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Where and why do firms choose to move? Empirical evidence from Norway

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Abstract: A key goal for many public policies is to increase the competitiveness of local industries and make areas more attractive for firm location and development. However, little is known about firm relocations even though they are of crucial importance in understanding economic development within a region and the effectiveness of the policies proposed. This paper contributes to filling this gap by looking further into the firm relocation process by estimating models for the decision to relocate and to where. The studied area consists of four counties on the western coast of Norway that generate about half of Norway's traditional exports. Changes in firm relocations for approximately 16,500 firms within this study area are analyzed. In addition, interviews with firms that relocated are also carried out to support the findings from the model. The results indicate that the decision to relocate is influenced by a firm's internal and external characteristics such as agglomeration. The results are relevant for regional planning and development as firms seem to have different preferences regarding what makes a location attractive or not. The results might serve as input in land-use interaction models, where changes in firm location patterns from transport investments are estimated.

Keywords: firm migration, agglomeration, transportation investment, mixed logit model

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1 Introduction

The relocation pattern of firms is essential to understanding the economic development within a region, as highlighted in Arauzo-Carod, Liviano-Solis, and Manjón-Antolin (2010) and van Dijk and Pellenbarg (2017). However, studies investigating this topic are missing in the literature. This is problematic because a key goal for many policies is precisely to promote projects that make regions attractive for firm's location and growth. In order to do so, it is important to get a better understanding of the determinants behind the firm location choice. This article will address this concern by looking further into which internal and external characteristics are important by using a mixed logit model framework, an approach missing in the literature which is argued to be a suitable way forward for the research within firm relocation (Arauzo-Carod et al., 2010).

The literature on urban economics emphasizes the importance of agglomeration economies as an essential factor in determining the benefits of one location compared to another. Agglomeration effects are external economies from which firms can benefit through co-location, which endogenously induces localized economic growth (Gleaser, Kallal, Scheinkman, & Shleifer, 1992; Rosenthal & Strange, 2003). This means that firm productivity rises with the overall amount of activity in other nearby firms, or with the number of nearby workers or consumers (Graham, Gibbons, & Martin, 2010). The main sources of agglomeration externalities are reduction in search costs for suitable employees, access to specialized suppliers, and benefits from knowledge spillovers from other similar firms.

Agglomeration effects can be divided into two main categories: 1) co-location of similar firms (localization economies) and 2) co-location with other firms (urbanization economies). Typical benefits of having many firms in the same sector in close proximity is reduced search costs for finding suitable employees, specialized suppliers, reduced training costs and more specialized labour (Marshall, 1890). Firms could also benefit from knowledge spillovers from other similar firms. Location economies can be measured by looking at the sector specific employment level (Rosenthal & Strange, 2001), sector specific employment density (Hensher, Truong, Mulley, & Ellison, 2012), or firm productivity (Jofre-Monseny, Marín-López, & Viladecans-Marsal, 2012). Urbanization economies is an indicator of the benefits of beeing located in cities. These benefits are related to a diverse labour market, industry structure, good access to public amenities such as universities and the size of the local market (Jacobs, 1969). In general, firms are more productive in larger cities, due to competition and interaction among firms (Combes, Duranton, Gobillon, & Roux, 2010). Urbanization economies can be measure by accessibility to population and employment (de Bok & van Oort, 2011), population density (Rosenthal & Strange, 2008), or employment level in other industry sectors (Jofre-Monseny et al., 2012).

The spatial external agglomeration benefits are not paid for by the firm itself but are derived externally. As these factors are not easily exchanged from a distance, firms will tend to move to areas where they can benefit from agglomeration benefits and reinforcing them (Koo, 2005). However, to which degree firms benefit from these kinds of externalities varies between sectors, suggesting that there are different preferences regarding choice of location (Graham et al., 2010; Nilsen, Babri, Andersen, & Tørset, 2017a). This is also reflected in a few empirical studies done within firm relocation and agglomeration in the Netherlands (de Bok & van Oort, 2011; Kronenberg, 2013). They showed that when it comes to location choice, agglomeration is an important variable for some sectors but not for all. In these studies, population density was used as a proxy of urbanization economies while employment density in different sectors was used as a proxy for localization economies. However, only the analysis done by de Bok and van Oort (2011) are at a disaggregated level. The lack of disaggregated studies is problematic as agglomeration economies do not directly foster economic growth, but do that indirectly through firm performance and location decisions at micro level (de Bok & van Oort, 2011; Neumark, Junfu, &

Wall, 2006). As agglomeration benefits vary between regions and nations (Melo, Graham, Barge-Ardao, 2013) there is a need to investigate this in a more rural context at a disaggregated level.

In addition to agglomeration economies, the literature stresses the importance of localized network externalities in firm relocation. As firms are likely to have established customer, employee and supplier relations in their current location, they often move relatively short distances in order to keep these relations (Risselada, Schutjens, & Van Oort, 2013; Weterings & Knoben, 2013). Therefore, location possibilities that are in close proximity might be more attractive for a firm than locations further away. However, there seems to be a relationship between the distance a firm chooses to move and the factors that are "pushing" the firm away from its current location. Studies done by Weterings and Knoben (2013) suggest that firms that move short distances mainly do so because of changes in internal characteristics such as number of employees while firms that choose to move to other regions or municipalities are more influenced by regional characteristics and possible agglomeration benefits.

The firms' internal characteristics are an important factor in the relocation process (Brouwer, Mariotti, & van Ommeren 2004). Older, larger firms seem to be less likely to relocate than smaller, younger firms as the moving costs are increasing with firm size and older firms often have established long-term customer relations (Brouwer et al., 2004; Risselada et al., 2013). Also, firms that experience a growth or decline in their workforce are more willing to relocate (Kronenberg, 2013). Furthermore, firms within different sectors have different needs regarding proximity to other customers, suppliers, specialized labor and office space that might affect the probability of relocating. Producer services are for example argued to be more mobile than manufacturing, distribution and consumer services (Holl, 2004; Kronenberg, 2013). Thus, firms that find themselves in a suboptimal location or need expanding their business or reducing costs will therefore often try to find a new location for their business.

Finally, we note that firm relocation is typically modelled in sequential steps by using a binary logit model to estimate the decision to move or not and a multinomial logit model is used to estimate the location choice given that the firm chooses to move (Kroonenberg, 2013; Brouwer et al., 2004; Risselada et al., 2013). However, by using a mixed logit model approach to estimate both the probability of relocating and where to relocate jointly, it is possible to use the whole data set for model estimation and to deal with possible correlation between alternatives. An approach which is recommended by Arauzo-Carod et al. (2010) but is missing in the firm relocation literature. To our knowledge is it just Bodenmann and Axhausen (2012) who has modelled this decision jointly in their nested logit model for relocating firms in Switzerland.

This article is important for several reasons. First by using a micro approach to firm relocation and analyzing both the decision to relocate and where to relocate, the article fills a gap within firm relocation literature which is often at an aggregated municipality and regional level for areas with relatively high density. Secondly, these kinds of analysis are important inputs in a land- use transport interaction (LUTI) modelling context, where firm relocation modelling plays an essential part (Cordera, Ibeas, Dell'Olio, & Alonso, 2018).

The following hypotheses regarding firm relocation are tested in this paper:

1. Older firms are less likely to relocate than younger firms.
2. Large firms are less likely to relocate than smaller firms.
3. The relocation probability varies across sectors.
4. Firms are more likely to relocate to areas with a high employment and population density.
5. Firms are more likely to relocate to areas in close proximity to their prior location.

By empirically testing the above hypotheses, this paper looks further into the firm relocation process by using empirical data for almost 16,500 firms to estimate models for both the decision to relocate, and where to move. Additionally, 24 relocating firms have been interviewed to gain a better understanding of which aspects are important in the firm relocation process.

The structure of the paper is as follows. Chapter 2 describes the geographical area studied. Chapter 3 describes the data used in the analysis and the calculation of population and employment density. In chapter 4, the model for whether a firm chooses to relocate and the location it chooses to move to, is presented. The results from the model calculations are shown in chapter 5 while the results are discussed in chapter 6. Chapter 7 summarizes the findings from this investigation.

2 Study area

This paper focuses on four counties on the western coast of Norway, shown in Figure 1. The study area is approximately 66,000 km^2 large with around 1,550,000 inhabitants. Two of the largest cities in Norway (Stavanger and Bergen) are located within the area with a population of 130,000 and 280,000, respectively. Otherwise, the study area has a relatively low population density with many small cities in the range of 10,000 to 40,000 inhabitants.

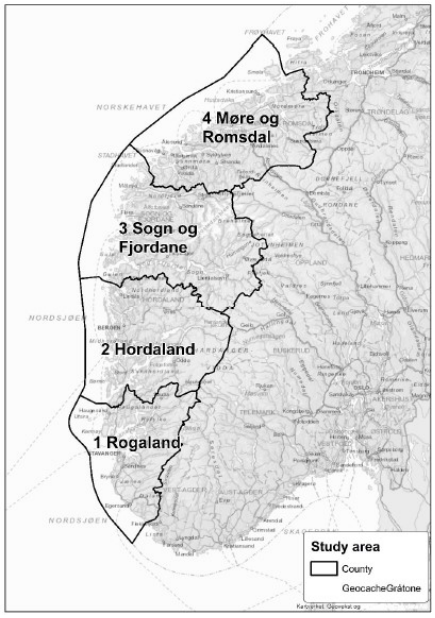

Figure 1. Study area consists of the four counties marked with black

Industries and companies in these four counties generate about half of Norway's traditional export (Statens vegvesen, 2018). This is mainly due to high activity in the fishing, maritime, and oil-related businesses. Characteristics of the four counties are presented in Table 1 (from Statistics Norway, 2016).

Table 1. Description of the characteristics for the five counties analyzed (2017)

	County 1 (Rogaland)	**County 2 (Hordaland)**	**County 3 (Sogn og Fjordane)**	**County 4 (Møre og Romsdal)**
Number of inhabitants	470,000	516,000	110,000	265,000
Workforce in employment	237,000	261,000	55,000	132,000
Unemployment rate	4.7%	3.5%	2.3%	3.4%
Size	9,400 km²	15,400 km²	18,600 km²	15,100 km²

The area is interesting because many transport infrastructure projects are being implemented or are planned to be implemented within the region. These will significantly improve the accessibility between work regions (Statens vegvesen, 2018).

3 Data and firm survey

3.1 Data and measurements

The variables used in this paper to investigate the impact of firm internal and external characteristics in the firm relocation process, are mainly those found relevant in the literature to describe agglomeration and localized network externalities. In particular, the internal firm characteristics used to model the differences between firms are mainly related to firm age, size, salary cost and changes in number of employees. Old, large firms are more likely to have well established networks and customer relations. The need for larger office space or reducing cost is captured in the variables growth or decline in employees. Salary cost per employee gives an indication whether firms with a high salary cost are more likely to relocate than firms with lower costs. The average square metre price for housing values and rent costs for office, industry or retail buildings is added to capture some of the costs of the location chosen. The effective population and employment density are used as indicators of agglomeration. Finally, to measure firm's reluctance for moving to locations further away, we estimate the importance of moving distance. The different variables included in the model are defined in Table 2. These variables were scaled for modelling purposes.

Table 2. Definitions of variables used in the analysis

Variable		Definition
Internal	**Firm age**	Firm age divided into 0-4 years, 5-15 years and 15 years and older
	Firm size	Average number of employees in the firm between 2009 and 2013 divided by 10
	Growth in employees	Positive change in number of employees from 2009 until 2013 divided by 10
	Decline in employees	Negative change in number of employees from 2009 until 2013 divided by 10
	Salary cost per employee	The logarithm of the salary cost per employee (for each firm is computed as the total salary cost divided by the number of employees) divided by 10
External	**Average square metre price for housing**	Average square selling price for housing transactions in the open marked divided by 1000. Data from 2009 to 2013.
	Average square metre rent price for industry, office or retail building	Average square metre rent price from 2010 for in-dustry, office and retail buildings at a municipality level divided by 1000.
	Moving distance	The logarithm of the distance in km along the road network divided by 10
	Localization economies (Effective employment density)	Employment density in sector s in each postcode and a weighted density of surrounding postcodes divided by 1000
	Urbanization economies (Effective population density)	Population density in each postcode and a weighted density of surrounding postcodes divided by 1000

The internal firm data used in this paper are provided by the Brønnøysund Register Centre (Brønnøysund Register Centre, 2018). The data set includes firm localization at a postcode level. The annual update of the firms' data and their detailed geographical level makes the dataset suitable for analyzing their relocation pattern at the disaggregated level. As each urban area consist of several different post codes, each firm will have many different post codes to choose from also within each city.

Only companies that have more than one employee and that have been active throughout the whole period are included in the analysis. Thus, firms that entered or left the market between 2009 and 2013 are not included in the data set. These companies and years were chosen due to data availability. Only firms with 5 or more employees need to register number of employees. Since only firms that have registered number of employees are included in the analysis, there are some small firms which are left out of the analysis.

In this paper, we focus on nine sectors: agriculture/forestry/fishing, manufacturing, construction, transport, retail, hotels and restaurants, public services and business services. These sectors were chosen because earlier research suggest that there are agglomeration differences between them (Graham et al., 2010). In total, approximately 16.500 firms are included in the analysis. The number of companies within each sector and the number of relocated firms are shown in Table 3.

Table 3. Number of firms within each sector

Sector	Number of analyzed firms	Firms that relocated between 2009-2013	Mean moving distance in km, (st.dev.)
Agriculture, forestry, fishing	246	23 (9.3%)	13.9 (29.1)
Manufacturing	1.687	203 (12.0%)	12.9 (17.4)
Construction	1.515	214 (14.1%)	11.0 (12.9)
Transport	1.994	298 (14.9%)	14.4 (29.1)
Retail	1.349	130 (9.6%)	18.0 (37.9)
Hotels and restaurants	741	75 (10.1%)	9.7 (18.3)
Private services	3.399	794 (23.4%)	12.9 (30.0)
Public services	1.633	209 (12.8%)	11.7 (26.4)
No sector stated, or none of the above	3.687	654 (16.6%)	
Total	16251	2.600 (16.0%)	14.0 (29.1)

In total approximately 16% of the observed firms relocated within the five-year period from 2009 to 2013. This is in line with studies done on firm relocations in the Netherlands where it is found that approximately 18% of the firms relocate during a six year time period (de Bok & van Oort, 2011).

Similar to Kronenberg (2013) and de Bok and Sanders (2005), moving distance is used as a proxy for the resistance a firm would have to move to areas further away. Thus, the variable gives indication of the importance of keeping the existing workforce, customers and/or suppliers. The variable also shed light on whether firms are imperfectly informed about all possible locations that they might choose from. The distances are calculated along the road network between post codes and are obtained from a transport model for the area of interest.

3.1.1 Agglomeration measures: Sector specific employment and population density

The agglomeration measure should generally reflect the degree of economic activities in one area as a function of the distance to and from the economic activities in other nearby areas. It should also address how agglomeration effects decay with distance between different areas, suggesting that firms located in close proximity should have a higher weight than firms further away.

To emphasize the importance of transport investments, generalized travel cost is explicitly included in the calculations of employment and population density. Changes in generalized travel cost between postcodes via transport investments are likely to reduce the generalized cost and in turn increase the effective employment and population density.

Equation 2 shows the definition of sector specific employment density which is used as a proxy for localization economies in this paper, which is based on Graham (2007). By differencing between sectors we try to capture the industrial clusters of similar industries in the more rural areas on the western coast

of Norway. The economic activity in postcode i is measured by an agglomeration index for postcode i (EMP_DENS$_i$) as:

$$EMP\_DENS_{is} = \frac{\text{Eis}}{ICi} + \sum_{i \neq j} \left(\frac{E_{js}}{GC_{ij}} \right) \quad (2)$$

Where:

- E_{is} and E_{js} = number of workers respectively in postcode i and j within sector s. The different sectors used is the primary, secondary industry, private services, public services and retail.
- GC_{ij}= general cost of travel between i and j
- IC_i is the internal generalized travel cost for postcode i. It is found by calculating the radius of the postcode and then assuming an average travel speed of 50 km/h.
- $\frac{\text{Ei}}{ICi}$ captures the economic activities in the postcode i
- $\sum_{i \neq j} \left(\frac{E_j}{GC_{ij}} \right)$ captures the economic activity in the neighboring postcodes j

Urbanization economies is related to the benefits of being in cities. Thus, population density is used as a proxy for urbanization economies. To weigh the population density for postcodes in close proximity higher than for postcodes further away, we used an approach similar to the one used in the case of the effective employment density. The effective population density (POP_DENS$_i$) for each postcode i is calculated using equation 3 and is based on Pooler (1987).

$$\boldsymbol{POP\_DENS_i = \frac{POP_i}{ICi} + \sum_{\mathrm{i \neq j}} \left(\frac{\mathrm{POP_j}}{\mathrm{GC_{ij}}} \right)} \quad (3)$$

Where:

- POP_i and POP_j = number of inhabitants respectively in postcodes i and j.
- IC_i and GC_{ij}= have the same definition as in equation (2)
- $\frac{POP_i}{ICi}$ captures the population density in the postcode i
- $\sum_{i \neq j} \left(\frac{POP_j}{GC_{ij}} \right)$ captures the population density in the neighboring postcodes j

3.2 Firm survey

To obtain a better insight into the reasons behind firm relocation, a survey among firms that relocated between 2009 and 2013 was conducted in June 2017. Nearly 200 firms from different sectors were approached and encouraged to complete a five-minute computer-assisted telephone interview (CATI). The complete number of answers was 24, representing a 12% response rate. The low responses rate, also experienced by other researchers approaching companies (Halse, Samstad, Killi, Flügel, & Ramjerdi, 2010), make the results only suitable as an additional information to support the findings in the logit models.

The main reason for relocating was asked together with the consequences of this relocation. These changes could be identified as internal changes such as modification of the firm structure, due to specialization or development of new projects, and revenue changes. Other changes related to contracts with suppliers and transport providers, and relationships to customers and other firms were also addressed. In addition, they were asked about changes in the labour market with regards to the movement of employees and their qualifications.

4 Methodology

A mixed logit model is used to calculate the joint probability that a firm chooses to move and the probability of choosing location *j*. As most discrete choice models, mixed logit are based on the Random Utility Theory (Ortúzar & Willumsen, 2011), which states that an agent *(n)* associates to each alternative *(j)* an index of preference, called utility. It is assumed that the decision maker (individual or firm) chooses the alternative that maximizes its utility, according to the utility maximization rule. Within this context, the firm is the decision-making agent. Our mixed logit model takes the following form:

$$U_{ijn} = V_{ijn} + \varepsilon_{ijn}$$
$$V_{ijn} = \begin{cases} \beta_i & i = j \quad \forall (i,j) \in A_n \\ \beta_{GC} GC_{ij} + \sum_s \beta_S S_{ns} + \sum_t \beta_Y Y_{nt} + \sum_k \sum_s \beta_{XS} X_{jnk} S_{ns} + \eta_n & i \neq j \quad \forall (i,j) \in A_n \end{cases} \tag{4}$$

where U_{iin} is the utility of not moving and U_{ijn} is the utility of moving from i to j. X_{jnk} is the set of external characteristics of the firm n, whose effect is estimated specific for Sectors (S_n) and β_{XS} is the corresponding vector of coefficients. Y_{nt} is the set of internal characteristics of the firm n, and β_Y is the corresponding vector of coefficients; β_i is the alternative specific constant (ASC) that is included only in the not moving alternative because the choice set (A_n) of the destinations available to each firm is defined randomly (see next section). η_n is a random term, distributed Normal $(0,\sigma_n)$ that accounts for correlation among moving options, while ε_{ijn} are the typical EV1 error terms. To test the robustness of the model, we estimated the same model as in equation (4) where η_n was included in the degenerated nest $(i=j)$. The results obtained are equivalent.

Integrating over the ε_{ijn} the typical MNL is obtained, conditional on the realization of the distribution of η_n. The unconditional probability is given by:

$$P_{ijn} = \int_{\eta_n} \frac{\exp(V_{ijn}(\eta_n))}{\sum_k \exp(V_{ikn}(\eta_n))} d\eta \tag{5}$$

Models are estimated using PythonBiogeme (Bierlaire, 2016).

4.1 The choice set definition

A practical problem with the ML is to define the choice set because the number of possible locations a firm can choose from is quite large. Hence, the computable effort to calculate the vector of parametres is considerable. McFadden (1978) proved that this problem could be adequately handled by including the chosen alternative and some other randomly selected alternatives. This only applies when there is no correlation between the alternatives and the selection of the alternatives are randomized. After McFadden (1978) pioneering work, a further extension (Keane & Wasi, 2012) showed that the effects of violating the criteria of correlation between the alternatives is not large, but it is essential to keep the selection of alternatives randomized. Moreover, Guevara and Ben-Akiva (2013a, 2013b) showed that the Naïve (independent from the sample protocol) "method for sampling of alternatives in Logit Mixture models implicitly considers an approximation that achieves consistency, asymptotic normality and relative efficiency."

A choice set generator was used to randomly identify for each firm the choice set, i.e., the 10 possible locations, alternative to the current one (i.e., the location before the decided to move or not). 50 random samples were generated varying randomly the choice set for each firm. Mixed logit models were estimated for each samples and results averaged over the 50 samples. Figure 2 illustrates the correlation

structure of the models estimated. Alternative 11 represents the chosen alternative of all firms that do not move, irrespective from the exact postcode where they are located. Alternative 1 to 10 represent the possible alternatives for all firms that relocate. There is no correspondence between the number of the alternative and the exact relocation zone. Thus, the probability of choosing alternative 11 is the probability of not moving while the probability of choosing alternative 1-10 is the probability of moving.

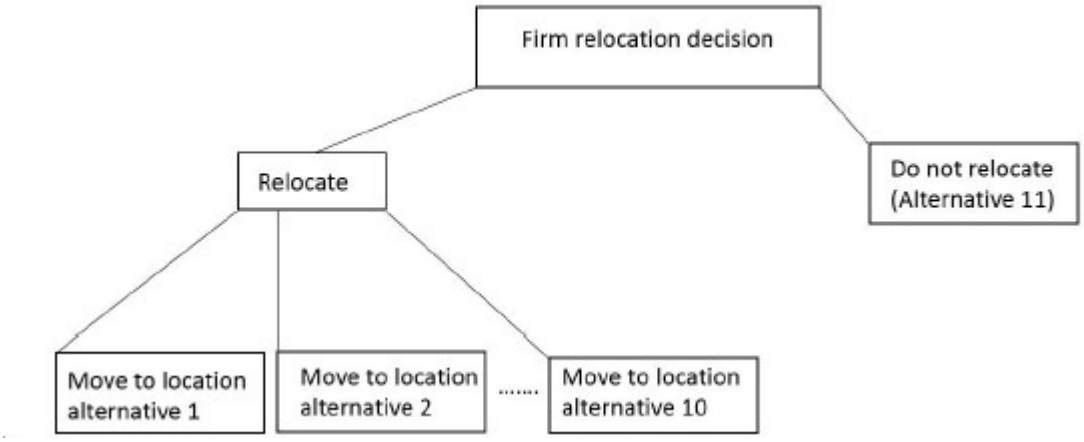

Figure 2. Structure of the firm relocation mixed logit model

Given the large number of observations it was possible to estimate a model based on a random sample of 80% of the data set. The remaining 20% was used to validate the model.

5 Results

Table 4 reports the model results for the ML model discussed in the previous section. The first two columns report the estimated coefficients and the t-tests averaged across the 50 samples. Following Cherchi (2017), the last two columns report instead the standard deviations of the estimated coefficients and the t-tests across the 50 samples, which tells for each coefficient how close/disperse are its estimations across the 50 samples. We first note that all the parametres have the expected sign, and most are highly significant. In particular almost all the internal characteristics of the firms (with the exception of employment growth) have a negative sign. This indicates that older, larger firms are less likely to move while firms that experience changes in number of employees are more likely to relocate. Furthermore, positive values of population and employment density indicate that firms are pulled towards areas that typically benefit from agglomeration externalities. The sectors agriculture and fishing were excluded from this analysis due to few observations. Positive values for the different sectors indicate that the probability of moving is higher than manufacturing while negative values mean the opposite. Manufacturing is used as a reference group. Finally, we note that the correlation coefficient among possible location alternative is not significantly different from zero at 5% significance, indicating that in our context there is no correlation among the options of relocating versus no-relocating.

Table 4. Estimated parametres for where to relocate and whether to move (robust t-test are presented)

Attributes	**ML**		**Standard deviation**	
	Estimates	**t-stat**	**Estimates**	**t-stat**
ASC - no move	5.366**	12.05	0.13	1.01
Firm internal characteristics				
Firm age between 0 and 5 years (reference group)	-	-	-	-
Firm age between 5 and 15 years	-0.227**	-3.37	0.02	0.17
Firm age from 15 years and older	-0.559**	-6.61	0.04	0.81
Employment growth	0.028	1.88	0.01	0.13
Employment decline	-0.035	-1.41	0.01	0.12
Salary per employee	-0.290	-0.93	0.04	0.13
Firm size	-0.006	-1.35	0.00	0.08
Sector type:				
• Manufacturing (reference group)	-	-	-	-
• Construction/ transportation/business services	0.376**	4.32	0.05	0.52
• Hospitality/retail/public services	-0.187	-1.62	0.06	0.40
Firm external characteristics				
Localization economies, sector specific employment density	0.066**	2.99	0.01	0.22
Urbanization economies, population density	0.038**	6.63	0.00	0.35
Average square metre rent price for industry buildings	-0.400**	-2.15	0.00	0.26
Average square metre price for housing	0.079**	15.37	0.01	0.32
Moving distance in kilometres along the road network				
• Manufacturing/Construction/Hospitality/ Retail/transportation	-0.979**	-6.17	0.10	0.58
• Business services/public services	-0.188	-1.15	0.14	0.82
Correlation among relocation options	-0.319	-0.76	0.41	0.71
Final log likelihood	-7498			
Rho(0) square	0.712			
Number of observations	10999			
Number of draws	1000			

** Significant at 99% confidence level, * Significant at the 95% confidence level

5.1 Model validation and prediction abilities

The validation process is crucial to assess the quality of the models estimated (Ortúzar & Willumsen, 2011). However, it is often neglected in transportation related studies (Mabit, Cherchi, Jensen, & Jordal-Jørgensen, 2015). In this article we have used a hold-out sample of 20% of the total observations to check if the model estimated was able to predict the choices made by the firms in the hold out sample. In particular, following Mabit et al. (2015) we computed the rho square (Rho2) and the Akaike Infor-

mation Criterion (AIC) using the hold out sample to evaluate the model fit, i.e., how well our model explains the relocation choice of the firms. In order to evaluate the model's predictive power we computed the First Preference recovery (FPR), the chance recovery (CR) and the expected recovery (ER) (Ortúzar & Willumsen, 2011). FPR is the proportions of agents choosing the option with the highest utility. CR is computed as 1 divided by the number of alternatives in the choice set, while ER is defined as:

$$ER = \frac{1}{N}\sum_i p_i^{max} \tag{7}$$

where N is the number of observations and p_i^{max} is the maximum predicted probability of the alternative i in the choice set. In general, the model is reasonable and informative if the FPR and ER values are similar and larger than CR. As the main interest is to check how well the models performs FPR, CR and ER are calculated on the hold out sample rather than the data sample used for estimation. This novel approach is not common in the literature. However, it highlights exactly the predictive power of the model estimated.

The probabilities of the different alternatives were computed disaggregate for each firm, using the coefficients estimated in Table 4. For the ML model the values of η were simulated using Mont Carlo simulation with 1,000 draws assuming a normal distribution with mean equal 0 and standard deviation 0.3.

Table 5. Model validation and predictive power of ML

	ML (full sample)	**ML (hold out sample)**
Number of observations	10999	2751
Final loglikelihood	-7498	-1993
Rho(0) square	0.71	0.70
FPR (all firms)	86%	85%
CR (all firms)	9%	9%
ER (all firms)	86%	86%
ER (all firms), s.e	1%	1%
Model simulations:		
Correct firm relocation	257 out of 1565	71 out of 350
Correct staying	8130 out of 9438	1988 out of 2330

The model validation shows somewhat similar results as the estimated model. Regarding the FPR values the utilities for staying/not moving is highest for all observations. As the FPR and ER values are similar and substantially larger than CR values, the estimations indicate that the model is informative and reasonable and confirms that the validation subsamples are consistent with the model.

6 Discussion

Few studies have investigated firm relocation (van Dijk & Pellenbarg, 2017) and especially in a more rural context and using mixed logit models. The main purpose of this paper is to contribute in filling this gap by investigating 5 hypotheses related to firm relocation in a rural context in Norway.

Hypothesis 1: Older firms are less likely to relocate than younger firms.

Yes. The results in Table 4 indicate that the probability to relocate decreases with firm age. Firms in the range 5-15 seem to have higher probability of moving than firms older than 15 years. The parametres are significant at a 99% confidence level. These findings are in line with other empirical studies and our expectations (Brouwer et al., 2004; Kronenberg, 2013; Weterings & Knoben, 2013). Older firms might have more established customer relations and be larger in size making it costlier to relocate. Furthermore, older firms might also be in a more optimal location as they might have relocated earlier.

Hypothesis 2: Large firms are less likely to relocate than smaller firms.

Uncertain. The results in Table 4 suggest that the probability to relocate decreases with firm size. However, the coefficient is not significant at a 95% confidence level. Firms that experience a growth or decline in the number of employees have a higher probability to relocate than firms that do not. A growth in number of employees is likely to affect the need for office space, and thus also the probability of staying in the location they currently are located in. This variable is significant at a 90% confidence interval. This is supported by findings in studies in the Netherlands (Kronenberg, 2013; Weterings & Knoben, 2013). More than half of the interviewed firms (14) decided to relocate mainly due to a need for more office space.

Hypothesis 3: The relocation probability varies across sectors.

Yes. The results in Table 4 indicate that the relocation probability varies across sectors. Firms within the manufacturing, public services, retail and hospitality sector seems to have the lowest probability of relocation, while firms within business, transportation and construction services are the most mobile.

Restaurants, shops and hotels (hospitality) might have substantial moving costs due to high sunk costs and capital assets. They also might be highly dependent on local market. Firms within business services, on the other hand, seem to be more mobile. These firms might be in need for more specialized labor, a wider customer marked, and might have lower moving costs. These findings are line with studies done by Weterings & Knoben (2013).

Hypothesis 4: Firms will try to relocate to areas with a high employment and population density.

Yes. The results in Table 4 indicate that firms prefer localizations in close proximity to other firms within the same sector as the variable localization economies is positive and significant at a 99% confidence interval. The variable can serve as an indicator of the importance of agglomeration benefits through localization economies and is significant across all sectors. Typical benefits of having firms in the same sector in close proximity are reduced search costs for finding suitable employees, specialized suppliers, reduced training costs and more specialized labour. The importance of access to skilled labour has been highlighted as the most important factor in the relocation process by KPMG (2016) and localization economies has been found to a significant variable in other empirical investigations (de Bok & van Oort, 2011; de Bok & Sanders, 2005).

The results also suggest that urbanization economies have a positive impact in the firm relocation process. The variable is significant across all sectors suggesting that urbanization economies is an im-

portant factor in the firm relocation choice. Likewise, the variable of square metre price for housing is significant, indicating that higher prices for housing increases the probability of a firm moving to that area. Following Fujita and Ogawa (1982) and Combes, Duranton, and Gobillon (2019) housing costs can be seen as a the willingness to pay for agglomeration benefits. If an area is attractive and growing people are willing to pay more to live there. This in turn can attract highly skilled labour making the area attractive for certain types of firm location searching for a more specialized labour force and potentially higher paying customers for the merchandise they sell (Gleaser, 2010). Thus, the variables urbanization economies and housing prices may indicate benefits of being in urban areas.

The average square metre rent cost of the chosen location seems to have a negative impact on the location choice. This seems to hold across all sectors. The highest rent costs are typically in inner-city areas, and firms that need large areas to operate their business are pulled towards lower density areas.

Six of the interviewed firms stated that reducing the distance to clients was one of the main reasons for relocating. Slightly under half of the interviewed firms (10) experienced an improvement in the relationships to other companies. In contrast, almost all interviewed firms (21) stated that they did not experienced an increase in competition with other firms after relocation.

Hypothesis 5: Firms are more likely to relocate to areas in close proximity to their prior location.

Yes. The results in Table 4 show that most firms prefer to move short distances. This suggests that it is important for relocating firms to keep their existing workforce and customers/supplier relations. Firms within the business and public services seem to be most mobile, while companies within hotel, restaurants, transportation, manufacturing and construction seem to be most reluctant to move longer distances. Firms within business services might have a larger market and the moving costs might be lower than for many of the other sectors. These findings are in line with expectations and findings in other studies (Bodenmann & Axhausen, 2012; Geurs, Zondag, de Jong, & de Bok, 2010).

6.1 Policy implications

A key goal for many public policy's is to increase the competitiveness for local industries and make the areas more attractive for firm location and development (Deparment for Business Energy & Industrial Strategy, 2019; Vickerman, 2016). Transport investments is seen as a policy that can make areas more attractive and are often proposed on that basis. In Norway, a new road along the western coast is proposed on the very idea that this road will make the areas more attractive for firm location and trigger population growth. The estimated cost of the project is 34 billion EUR (Statens vegvesen, 2018). The project will connect many rural areas to more urban areas and increase the overall accessibility in the region. However, little is known about how these changes in accessibility will affect the relocation pattern for companies. To ensure that the policies proposed are effective research is needed to get a better understanding of the drivers behind firm relocation.

The results from this investigation indicate that employment and population density are important variables in the firm relocation process. To which degree a transport investment affects the firm location probability, depends on the degree a transport investment changes the generalized travel cost to other areas, and the employment and population density in these areas. As firms are likely to relocate relatively short distances, it is essential that the area that gets the transport investment is in close proximity to other firms to be attractive. For example, an island that gets a fixed link connection to the mainland would have a higher probability of attracting firms from the mainland if the employment and population density on the mainland is high.

6.2 Limitations and further research

The model estimated in this paper gives an indication of the importance of localization attributes that are affected by transport investments. A logical next step will be to try implementing the results from this study and to estimate possible firm relocation changes in projects to get a better understanding of the method. This paper is the first step in such a process, but further research is needed to develop methods to implement in a land- use transportation (LUTI) model context.

The choice of where to relocate is highly complex. The parametres calculated are based on input variables thought to be important in the firm relocation process. Including other firm internal characteristics might further benefit the model estimation, as Brouwer et al. (2004) show that merger, acquisitions and take-overs are important factors in terms of reasons for firm relocation. Other variables as construction costs or space availability are also found to be important parts of the location choice (KPMG, 2016). However, such data was not available for this study, and is left for future research.

Earlier research suggests that the parametres estimated seem to be somewhat dependent on the choice set defined in the model (Elgar, Farooq, & Miller, 2009). Another possible direction of further research might be exploring more the impacts of the choice set definition on the estimation of the coefficients.

The data set used in this article made it difficult to study firm relocations within each postcode. This is a limitation, as there could be firms relocated within the postcode but were not accounted for in the estimates.

7 Conclusion

The relocation pattern of firms is essential to understand the economic development within a region. By empirically investigating the factors affecting the decision to move and where to move this article adds to the scarce literature on firm relocations. The results indicate that internal as well as external factors are important in the decision to move and where to move.

The probability of moving seems to decrease with the size and age of the firm. As the firm grows or age it is more likely to have established customer relations and the moving costs might be higher, making it less beneficial to relocate. Firms that experience changes in the number of employees on the other hand are more likely to relocate. However, the firm relocation probability seems to vary between sectors and some sectors seem to be more mobile than others.

When a firm decides to move it seems to be pulled to areas in close proximity to its original location in order to keep the existing employees, customers and suppliers. The results indicate that firms prefer areas with good access to skilled and diverse labour marked and are pulled towards larger markets often found in urban areas. This is supported by positive and significant variables of the housing prices and urbanization economies. Both highlight the importance of being located in an urban areas and the benefits from agglomeration. To sum up, the results from this investigation indicate that young firms in construction, transportation or business services move relatively short distances to areas with higher employment and population density, with low rent prices and high housing prices in order to benefit from agglomeration benefits. Larger and older firms seem to more reluctant to move. This seems to be especially true for the firms within the hospitality, retail and public sector.

The policy implications of these results are that cautions should taken in expecting that policies, such as transport investments, will have a substantial impact on the attractiveness of firm relocation. As most of the firms move short distances and relatively seldom the probability of experiencing a substantial growth in businesses for areas that get a transport investment might be minor. For that to happen, the

changes in accessibility made by the transport investment must be substantial, and it must be in close proximity to areas with higher densities of employment and population such as cities.

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