consumer marked, e.g. hotels, restaurants, retail and other services for the private marked. The area is also attractive for office companies recruiting employees from a large area. It is a transport hub for both the national rail network, the metro, as well as for the tram and bus networks. It is also served by several scheduled boats/ferries. However, the city centre is not densely populated (see Figure 4). Oslo city centre has a varied and diverse industrial structure. In recent years, there has been

a massive development of new service industries around the central railway station, based on the principles of central work place localisation (see Tennøy et al. 2014).

Akerselva is situated north of the Oslo city centre, but within walking/cycling distance from the city centre and large residential areas. This part of the city is characterised by a functional mixture of residence, work and different services. Akerselva was the hotbed for the industrial revolution in Norway, the textile industry grew up here around 1850 but it more or less disappeared in the late 1950s. This part of the city is more or less similar to the regional average of the Oslo region (Oslo, Asker, Bærum) with respect to industries and employment, but with a concentration of media and ICT. The area is fairly well served by busses and trams but not by rail or metro, so it is not a transport hub. It is also easy accessible by car and located close to high density residential areas.

Fornebu is situated west of the city centre of Oslo, within the neighbouring municipality, Bærum. The area was opened for urban development, when the airport was relocated in 1998. Today several major Norwegian companies, such as Statoil, Telenor and Norwegian have their headquarters at Fornebu. Norwegian branches of several multinational companies are also located in this area. Among our cases Fornebu is the most industrially specialised one. It is dominated by business services, particularly engineering and ICT. Geographically Fornebu is located on a peninsula connected by road (and accessible by bus and car) to the transport hub Lysaker. There is no railway or metro services to the area.

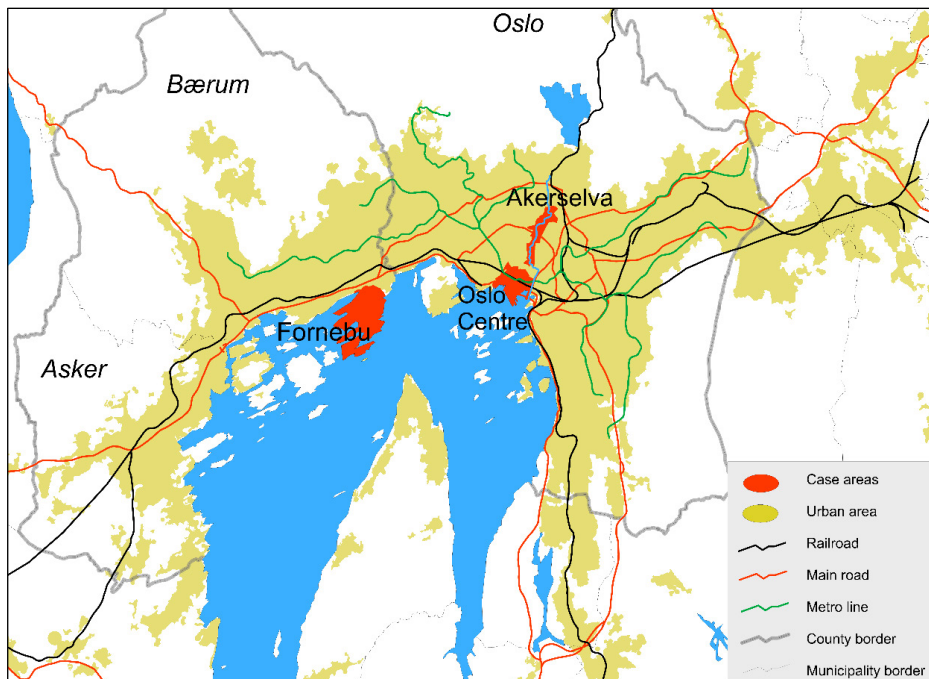


Figure 1. The selected case areas in the Oslo region.

The distribution of employees by industries (see figure 2) shows that Fornebu is the most specialised area dominated by business services. Business services also makes up a large part in Oslo Centre but this area is more diverse with several different service industries. The share of public administration and services connected to tourism and transportation is also significant in Oslo centre. This diversity reflects a usual industry pattern of a city centre. Akerselva is more in accordance with the general industrial pattern of Oslo region regarding employment by industry sector. However, the area is to a certain degree specialised in media and ITC although this is not visible in figure 2.

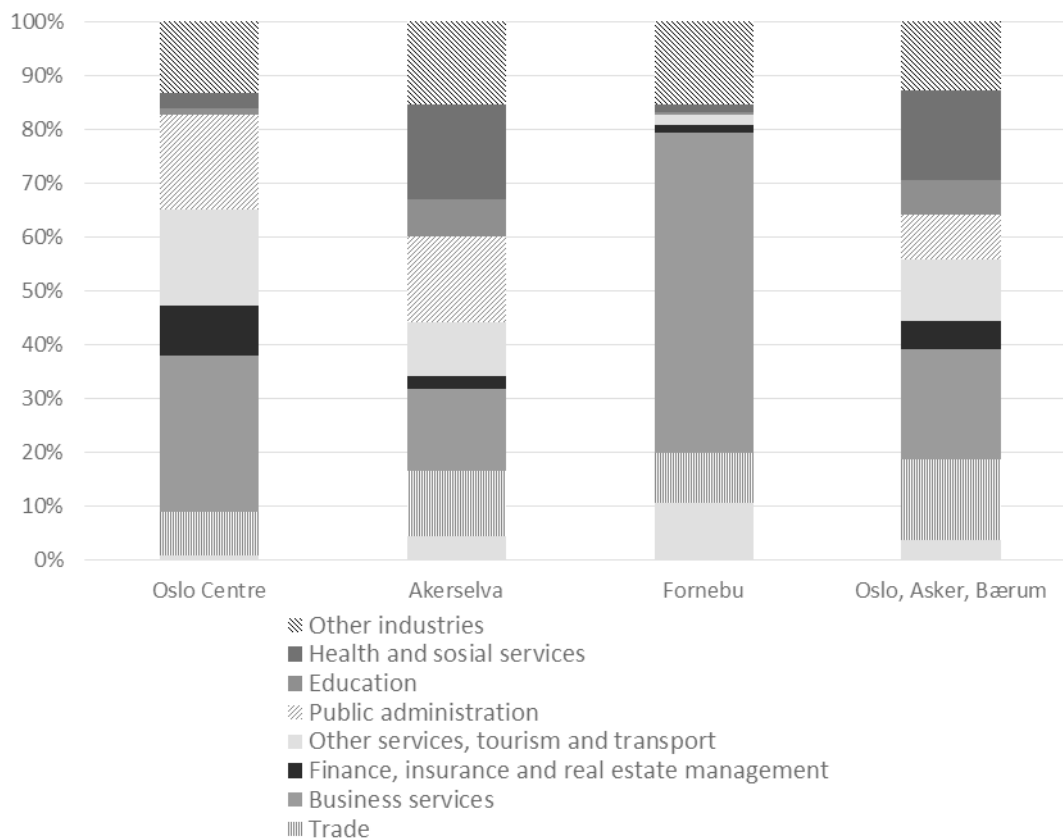


Fig. 2 Employment by industries in the Oslo region and in selected areas in the region

### 3.3. Accessibility and commuting

Employees working in the Oslo city centre come from a large geographical area. Good access to public transport has led to an expansion of the commuting area and a large share of the work force commuting to the city centre is situated along the main railway and metro lines (see figure 3).

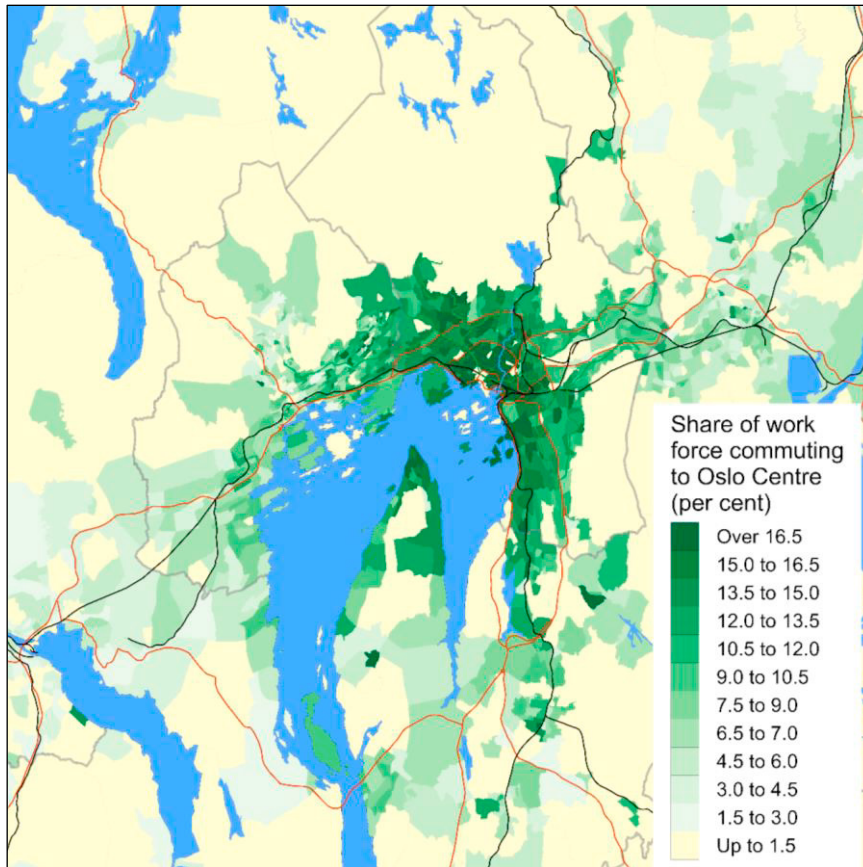


Fig. 3 Share of resident work force commuting to Oslo Centre. 2014. Per cent.

The business area in the centre of Oslo is rather small and there are large residential areas within walking/cycling distance of downtown (see figure 4). However, the centre of Oslo is the area with the strongest concentration of both work places and public transport systems in Norway. Oslo city centre is then as near as you get to a transportation hub with a competitive industry.

Figure 4 shows the density, in terms of employees and residents per square kilometre, and distance from city centre. The figure reveals that there is a high density employment area in the city centre, but that it drops rapidly with distance from the city centre. Just 2,5 kilometres from city centre there is less than 10 000 employees per square kilometre. The dark line displays the residential density and it shows that although there are few residents in the inner city, there is a high density population belt located between two and five kilometres from the city centre. This is within walking and cycling distance.

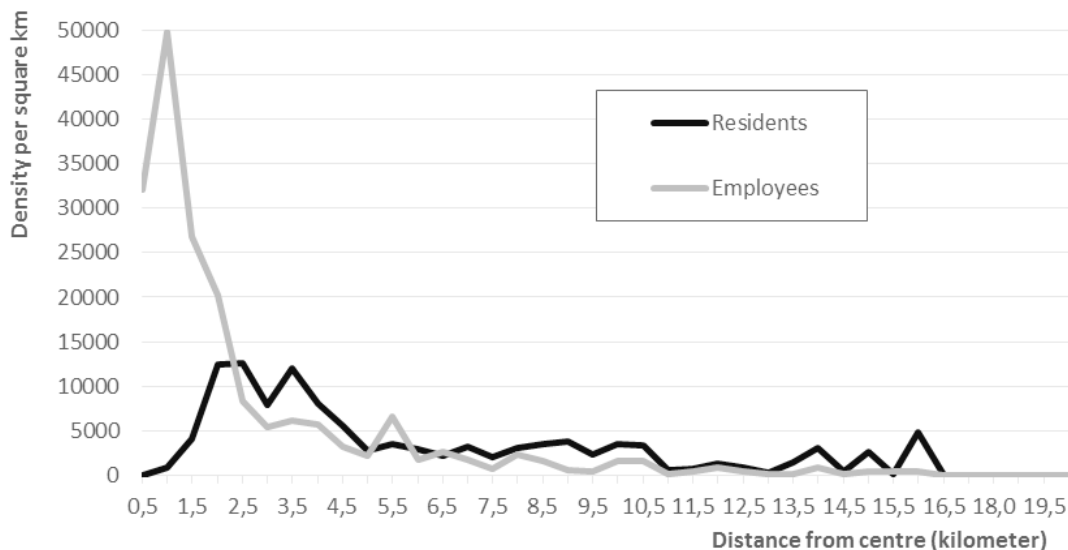


Fig. 4 Distribution of employees and residents from the city centre (city hall used as point of reference) in Oslo. 2015.

Fornebu is a more specialised area with a large share of the employment in business services, particularly within engineering and telecommunications.

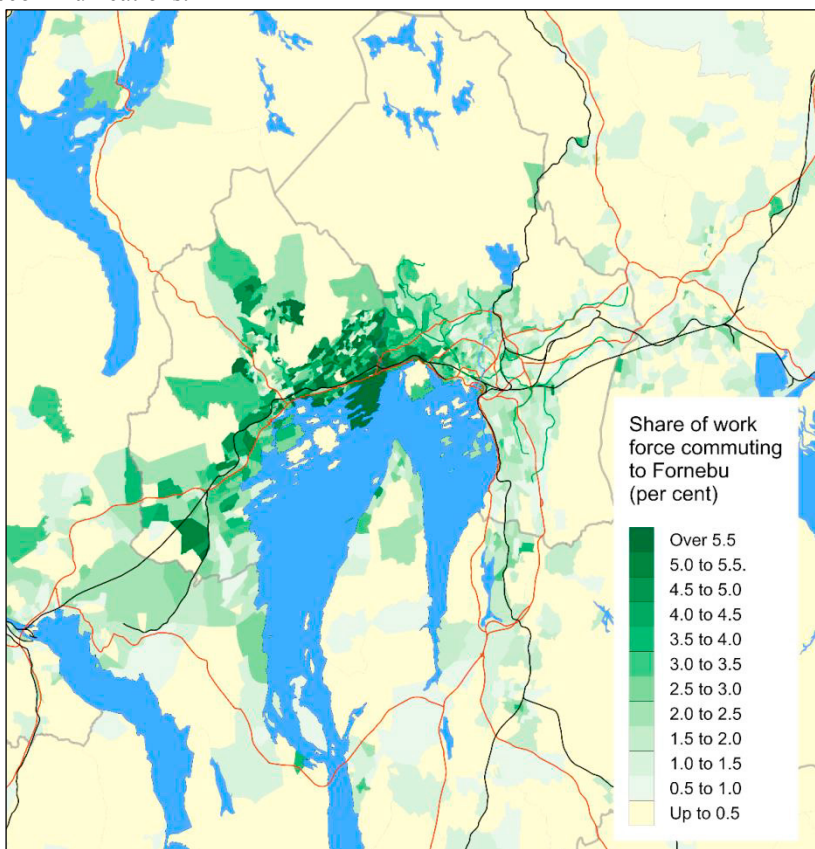


Fig. 5 Share of resident work force commuting to Fornebu. 2014. Per cent.

Most of the employees at Fornebu are living to the west of Oslo, cf. figure 5. This is not surprising bearing in mind that living on the “wrong side” of the city means you have to struggle with heavy congestion through the city centre in the rush hours. It is also interesting to note the wide distribution within the municipalities of Asker and Bærum, corresponding with areas with high levels of car use (Christiansen et al. 2016). At Fornebu there is a great surplus of jobs compared to residences and a limited public transport system. This may change in the coming years as there are proposals in the municipal area plans for increased development of both new residences and a new metro line.

In contrast to the newly developed and more specialised industrial cluster at Fornebu, the clusters that have evolved along the Akerselva river, are located in a high density mixed use setting, and businesses attract employees from a smaller and nearby area (fig. 6).

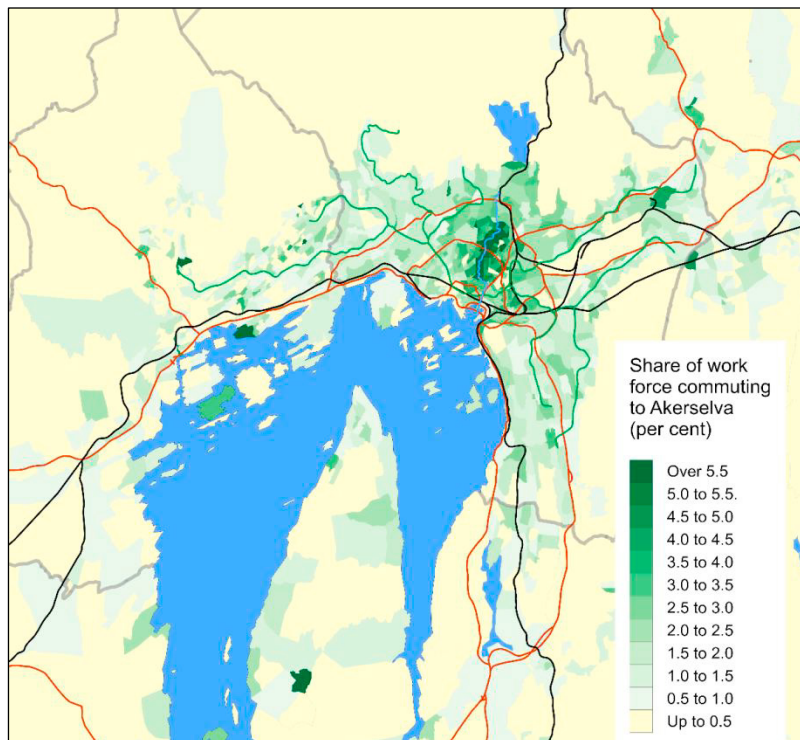


Fig. 6 Share of work force commuting to Akerselva. 2014. Per cent.

Looking at figures 3,5 and 6 we see that there are some differences between our cases with respect to catchment areas. Companies located at Akerselva partially attract employees from a different area than Fornebu, but both have overlapping catchment areas with Oslo city centre, cf. figure 6. Looking at the average commuting distances (figure 7) we observe significant differences between the different areas. Fornebu has the longest average commuting distances and Akerselva the shortest. This may be partly due to differences in industrial specialisation in the two different areas. Highly specialized companies at Fornebu may require a larger catchment area for employees than the average company at Akerselva. Akerselva is also the only case area with a shorter commuting distance than the average in the city region.



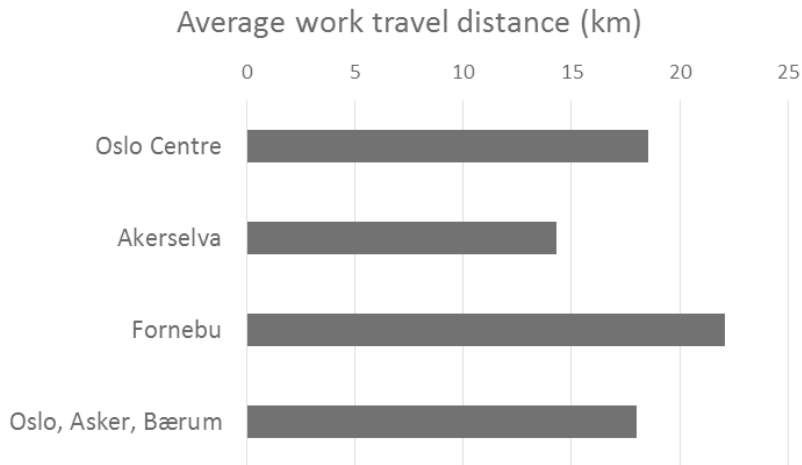


Fig. 7 Average commuting distances in the different case areas.

Despite good access to train services, a large proportion of highly specialized jobs and a large catchment area, the travel distance for Oslo Centre is about average. The reason for that is that the share of walking to the city centre is relatively high (see figure 8 and 4) and the high density residential areas close to the city centre (figure 4).

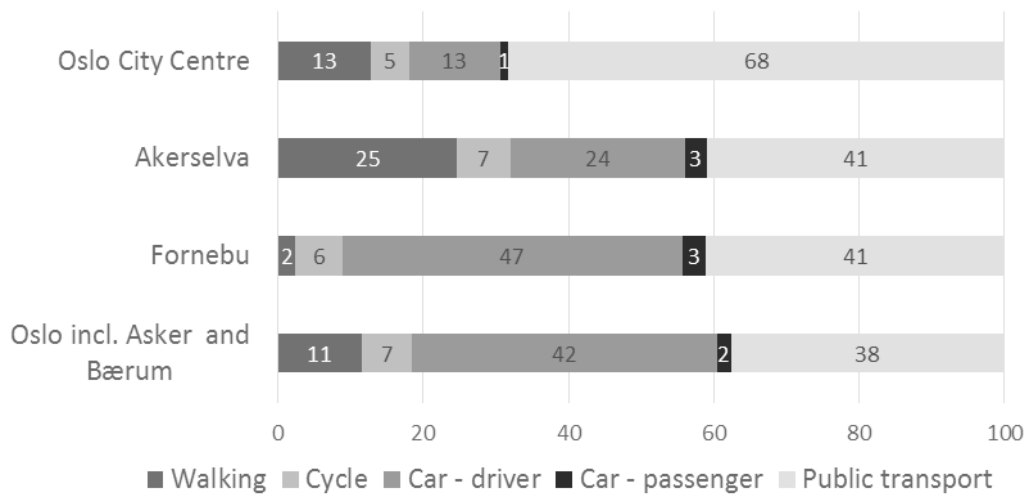


Fig. 8 Main mode of transport on commuting trips to workplaces in the selected areas in the Oslo region (see map). Data from the national travel survey 2013/14. (N=738, 124, 134 and 5009).

The modal share of public transport for work journeys vary a lot between the case areas, cf. figure 8. Public transport dominates in Oslo city centre, where almost 7 out of 10 commute by public transport, while only 10 percent uses car for their work journey. The other two selected areas are close to the average for the city region, with about 4 out of 10 using public transport. However, use of car and walking is very different between the two selected areas Fornebu and Akerselva. Walking is much more important at the mixt land use area Akerselva (24 percent) which is close to the inner city, than at Fornebu (5 percent) which is a more specialised and segregated area situated farther away from the city centre. Cars dominates at Fornebu (45 percent). This may change in the future as new areas are opened for residential development at Fornebu.

#### 4. Discussion and conclusions

The data on firm location and travel patterns presented in this paper may indicate that there are different paths to achieve urban competitiveness measured as the ability to attract businesses and people to different parts of the city. All the cases are characterised by a large part of the work places belonging to the “knowledge economy”, i.e. jobs with a high degree of competence and specialised skills. Today the Oslo region make up a national hub of knowledge-intensive business services (KIFT) which is also one of the main growth drivers in the Norwegian economy (Holmen et al 2016). In order to remain or increase its competitiveness, the Oslo region must attract a sufficient share of such high-growth industries and knowledge workers also in the future. The attractiveness will vary between different parts of the city or city regions, partly dependent on the transport infrastructure and mobility systems.

Oslo centre is a transport hub with a high score on business attractiveness and it has a large density of highly educated employees and well-paid jobs and, it provides all kinds personal and business services. The area is characterised by efficient and climate-friendly transport, but with substantial transport requirements. It may be labelled as an urban hub both with regard to jobs and transport.

Fornebu also have a high score on business attractiveness and a large density of highly educated employees and well-paid jobs but it lacks an efficient transport system. The area is heavily car-based and the bus services are working close to its maximum capacity in a mixed traffic setting. A metro is high on the companies wish list in this area. Today Fornebu also lacks several urban services and amenities. Evidence from interviews with companies clearly indicates that the firms want this part of the city to be more urban, i.e. to get more services to the area. This area may be labelled semi-urban.

Akerselva also have a high score on business attractiveness and a large density on well-paid jobs. The area is also partly sufficient on urban services but it cannot be characterised as a transport hub. Private city developers emphasise both the urban qualities – private and public services - and the closeness to nature in this area – the river and adjacent parks with a green urban landscape when explaining the attractiveness of the area. This area may be labelled “naturban”.

Both Akerselva and Fornebu wants to strengthen the urbanity of the city areas (more services) in order to be more attractive to both high-productive companies and employees. However, the starting point is rather different for those two parts of the city. Fornebu is economically specialised and much more car dependent and the potential for walking is smaller but biking may grow. However, considering the average commute of 22 kilometres, there is also a limit to the potential modal share of biking. This may partly change if and when the planned residential construction take place at Fornebu. Akerselva, on the other hand, is more economically diverse and have nearby residential areas and accordingly, the share of walking is much higher. In order to improve accessibility even more there are plans to invest in a new metro tunnel which will connect the Akerselva area closer to the rest of the city. Then the area may develop into a transport hub.

The experience from Oslo, illustrated by these three cases, shows that there is no single causal link between industry location and transport hubs. There are examples of industries locating at transport hubs, such as Bjørvika in the city centre, when new areas are made available for industrial development. However, the development at the Akerselva area illustrates that other industries also based on “knowledge jobs” choose to locate in an area, which is relatively central with good access to public transport, but not a transport hub. This in contrast to the development at Fornebu, which is by no means a transport hub, but where several large companies choose to locate, as part of a politically approved plan for creating an ITC-cluster in this area.

Assessing this development in an environmental perspective it is tempting to suggest that the pathway indicated by the IPCC (2014), which focuses on central workplace location, does not seem to be the only way to achieve an environmentally friendly and competitive city. In line with the suggestions of Gleaser (2012) we find that, although central workplace location generate a high modal share for public transport, which is more environmentally friendly given a fixed transport volume, locating firms in mixed use dense areas of the city, can also create less transport. And although the modal share of car is higher, congestion can be less of a problem in this case, as there is relative more road capacity and higher share of walking and cycling. In an environmental perspective a high share of walking and cycling is also preferable to the use of motorised public transport.

We also see that firms located in business districts, in less dense areas, such as Fornebu, generate more transport, and much more car use, than “average” location, and for the other cases. We also observe that the firms located at Fornebu feels the need to attract new services and more residents to this area, in order to increase its attractiveness. They want Fornebu to become a mixed use area, rather than a single service type cluster. In this way, we observe that Fornebu has managed to become an attractive area for business localisation despite of its location in the urban area, not because of it. In extension, firms located in Fornebu point in the direction of mixed use as the way forward, as opposed to continuing the path of single use. Even with the proposed metro connection to Fornebu, this area is located at a relatively small peninsula, and can as such not evolve into becoming a transport hub.

To sum up; although all the different case areas can be characterised as attractive places for business location, the single use not hub located case of Fornebu, generates more traffic, particularly more car use, compared to the city in general and the other case areas. We also observe that location in areas such as Akerselva, i.e. the mixed use and high density area, can be an attractive option compared to location at central transport hubs both with regard to competitiveness and environmental impacts.

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