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Investigating the relevance of market size and regional
hierarchy

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Abstract

This paper investigates returns to location in the retail sector and further analyzes the systematic variations across central and peripheral retail markets, as well as across different types of retailing activities. The empirical design utilizes individual level data, where the earnings of individuals working in the retail sector are used as a proxy for retail performance, which allows for a comparison across different types of retailing activities, although the sector as a whole is highly heterogeneous. In order to capture the urban-periphery interaction in retail markets, an accessible market potential measure is used, which allows for capturing the impact from potential demand in close proximity, in the region and from outside of the region separately. In the analysis, the impacts of spatial, store, and individual characteristics are analyzed for four types of retailing activities: food retailing, clothing, household retailing and specialized stores. The results are in line with previous theoretical arguments that rely on traditional location theories. There is a distinct variation between urban and peripheral retail markets, as well as between different types of retailing activities. Market size in close proximity is found to play an important role for stores selling goods for frequent purchase, whereas the relevant market extends beyond municipal borders for retailers selling goods for less frequent purchase. The competition effect is evident for non-central markets, driven from close proximity to large central markets.

JEL Codes: L81, D31, E24, P25

Keywords: urban hierarchy, market accessibility, retail sector, location premium

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1. Introduction

Retailing constitutes a large share of the overall economy in almost all countries in the world. Yet, there is limited research on the sector as a whole where the entire market is taken into account. Specifically, research on various aspects of retail location is mostly limited to case studies and limited geographical units, neglecting the relevance of overall spatial and sectoral conditions. Although the retail literature derives from various disciplines, the consensus is that retailing is heavily dependent on proximity to large enough demand. From a regional economics point of view, we know that the demand inflow to a spatially limited market plays an important role for the presence and the scale of retail clusters. What is overlooked in the previous literature is that the demand inflow to a market is not only dependent on its size, but also its place in the regional hierarchy. This implies that it is not only the size of the market that matters for the retail sector, but also the respective market's place in a hierarchical order in the system of regional markets. Traditional location theories suggest that demand flows from peripheral (non-central) markets towards the central market in the same region, but usually not the other way around (Christaller, 1933; Lösch, 1940, Haig, 1927). While taking the absolute market size into account, existing empirical studies often neglect this type of urban-periphery interaction and its possible implications. What is particularly important for this paper is that the market's place in the regional hierarchy should not only affect the presence and the scale of retailing, but it should also matter for retailers' performance. Thus this paper mainly seeks for an answer to the following question: *"Are there systematic variations between central and peripheral markets when we investigate returns to location in retail sector?"*. Identification of the determinants are done based on their attributes, and the paper proposes several explanatory variables nested under the following categories: *place in the regional hierarchy, regional attractiveness, and labor market characteristics*. Also, *store characteristics* and *individual characteristics* are controlled for in the analysis.

The paper also extends the conversation on the returns to market size and place in regional hierarchy for different types of retailers. The location patterns of stores that are engaged in different kinds of retailing activities vary significantly depending on the type of service or good they provide. Previous literature points out that for different types of retailing activities, dependence on proximity to -and scale of demand varies significantly (Dicken and Lloyd, 1990). People's willingness to travel further distances to patronize a retail market is not the same for all kinds of goods and services they purchase. Although this kind of variation is acknowledged and discussed in depth in the previous literature, empirical applications are limited, and its relation to retailers' gains is understudied. The main reason is that any comparison across different types of retailing is a challenging task, given the heterogeneous nature of the sector. The empirical investigation carried out in this paper uses the finest level of aggregation in the economy, individual earnings, to address this question. Using individual earnings is an attractive property of the empirical design, since it allows for such a comparison. Rather than bundling together all different kinds of retailing activities with heterogeneous features, the analysis decomposes the sector based on the variation in the spatial pattern of different types of retailing activities: *Food, Clothing, Household, and Specialized*.

Economic actors, firms or individuals, are found to perform better in dense and agglomerated places. The proposition that density is positively associated with the productivity of individuals, and entities in which individuals create economic value together with other forms of production factors, is not a recent one. Over two centuries ago, Adam Smith (1776) already points out the relative importance of internal scale for productivity, whereas a century ago Marshall (1890) deliberately discusses the positive externalities that are the result from the external scale of the market. However, when we look at the literature that deals with the quantification of the impact from the market scale on productivity levels, we see a rapid development only over the past few decades. Puga (2010) classifies this new trend for empirical research in the urban economics literature, dealing with ‘returns to market scale’ under three main bullet points. The first stream of literature is focusing on a commonality, showing that highly productive activities are ‘*clustered*’ in space. The second stream of the empirical literature in Puga’s classification investigates the ‘*pattern*’ in the density-productivity relation by looking at wage levels and/or land rents. Finally, the third approach focuses mainly on the ‘*systematic variations*’ in productivity across space (Puga, 2010).

In broad strokes, this paper positions itself within a framework where the systematic variation in returns to market scale is captured via looking at the ability of an establishment to pay higher wages (premium). The contribution of the analysis, however, is that it specifically deals with an economic activity that is heavily bounded by the proximity to the market and a sufficient size of demand, and heavily heterogeneous: Retailing. What makes the retail sector especially suitable for this framework is the strong influence of market size and proximity to potential demand. This strong dependence is due to the fact that the consumption of retail goods either occurs where a retail service is provided, or in very close proximity to that point. Any reallocation of individuals and households between regions would therefore be expected to influence retail geography.

The empirical analysis utilizes individual level data from Sweden for the years between 2002 and 2008. The country constitutes a homogenous market as a whole, with relatively small regional variation in incomes. Almost all Swedish regions are monocentric, with one central municipal market surrounded by several peripheral ones. Being a heavily unionized economy as a whole, most retail workers belong to the same union, the impact of which doesn’t vary across regions either. Together with the unique qualities of the data, and the characteristics of the country in question, the paper provides a rather robust analysis.

Besides being one of few empirical attempts to identify the returns to market scale for retail, this paper contributes to the existing literature by assessing this relationship where urban-periphery interaction and variation within the sector are accounted for. The findings from the empirical analysis are in line with the theory. There is a significant and systematic variation across different types of retailing activities, as well as across central and non-central retail markets, when we look at the returns to market scale. Impact from the potential demand in the immediate market is found to be important for the performance of the stores selling goods for frequent purchase, whereas this dependence is not evident for stores selling mostly household goods (e.g. furniture, electronic goods, etc.). A competition effect that is driven by higher

accessibility to the markets in the same region is evident in non-central retail markets for most of the retailing categories in question. The relevant market boundaries are also found to vary systematically across different retailing activities, where retailers selling mostly durables are dependent on the larger market area.

1.1. Outline

The paper proceeds with the theoretical framework, where retail location, returns to market scale, and its relevance for retail productivity are explained. Further, the way market scale is measured is outlined in detail. Later, a section on the empirical design is presented, under which information on data, variables, method, as well as the results from the empirical analyses are available. The paper concludes with a discussions of the findings.

2. Theoretical Framework

2.1. Retail location

Retailers specialize in providing services that consumers and producers find useful; such as a range of goods, convenience shopping, customer service, packing and credit facilities (Johnston et al., 2000). One particular characteristic of retailing as an economic activity is its strong sensitivity to location. Due to the nature of economic activities carried out in retail establishments, one is likely to find these establishments in (or close to) the center of the city regions. One concrete explanation to this commonality is that the transactions in the sector often require face-to-face interactions between buyers and sellers. Although we have observed a significant increase in online shopping over the past decade, the retail sector across the world is still dominated by offline stores (Birkin et al., 2002)

A large body of literature utilizing traditional location theories discusses location pattern of retail stores. Classics, like Reilly's (1929) "*law of retail gravitation*", introduce the idea that the demand flow between retail markets is associated positively to the sizes of the markets and negatively to the distance between them. Following this gravitational approach, various researchers aimed to determine retail market boundaries (Converse, 1949; Huff, 1964). The flow of demand between marketplaces has been at the core of the literature that deals with the hierarchical system of places. Research on retail location points out the regional hierarchy between retail markets where the demand for services attenuates as we move from core to periphery based on the '*Central Place Theory*' framework of Christaller (1933) and Lösch (1940) (Berry, 1967; Berry and Garrison, 1958a; 1958b; Applebaum, 1974).

As a complementing approach, *Bid Rent Theory*³ argues that the central markets are allocated to the activities that can pay the highest rent (Haig, 1927; Scott, 1970; Johnston, 1973). According to the theory, different kinds of retailing activities should then be distributed across space with respect to the required intensity of interaction between buyers and sellers (Kivell and Shaw, 1980).

On the importance of location for retailers, Hotelling (1929) argues that firms selling alike products tend to cluster in the center to benefit from the scale of a given market (Hotelling, 1929). Artle (1959) investigates six retail activities for the Stockholm metropolitan region, highlighting the importance of proximity between suppliers and purchasers. Although clustering in retail is a common phenomenon, it is worth noting that significant differences in the degrees of these retail clusters are observed with respect to the type of the specific retailing activity (Kivell and Shaw, 1980). Higher order retail activities are known to have the tendency to cluster more than lower order retail activities³. (Dicken and Lloyd, 1990).

Although central place theory suggests that distance is the fundamental factor behind the demand for retail markets, today it is easy to see many consumers travelling further distances to patronize retail markets other than the ones that are located nearby regardless of the similarities in market scale. Despite the highly distance dominant propositions of the central place theory, *Spatial Interaction Theory* suggests that the attractiveness and the surrounding environment of the retail location might outweigh proximity in some cases (Haynes and Fotheringham, 1984; Fotheringham and O’Kelly 1989; Reilly, 1929, 1931). Previous empirical research has shown that shoppers do not always patronize the nearest center where they can find a particular good or service (Rushton et al, 1966; Clark, 1968). Multipurpose shopping is found to motivate customers to travel to a range of locations, depending on the good or service they are looking for (O’Kelly, 1981, 1983; Thill and Thomas, 1987; Johnston and Rimmer, 1967; Craig, Ghosh and McLafferty, 1984). Hence capturing a precise impact of market scale on retailer’s performance requires isolation of the impact from the ‘attractiveness’ and retail concentration of the location in question. The idea is that the attractive attributes of a region creates a competitive power. This kind of impact is also taken into consideration in the empirical application of this paper.

2.2. Returns to market size in retail

Returns to location is not a recent subject of study. Numerous scholars have addressed the causes of agglomeration economies and returns to the agglomerative forces. In a nutshell, agglomerative forces are found to provide more efficient facility and supplier sharing, greater individual specialization, bigger labor pool and hence better labor matching opportunities, which all together add up to more productive processes. Besides these well-known advantages, retail has additional distinct aspects that can benefit from market scale. One of the arguments raised in this paper is that individuals working in the sector have

³ High order retailing means shops selling products for less frequent purchase that are often more expensive and durable. Whereas low order retailing implies the sale of goods for frequent purchase. A corner convenience shop is a typical example for a “low order” retailer, whereas stores selling clothing or technological equipment can be considered to be “high order” retailers.

greater incentive to increase their performance in order to enjoy sale-based bonuses, which then are not equally common in every type of retailing activity. Another argument is that two individuals with similar job definitions in the same type of retailing activity would still be engaged in different sets of tasks in the markets of different scales. This may imply a tendency to be more productive (or competent) in denser market places given retailers and their employees engage in more complex and intensive tasks. Stores located in larger markets should also have the cost advantage to provide additional services and in-store elements, which may result in higher price levels.

There are three main micro foundations of agglomeration economies as explained by Duranton and Puga (2004), namely sharing, matching and learning. Sharing refers to common infrastructure (Scotchmer, 2002), a larger pool of labor (Marshall, 1890; Ellison et al., 2010), and intermediaries and input suppliers (Abdel-Rahman and Fujita, 1990; Rosenthal and Strange, 2001). Matching refers to the average quality of pairings between employers and employees, businesses, as well as between buyers and suppliers (Helsley and Strange, 1990; Coles and Smith, 1998; Costa and Kahn, 2000). Finally, cities facilitate knowledge spillovers via learning (Glaeser, 1999; Rosenthal and Strange, 2003; Glaeser and Maré, 2001; Duranton and Puga, 2001), and the diverse nature of cities allow for higher level of creativity and productive interaction between individuals (Jacobs, 1969).

How does the location of retailers come into play when examining productivity for this sector? Previous research for many years put a great emphasis on the importance of location decision for retailers as it allows an individual store to capture greater demand in agglomerated market places. Sales related measures have been a popular way to look at performance as they are considered to be the output measures for a retailer, which naturally have the tendency to be higher in bigger markets. Output-to-input ratios and their relevance for retail productivity attracted the attention of researchers (Bucklin, 1980, 1981; Lusch and Ingene, 1979; Ingene, 1982). The traditional approach to rely on output levels as a productivity measure is particularly problematic for retailing activities, given that the sector's response to the changing market circumstances may be very rapid. For example, an increase in demand in the market may not necessarily lead a retailer to become more productive. Its competence to meet the higher levels of demand by increasing output may be irrespective of its increasing operational efficiency. Hiring more labor, and accommodating more inventories may allow a retailer to meet higher demand without implying any improvement on the cost side. Another problem with relying on an input-output related measure for retail is that for retailers both 'input' and 'output' have a different connotation. In the case of manufacturing, for example, what comes into the production process as an input, and what goes out in the end can be identified, thus, quantified in a very straightforward way. However, for retailing, although the goods provided by the shops seem similar to how they are after production in a factory, retailers always alter those products into different commodities with the additional 'service' elements they provide. A piece of furniture sold in a store is not the same commodity, as it is produced in a factory anymore; neither is a box of strawberries sold in a supermarket the same product as it is in the wholesalers cold storage depot.

Depending on the attributes of a store (e.g. customer services, location, and even its atmosphere), pricing of an item may change (Achabal et al, 1984). Also depending on the type of retailing in question, possibilities to embed services to create additional economic value may be limited. This makes using input-output related productivity measures even more problematic for comparison across different kinds of retailing activities.

The aforementioned attributes of retailers that add additional value to a product can be captured by looking at individual earnings, which is also useful for a comparison across activities of different kinds in the sector. Since wage is a function of marginal product of labor times price of the commodity (or service) produced, no employer should be expected to pay more than an employee's economic value creation. Location of the retailer should then have an impact on both the price levels and the scale aspect of production, which may allow higher MPL. Not for every type of retailing, but for some, commodities are sold in different prices in different markets depending on the measures of purchasing power in the market, as well as the scale of demand. Meeting the higher rent costs in bigger cities is one of the motivations for retailers to charge more for what they provide. Also, higher potential demand can allow a retailer to offer customer services with high fixed costs, which would otherwise be too costly to cover in a smaller market. Even when we assume the prices of products to be constant across space, the number of transactions per employee in a store is likely to be higher in a denser market. The complexity of the tasks, then, may require retailers to seek for higher competence in their employees, which then may be reflected in the wage levels. In addition to this reasoning, for some of the retailing activities, sale bonus is also a common phenomenon, which is then also directly linked to the available market demand for a retailer. From a multipurpose shopping trip perspective, having a larger and more accessible market with a greater variety should also imply greater demand for a retailer, the market for the respective retailer being an attractive one for customers to patronize (Johnston and Rimmer, 1967; Craig, Ghosh and McLafferty, 1984). In markets where we observe higher degrees of co-location between different kinds of retailers, hence, we would see a greater inflow of demand.

This paper does not seek to differentiate between the impact from traditional agglomerative forces arising from the scale of the market and those that are exclusive to the retail sector. The variables of interests are the market accessibility measures for different kinds of retailing activities, the impact of which can be various once decomposed. By the introduction of other sets of variables, the analysis aims to control for the possible determinants of performance returns in space other than accessible market size. However, even then, this paper acknowledges that what is contained in the relation between the size of accessible market and productivity may vary. The analysis tries to capture the systematic variation in this relationship rather than identifying the exact sources of the return. A significant share of this impact from market scale may or may not be driven by the traditional aspects of agglomeration. As it tries to capture the urban-periphery interaction, it doesn't only examine certain attributes of a retail market separately, but also investigates the relevance of a market's rank in the regional hierarchy. Hence, the agglomeration effects

should work for the entire region because the region is the 'Local Labor Market'. On the other hand, the effects from the scale of market demand should be different for different markets in the same region, depending on their places in the regional hierarchy.

2.3. Accessible market size & place in regional hierarchy

The way market potential is measured and introduced to the analysis in this paper constitutes the foundation for its contribution. It allows observation, not only of size effects, but also of the interaction between urban and peripheral retail markets. Many regions consist of one or several central market places surrounded by smaller peripheral markets. Central markets are expected to play a more influential role in the supply of consumer services, as well as many other economic activities that require intensive interaction between economic actors, while the individuals from peripheral markets can be expected to commute to the core in order to consume what is available in the center. This paper uses a central vs. non-central municipality division for Swedish regions. This division is not only relevant for the way the empirical analysis is conducted, but also relevant for the way the market potential measures are constructed.

The basis of central and non-central municipalities in a Swedish context is based on integrated labor markets. Municipalities that are integrated in terms of commuting constitute a functional region, which also corresponds to a local labor market. There are 81 local labor markets in Sweden with one central municipality in the core of each. This implies that economic activity within a region is more intensive than it is across regions (Johansson, 1997). This is one of the advantages of using Swedish data for the respective research questions thanks to the mono-centric nature of the Swedish regions which allows for a coherent investigation on urban-periphery interaction. As discussed previously, this kind of urban-periphery relation is particularly important for retailing, where the importance of proximity to the central market differs based on the type of retailing activity in question.

Market potential is a measure for the magnitude of economic concentration and network opportunities within and between regions (Lakshmanan and Hansen, 1965). Johansson and Klaesson (2007) shed light on the ways to distinguish between internal and external market potentials of functional regions, given that different type of goods and services have different levels of interaction-intensity, meaning the intensity of interaction between buyers and sellers. Karlsson and Johansson (2001) also mention that interaction-sensitive goods and services have the distance-sensitive transaction costs that rise sharply when these transactions take place between regions rather than within regions.

The study employs each Swedish municipality's accessibility to wage sums as a proxy for the total demand in a market. Calculations are done based on the earlier work of Johansson, Klaesson, and Olsson (2002), which is further developed in Johansson and Klaesson (2011), where they investigate the agglomeration

dynamics of business services. Total market accessibility of each municipality is divided into three parts as shown below;

$$S_a^{tot} = S_a^M + S_a^R + S_a^E \quad (1)$$

In equation-1, S denotes size of the market, then S_a^M denotes intra-municipal market size, S_a^R intra-regional, and S_a^E extra regional market accessibility for a given municipal market, a . What is meant by intra-regional in this context is the accessibility from one to the other municipalities within the same functional economic region (FER).

The summation in the equation is not considered to be the relevant measure for an individual municipal market. It gives us the *total* market potential. This reflects the fact that different municipalities compete for consumers within the same geographic footprint. It is argued that the influence of the three components in the given equation differs for different municipalities. The relative size of these components is used to provide different types of municipalities. Assuming $N = \{1, \dots, n\}$ to be the set containing all municipalities in an economy and R denoting a local labor market employing several municipalities (N) within, we can say that $R \subset N$. Then $R_{-a} = R \setminus \{a\}$ denotes the municipalities in region R excluding the given municipality a . Finally $W_{-R} = W \setminus R$ denotes all municipalities in that economy excluding the ones in R .

Municipal market size:	$S_a^M = W_a e^{\{-\lambda_M t_{aa}\}}$
Regional market size:	$S_a^R = \sum_{R-a} W_R e^{\{-\lambda_R t_{aR}\}}$
External market size:	$S_a^E = \sum_{N-R} W_N e^{\{-\lambda_N t_{RN}\}}$

W in the formula stands for the wage sums in a given municipality, a . travelling time by car between two given municipalities is represented by t , and as a time distance decay parameter, λ is used. For each geographic aggregation level, λ takes on a different value⁴. The values are calculated by Johansson et al. (2002) by using Swedish commuting data.

Utilizing distance decay is an efficient way to control for spatial dependencies, as well as a superior way to capture the actual scale impact since it allows us to account for spatial continuum (Andersson and Gråsjö, 2009). The figure below represents the three components of the market potential measure, where a is a

⁴ λ_{aM} , for intra-municipality 0.02, λ_{aR} (intra-regional) 0.1, and for the λ_{aN} (extra-regional) 0.05

municipality located in a region R , which then is contained in the greater Swedish market, N . Using the time-distances in combination with the distance decay parameter and wage sums gives us a unique total market potential value for each municipality in the economy as explained above.

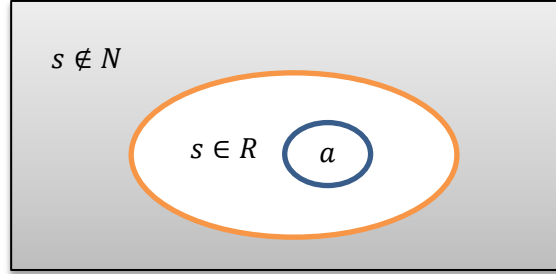


Figure-1: Market potential divided into three parts

The impacts driven from the market accessibility variables are expected to differ between central and non-central market places, as well as between different types of retailing activities in question. For example, one of the hypotheses based on the theory can be that we should see a positive and significant impact from municipal market accessibility on the individual wage levels in all types of retailing activities, and both in central and non-central markets given the arguments for the proximity to demand. This kind of impact, however, may or may not be significant, and may or may not be positive with the regional market accessibility and the external market accessibility depending on the type of retailing activity, as well as the place of the respective municipality in the hierarchy of regions.

In the case of a retailer selling goods for frequent purchase (e.g food retailing), there is no reason to assume a significant impact from the regional market, and if there is any significant impact, its magnitude then should be negligible. If it is a retailer selling durables (e.g electronics, furniture and household appliances), we can then expect a negative impact from the regional market accessibility in non-central markets, whereas this impact should be positive for central markets. As explained previously, we assume the municipalities in the same region to be in competition for the same pattern of potential demand. Hence, if a central market place is large and accessible enough, the flow of demand would be from the periphery (non-central municipality) towards the central market place. In contrast, due to the competition effect imposed by the large and highly accessible central market, regional market accessibility may then have a negative impact in a non-central market that is located in the same region as the central one, because of the outflow of demand towards the central retail market.

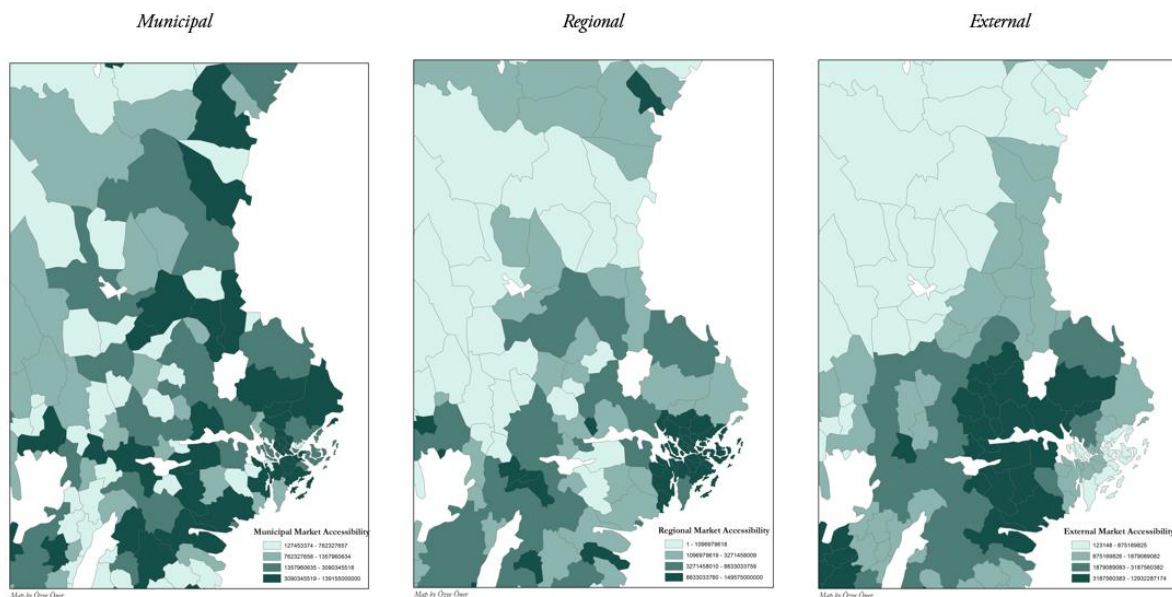


Figure-2: Accessible market size measures for Swedish municipalities: *Municipal, Regional and External*

In Figure 2, we see three maps for the three accessible market size measures that are scaled to the Stockholm region and the surrounding municipalities. The municipal market size is much more dispersed than regional and external market size. The first map shows the market size in the immediate surroundings, whereas the second map tells us how much market size a municipality has corresponding to the respective region. The last map shows the market potential that extends beyond the region a municipality is hosted in.

Another aspect of place in regional hierarchy relates to specialization. One way to capture the relative importance of specialization in retail is to look at the degree of concentration of the sector with respect to other economic activities. A market may be relatively small in size but may still exhibit a considerable degree of concentration of a given sector with respect to the other economic activities. Location quotients (LQs) are simple, yet a rather straightforward way to capture the relative importance of a sector in a geographically delimited area. Below, we see a Swedish map where the municipalities are shaded according to the LQ values⁵ for the retail sector. Those that are colored red have a LQ higher than 1, meaning retailing is one of the basic (exporting) sectors in the respective municipalities.

⁵ Location quotients used in the map are from 2008.

The calculation of the location quotient is as follows: $(E_{r,i}/E_i)/(E_r/E)$

where E is the total employment in the country, E_i is the total employment in region i . $E_{r,i}$ denotes employment in the retail sector in region i , E_r denotes the total employment in retailing.

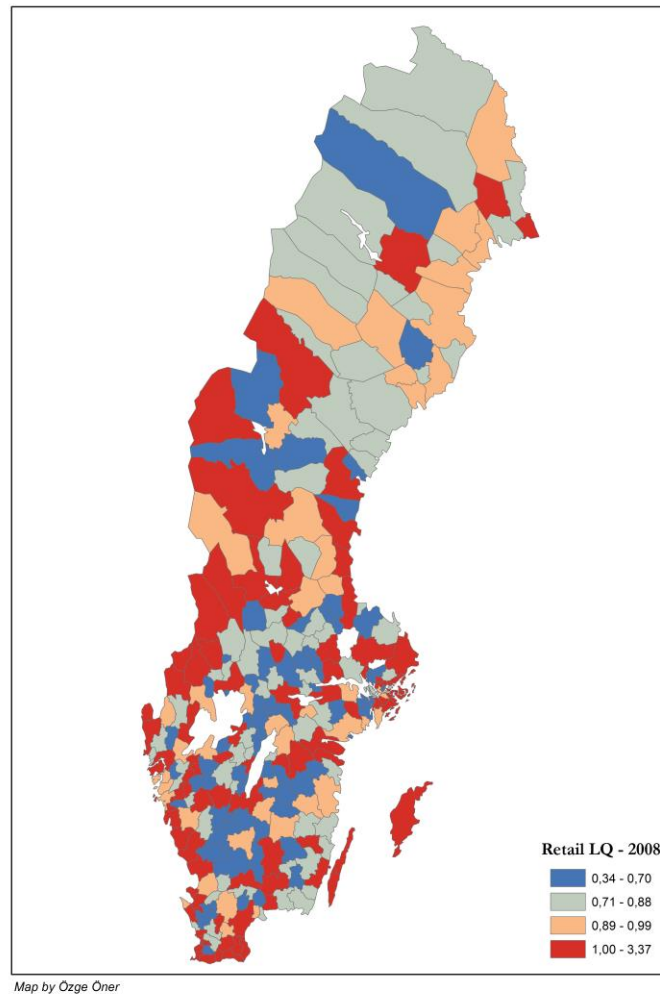


Figure-3: Retail Location Quotients for the entire Swedish market

The LQ map we see above shows us that municipalities with a high LQ value are more dispersed across space than what we see previously in the accessibility maps. Since retail concentration does not depend on the size of the market, we can see a LQ higher than one in municipalities that do not necessarily have a large market. The concentration of retail across large municipalities and metropolitan regions is generally predictable. Besides this predictable concentration, the LQ map also allows us to see how retail is concentrated across the Norwegian border, implying that the demand is not only driven domestically. Municipalities like Strömstad, Arjäng, Eda are known to attract consumers from Norway given the lower price levels for goods and services. Places like Åre and Härjedalen are popular in terms of winter sports, signaling that the demand for retail is not exclusive to the domestic consumers.

As with economic activity, gross retail employment is clustered in the southern part of the country. Nevertheless, big market places in the North still exhibit a considerable level of relative retail concentration. These market places are more likely to be supported by the external market given the degree of retail concentration in the surrounding municipalities. Once again, a location quotient being

higher in a municipality does not always imply a large retail market in absolute terms. The concentration in discussion is subject to relativity. Although we see competitive regions in retailing in relative terms, the Malmö, Stockholm and Gothenburg regions together account for approximately 40 percent of the overall retail employment in the entire country.

3. Empirical Design

3.1. Data

The data used in the study is micro-data on the individual level from Statistics Sweden for the years between 2002 and 2008. It is a publicly audited dataset, containing information on every individual in the labor market and their work place. The selection of the time period is based on the macroeconomic level consistency, as well as significant changes in the industrial categorization done after 2002. The data initially contain information on all individuals between the age 18 and 64 with wages higher than zero. One problem with the data is that they do not provide information on working hours. However those that earn less than a full time employment are excluded from the analysis as well to avoid disturbances from part time workers⁶. The total number of individuals in the analysis is around 600.000. The descriptive statistics, as well as pairwise correlations are presented in the appendix.

3.2. Variables

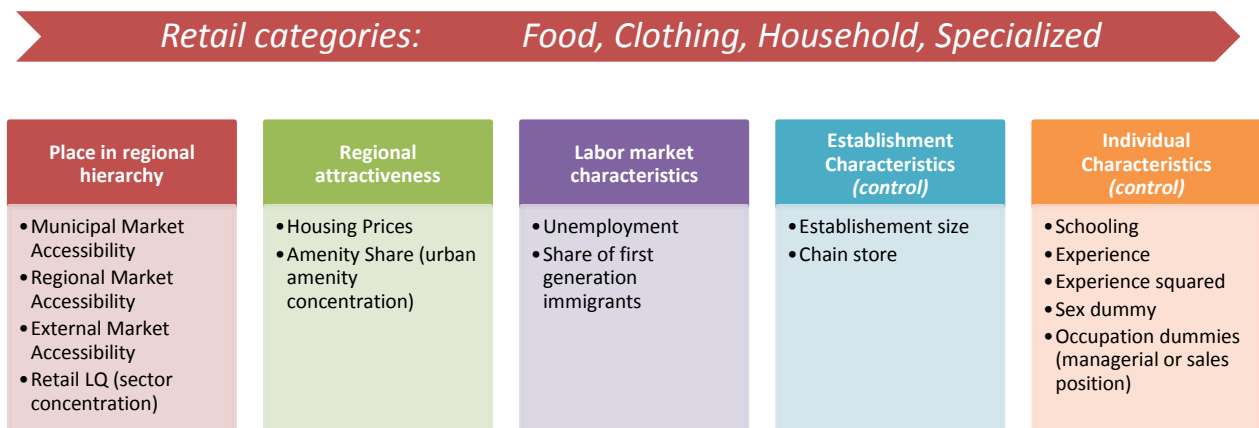


Figure-4: Variables with their respective categories

⁶ Individuals with yearly income below 156.000 crowns are removed from the data. This is the minimum income required for a work permit by the Swedish Migration Board.

Retail categories: Food, Clothing, Household & Specialized stores

The analysis uses four retail categories under which several retail activities are nested with respect to the goods they provide as well as the commonalities in their location pattern. As discussed previously, the retail sector consists of heterogeneous activities. Using the sector as a whole would lead to a coarse analysis. Hence, the empirical analysis aims to provide a framework where the retail categorization coincides with the previous theoretical framework. The first category, food retailing, is a unique category where the individuals working in all retail shops that are food dominated are examined together. They are known to be very sensitive to the proximity to demand because the goods provided by these stores are not very likely to be carried far away from the location where they are provided. They are likely to be found in the city centers, or in close proximity to such centers. Purchases of the goods provided by these shops are more frequent than other forms of commodities provided by the retail market. The second category is clothing, which corresponds to a significant share of the retail market. The locations of these stores are variable. As individual stores, they dominate the downtown retail markets, but they can also be found in regional malls, and/or in the out-of town retail clusters. The nature of the goods and services provided by these retailers can neither entirely considered to be durable, nor nondurables. They are purchased less frequently than food, but more frequently than big and expensive household items. The third retail category, household, has various retailing activities like retail sale of electronic goods, furniture, construction material, etc. These are the type of retailing activities that require bigger store space. Together with the fact that consumers purchase their goods less frequently and are willing to travel to further distances to do so, bigger store space makes them located further from the city core. They are often found in the intersection of different markets and regional hubs. They are located close enough to a large enough market to secure sufficient demand while being further from the core in order to enjoy lower rent costs.

As it is in the food retailing, consumers have rather short desire lines in terms of commuting to patronize specialized stores, which then constitute the fourth retail category of the analysis. This category is the most heterogeneous one in terms of the goods and services provided by stores. Each store is specialized in providing one particular line of goods, like opticians, pet stores, flower shops, bookstores, music shops, etc. One notable commonality is in their location pattern. They are almost always located in the very core of the market. The store size is often small, which allows them to compensate high rents. A detailed list of retailing activities listed under these four categories can be found in the appendix.

Individual earning

In the analysis, log-transformed individual earnings for individuals working in the selected retailing activities in Sweden are used as the dependent variable in the analysis⁷. Using individual earnings allows for a comparison across different types of retailing activities that are quite different in the way they operate. Previous literature discusses the disadvantages associated with using measures for productivity or performance that utilize output per worker and/or per unit capital. Comparing the productivity or performance of different economic activities (even when they belong to the same line of the sector) with respect to a set of indicators may lead to an inaccurate picture, given the heterogeneity issues. Individual earnings in that sense have been acknowledged as a good proxy to capture productivity levels.

From a neoclassical perspective in competitive markets, individuals should be earning according to the marginal product they produce, which implies their individual level productivity. Even when the markets are not perfectly competitive, firms being located in the cities despite the high wage and rent costs should imply cooperative productivity advantages. Being the most disaggregated level of analysis, variation of the individual earnings should, thus, reflect the variation in productivity levels in the respective economic activity once controlled for individual characteristics and other spatial indicators associated with earnings (Roback, 1982; Glaeser and Mare, 2001; Puga, 2010). Findings of numerous studies suggest that the spatial characteristics of a firm's or individual's location matter for productivity differences (Combes, Duranton and Gobillon, 2008; Glaeser and Maré, 2001; Ciccone and Hall, 1996; Lippman and McCall, 1976; Yankow, 2006; Andersson et al., 2013).

Place in regional hierarchy: accessible market size measures & retail LQ

Being in the core of the analysis, the three measures for accessible market size constitute the variables of interest together with the retail location quotient. The three market accessibility measures are *Municipal market size*, *Regional Market size* and *External Market Accessibility*. These measures are log transformed in the empirical analysis, along with the income levels (used as dependent variable). Hence the results obtained from the regression analyses for these market size variables are elasticities. (For a detailed discussion see the section: *Market accessibility & place in regional hierarchy*) Also location quotients for retail concentration in respective municipalities are introduced to the analysis⁸.

⁷ Individuals are 18-64, they earning positive wage, and the minimum wage is 156.000 SEK.

⁸ Calculation of the location quotients and visualization of its distribution across Swedish municipalities can be found under the section: "*Accessible market size & place in regional hierarchy*".

Regional attractiveness: Housing prices & Amenity share

As discussed in the theoretical framework, a region's certain attributes are acknowledged to play an important role for attracting consumers. These attractive attributes are not always easy to quantify. Previous research relies on several proxies to do so. In their paper, "*Consumer City*", Glaeser et al. (2001) argue that cities function as hubs of consumption. Places with higher potential to provide urban amenities to its residents are empirically found to grow faster than low amenity cities. Urban rents going up faster than the wage levels in Glaeser et al. (2001b) analysis is considered to be an indicator of having a desire to be in these places for reasons other than high wages. A similar argument can be found in the research of Rosen (1979) and Roback (1982). In order to capture this kind of impact, we follow the approach suggested by previous research where consumption possibilities provided by several service related establishments are considered to be urban amenities and their presence is found to be contributing to the hosting city's attractiveness. The availability of bars, cafes, restaurants, museums, hairdressers in a city should contribute to attractiveness. In the empirical analysis *Amenity share* is introduced as a variable to control for the attractive attribute of the markets in question. The variable is obtained by dividing the number of establishments that are known to be urban amenities by the total number of establishments in a municipality. Often the scale of urban amenities are highly correlated to size of a municipality. Thus in order to avoid multicollinearity, shares are used instead. A table listing the type of establishments that are included in the amenity measure can be found in the appendix. In her framework for a spatial equilibrium, Roback (1982) argues that wages and rents are the two indicators on how the workers are allocated across cities with different sets of amenities. Together with the urban amenity measure, housing prices for the given time period on the municipal level is also introduced to the analysis.

In her framework for a spatial equilibrium, Roback (1982) argues that wages and rents are the two indicators on how the workers are allocated across cities with different sets of amenities. Together with the *urban amenity* measure, *housing prices* for the given time period on municipal level is also introduced to the analysis⁹.

Labor market characteristics: Unemployment share & Immigrant share

Two variables for controlling for the overall labor market circumstances are introduced to the analysis. The first one is the share of the population that is first generation immigrant, immigrant share. The impact of a higher share of immigrants can be twofold for the retail case. Due to the late comer disadvantages, the composition of the labor market can be substantially different in markets that are highly populated by

⁹ One problematic feature of this variable is that it highly correlates with the regional market size variable. When we look at the correlation between housing prices and wage levels, we see a positive relationship for all types of retailing activities both in central and non-central municipalities. However, housing has negative impact in some cases in the regression analysis, interpretation of which should be handled with caution.

immigrants. Labor market participation, as well as unemployment levels, is found to be systematically different in markets with a relatively higher share of immigrants than the country average, and there is found to be significant positive and negative impacts from labor migrant inflow to the hosting labor market (Card, 1997; Friedberg and Hunt, 1995). Another aspect of a higher share of immigrants in a labor market can be viewed through *'push-pull factor'* concept (Baycan-Levent and Nijkamp, 2009). Due to challenges in finding jobs, first generation immigrants are found to have greater incentive to start their own businesses under challenging labor market circumstances, which are likely to be related to retailing and consumer services.

Another variable is the *Unemployment share*, which is the number of unemployed people, relative to the total population. This variable is introduced to the analysis to control for the wage effects of the overall labor market condition.

Establishment characteristics: Store size & Chain store

In the analysis, store size in terms of number of employees is introduced as a control variable. This variable is log transformed. Also whether a store belongs to a chain or not is controlled for by a dummy variable. This dummy variable takes the value one if the mother firm has more than one store, otherwise zero. The effect of being a store that belongs to a chain should be positive due to the internal scale related operational advantages.

Individual characteristics: Schooling, Experience, Experience², Sex & Occupation dummies

According to neoclassical theory, workers in the same industry with similar occupations and skills should receive the same wage. Nevertheless, intra- and inter-industry, as well as inter-regional wage differentials, are widespread phenomena. The most acknowledged method to explain the determinants of income variation is referred to as a Mincerian wage equation (Mincer, 1974), which traditionally incorporates education and experience as determinants for wage levels. Returns to education and the problem of unobserved skills have also been investigated by numerous scholars (Bound and Johnson, 1992; Katz and Murphy, 1992; Murphy and Welch, 1992; Griliches, 1977; Willis and Rosen, 1979; Blackburn and Neumark, 1991). As the research on the topic has developed over time, the Mincerian approach has been extended where different combinations of explanatory variables relevant to the respective research question have been incorporated to the original model, which solely focused on the impact from individual characteristics.

The *schooling* variable is the theoretical number of years of schooling. The *experience* variable is obtained by subtracting both the total years of schooling and the first 6 years of an individual's life from the present age (Mincer, 1974). In addition, traditional wage equation proposes the use of a squared *Experience* variable

in order to control for diminishing returns to experience. Theory suggests that a squared experience variable should be introduced to the model to control for the decreasing returns to age from an age point onwards (Mincer, 1974).

In addition, in order to control for unobserved ability bias and variations across high and low end occupations in the sector dummy variables for *managerial jobs*¹⁰ and *sales jobs* are introduced¹¹. The categorization is based on the earlier work of Klaesson and Johansson (2011), where all occupations are clustered into four groups with respect to the skill set they require.

4. Results: *returns to location in retail*

The results from the regression analyses are displayed in Table-1. The regressions are run separately for each type of retailing activity, as well as for central and non-central municipalities. The coefficients in separate regressions are statistically significantly different from each other. The estimation technique preferred in the analysis is Pooled OLS. The discussion of the results are provided under separate headings, corresponding to the respective category the explanatory variables belong to. Since the interest of the present paper is in the capabilities of firms to bear their costs, and not in the selection processes of their employees, a pooled OLS estimator is used, since a fixed effect (FE) estimator would eliminate desirable variation, such as unobserved ability.

Place in regional hierarchy

The results for the variables that are associated with returns to market size and place in regional hierarchy provides us with a theoretically consistent story on retail location. As expected, the *Municipal market size* has a positive and significant impact in all types of retailing activities, both in central and non-central municipalities except *Household*. The impact of municipal market size is the highest for *Food* and *Clothing* in central municipalities, where a doubling of market size is associated with three percent higher wages. This impact is around one percent for the non-central municipalities.

The negative impact from the municipal market size in central municipalities for household retailers is in line with the theoretical framework (although the magnitude of the impact is negligible. Most of the traditional location theories suggests that these kind of stores are likely to be found in the periphery of the urban core to reduce fixed costs since they are relatively bigger in size. The negative sign implies that the *household* retailers that are located in the central municipalities may be facing relatively higher costs which are not compensated by the proximity to demand. This may lead to a decrease in the competitive advantage, thus in performance. Since consumers purchase the goods offered by household retailers less

¹⁰ Managerial occupations include chief and executive officers and marketing people.

¹¹ The base category for these two dummy variables is the people working as machine operators, maintenance, etc.

frequently, the distances they are willing to travel to patronize a store are generally higher compared to the other purchases. The positive and significant return to the *External market size* in household retailing signals that the relevant market boundaries extends beyond the regional markets where these retailers are hosted in.

Having a higher accessible market size in the regional market is found to impose a competition effect both on central and non-central markets for *Food* retailing. However this impact is negligible for the central market place, while it is around 1.5 percent for the non-central ones. The positive impact from the *Regional market size* for *Clothing* implies that the relative market extends beyond the municipal borders both in central and non-central municipalities for these retailers. Whereas the negative impact from *External market size* implies a competition effect that is imposed by the municipalities that are outside of the respective region. However, this competition effect is small for the central municipalities whereas it is around 2 percent for the non-central municipalities for *clothing*.

For the *Specialized* stores, all three market size measures have a positive and significant impact on the performance of retailers in the central municipalities. Consumers not only from the same local market, but also from other municipalities in the region, as well as outside of the region have a demand for these retailers located in the central municipalities. Most of the small scale, non-central municipalities have none or a few of these retail services. Thus, the consumers in need may prefer to patronize a retail market that will provide them with the possibility to engage in multipurpose shopping since central municipalities in most of the cases have all kinds of retailing services. The return to market size then becomes evident. However, by looking at the magnitude of the coefficients, it is apparent that the economically significant impact comes from the close proximity, *Municipal market size*. For the non-centrally located specialized stores, the relevant market doesn't extend beyond the municipal borders, which is not surprising¹². The goods and services these small scale and highly specialized stores provide are heavily place bounded. Consumers have the tendency to patronize the closest shops in this case.

Concentration of the retail sector as a whole in a municipality (controlled for by the location quotients) is found to play a negative role in the non-central markets for *Food* and *Specialized*, whereas this kind of impact is mostly positive and significant for the central markets.

¹² An example: when one loses his/her keys, one is not expected to travel to another municipality to find a lock smith.

Regional attractiveness

Looking at the correlation table (presented in the appendix), we should see a positive and significant return associated with the housing prices since it is a strong signal for how attractive a market place is. However in central municipalities, housing prices are highly correlated with regional market size, which is probably the reason for the negative significant coefficients. This kind of multicollinearity is not evident in the non-central markets, which then signals the true impact of attractiveness, where doubling the ‘attractiveness’ (explained by the housing prices while holding the rest constant) leads approximately to a 6 percent return. *Amenity share*, is found to be relevant for the non-central markets while being unimportant for the central markets. Once again, this is not a measure for the scale of the amenities that are present in a municipality but their concentration.

Labor market characteristics

With the *Immigrant share*, for most of the cases we see a positive and significant impact. This is signaling that the concentration of foreign born may be associated with a more competitive labor market for retailers. Earlier in the paper, it is suggested that most of the foreign born in northern European countries are employed in retail and service jobs. They are known to be earning relatively less, however, the overall impact they create in the respective market implies a more vibrant retail milieu where the returns may appear to be higher. *Unemployment share* has a significant and rather high negative impact on the wage levels of individuals, which confirms the relevance of overall labor market conditions.

Store characteristics

There is a positive and significant return to *Establishment size*, where doubling the establishment in terms of number of full-time employees is associated with approximately 3 percent return. This impact is highest for *Clothing* in central municipalities, with approximately 5 percent return.

Being a *chain store* as well is found to contribute to retailer’s returns where the magnitude is higher for central municipalities except *Clothing*, where the return to belonging to a chain store is higher for the retailers in non-central municipalities.

Individual characteristics

Schooling and experience are positively associated with the wage levels of individuals as expected. The variation of the impact across different kinds of retailing activities and across central and non-central municipalities is very small. Having a managerial position is highly and positively associated with a high premium. This impact is higher in central municipalities, except *Household*. Once again, stores selling household goods are found to be located in the peripheral markets, thus, the impact of several determinants are often reversed for household retailing.

Table-1: Regressions results: returns to location in retail

	FOOD		CLOTHING		HOUSEHOLD		SPECIALIZED	
<i>Dep. variable: Individual Wage</i>	Central	Non-central	Central	Non-central	Central	Non-central	Central	Non-central
Municipal market size	0.0303*** [0.00208]	0.0165*** [0.00129]	0.0290*** [0.00396]	0.0107*** [0.00311]	-0.00971*** [0.00257]	-0.00151 [0.00224]	0.0112*** [0.00332]	0.0126*** [0.00247]
Regional market size	-0.00240*** [0.000881]	-0.0121*** [0.000955]	0.00312** [0.00151]	0.0212*** [0.00199]	0.00806*** [0.00119]	-0.00309** [0.00154]	0.00441*** [0.00129]	0.00188 [0.00183]
External market size	-9.08e-05 [0.00106]	-0.0129*** [0.000930]	-0.00341* [0.00180]	-0.0235*** [0.00215]	-0.000224 [0.00137]	0.0126*** [0.00155]	0.00368** [0.00154]	-0.00287 [0.00179]
LQ-Retail	0.00168 [0.00401]	-0.0137*** [0.00178]	0.0542*** [0.00767]	-0.00163 [0.00353]	0.0275*** [0.00367]	-0.00412 [0.00279]	0.0242*** [0.00650]	-0.0102*** [0.00310]
Housing price	-0.0220*** [0.00474]	0.0636*** [0.00278]	-0.0193** [0.00796]	0.0179*** [0.00672]	0.0124** [0.00626]	0.0657*** [0.00459]	-0.00665 [0.00708]	0.0501*** [0.00536]
Amenity share	0.107*** [0.0366]	0.133*** [0.0125]	0.128 [0.0937]	0.239*** [0.0367]	-0.246*** [0.0358]	0.0853*** [0.0209]	0.0118 [0.0677]	0.0731*** [0.0280]
Immigrant share	0.124*** [0.0450]	0.113*** [0.0209]	0.102 [0.0747]	0.0954** [0.0468]	0.408*** [0.0521]	0.142*** [0.0336]	0.178*** [0.0657]	0.00248 [0.0410]
Unemployment share	-0.489*** [0.0671]	-0.475*** [0.0548]	-0.293*** [0.105]	-0.755*** [0.134]	-0.573*** [0.0848]	-0.0246 [0.0901]	-0.337*** [0.0930]	-0.587*** [0.116]
Establishment size	0.0255*** [0.000624]	0.0314*** [0.000702]	0.0465*** [0.000668]	0.0213*** [0.00103]	0.0302*** [0.000671]	0.0148*** [0.000935]	0.0493*** [0.000893]	0.0442*** [0.00144]
Chain store (<i>dummy</i>)	0.0319*** [0.00142]	0.0436*** [0.00149]	0.0145*** [0.00209]	0.0330*** [0.00344]	0.0406*** [0.00187]	0.0387*** [0.00265]	0.0429*** [0.00187]	0.0264*** [0.00300]
Schooling	0.0254*** [0.000519]	0.0292*** [0.000566]	0.0245*** [0.000651]	0.0385*** [0.00100]	0.0333*** [0.000554]	0.0248*** [0.000755]	0.0277*** [0.000596]	0.0339*** [0.000852]
Experience	0.0201*** [0.000215]	0.0202*** [0.000226]	0.0200*** [0.000293]	0.0183*** [0.000446]	0.0232*** [0.000279]	0.0217*** [0.000357]	0.0193*** [0.000303]	0.0188*** [0.000422]
Experience²	-0.000312*** [4.63e-06]	-0.000320*** [4.80e-06]	-0.000324*** [6.35e-06]	-0.000291*** [9.56e-06]	-0.000371*** [6.17e-06]	-0.000369*** [7.69e-06]	-0.000296*** [6.73e-06]	-0.000291*** [9.31e-06]
Sex dummy (<i>base: male</i>)	-0.198*** [0.00143]	-0.209*** [0.00156]	-0.171*** [0.00232]	-0.156*** [0.00371]	-0.151*** [0.00167]	-0.154*** [0.00222]	-0.148*** [0.00181]	-0.147*** [0.00261]
Managerial position	0.135*** [0.00357]	0.124*** [0.00393]	0.145*** [0.00346]	0.0646*** [0.00573]	0.0850*** [0.00259]	0.122*** [0.00346]	0.126*** [0.00333]	0.126*** [0.00472]
Sales position	-0.0142*** [0.00329]	-0.0300*** [0.00365]	-0.0709*** [0.00330]	-0.0790*** [0.00557]	-0.0309*** [0.00242]	0.00686** [0.00311]	0.000809 [0.00287]	0.0118*** [0.00404]
Constant	6.708*** [0.0594]	6.915*** [0.0359]	6.638*** [0.115]	6.777*** [0.0849]	6.992*** [0.0686]	6.532*** [0.0595]	6.701*** [0.0934]	6.483*** [0.0705]
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	115,494	102,853	73,601	29,887	85,671	51,392	73,722	35,597
R-squared	0.313	0.380	0.411	0.326	0.309	0.259	0.279	0.303

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1; Pooled OLS estimations
Log transformed variables: Individual wages, market size measures, housing, establishment size

5. Concluding remarks

This paper addresses the returns to location for the retail sector. There are two main aspects that are in focus. First, to capture any systematic variations across central and peripheral market places when we examine the impact of regional determinants, such as market size. This kind of urban-periphery interaction is not only taken into consideration for the retail markets by examining the central and non-central markets separately, but also via the decomposition of accessible market potential used in the analysis. In order to address this issue, the paper uses finest level of aggregation in the economy, individual earnings, as a proxy for retail performance. The advantages from using individual earnings as a proxy for the levels of productivity are also discussed in detail in the paper. Second, to investigate returns to location for different types of retailing activities. The aim here is to capture the variation across four different types of retailing because the impact from the determinants should systematically be different for each. The reasoning is that the location pattern of stores that are engaged in different kinds of retailing activities vary significantly depending on the type of service or good they provide. Proximity to demand should have different returns in these retailing activities, and the relevant market boundaries should relate to this variation.

The empirical analysis groups the determinants of return under four main categories with respect to their attributes. These are mainly: place in regional hierarchy, regional attractiveness, labor market characteristics, and individual characteristics. The analyses are conducted for central and non-central markets, as well as four different types of retailing activities separately.

The findings are in line with the previous literature on retail location. Traditional location theories like central place theory and bid rent theory suggest a certain way of spatial allocation of economic activities between urban core and peripheral markets. This kind of allocation is found to be evident and relevant for the retail sector when we examine the returns to market size. The results suggest a higher dependency on market size for higher returns for the retailing activities that require more interaction with consumers and selling goods for more frequent purchase. Stores selling furniture, electronic goods and other kinds of household appliances, on the other hand, are found to have a larger market area to rely on for returns to scale. What matters for this kind of retailers is not necessarily the proximate market but rather the regional market. This also is in line with the theoretical framework, where individuals are found to have longer desire lines to travel for goods that are more durable and require less frequent purchase.

The dependence on the potential demand in the immediate market for food retailers in the central markets is not evident in non-central ones. Retailers that are specialized in a particular good or service and clothing retailers are found to depend on the proximate market potential. The findings for the impact from regional market size and external market size are also in line with the traditional location theories. The impact from regional and external market potential on returns in the central retail markets is either

positive or not significant. When we look at the non-central retail markets the picture is mixed, yet the red thread tying the results together for different types of retailing activities is available. For non-central food retailers, a competition effect driven from higher market access to other markets in the same region, as well as outside of the region is present. This is implying a negative impact rising from the outflow of demand in the non-central retail markets for food retailers. In contrast, both central and non-central retail markets benefit from higher market accessibility in the case of retailers selling clothing. For the specialized retailers, the relevant market is the municipal one for the central retail markets, however the relevant market extends beyond the municipal border for the non-central retail markets.

The findings suggest that when we examine the returns to retail location, taking the regional hierarchy into account brings interesting results and clarifies the importance of spatial characteristics for retail markets of different kinds. Urban-periphery interactions, where retailers and consumers meet, is found to be relevant for the performance of retailers.

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Appendix 1: Descriptive statistics

Table A-1: Regional variables

	N		Min		Max		Mean		Std. Deviation	
	Central	Non-central	Central	Non-central	Central	Non-central	Central	Non-central	Central	Non-central
Municipal	498871	282893	19,07	18,64	25,66	23,80	23,57	21,72	1,37	0,93
Regional	498871	282893	16,03	17,09	24,48	25,73	22,23	23,31	1,66	1,60
External	498871	282893	11,38	18,38	23,14	23,28	21,20	21,16	1,28	0,76
Retail LQ	498871	282893	0,59	0,34	2,63	3,37	1,06	1,15	0,24	0,49
Housing	498871	282893	5,44	1	8,33	8,78	7,46	7,31	0,56	0,68
Amenity Share	498871	282893	0	0	0,43	1,04	0,04	0,09	0,05	0,08
Unemployment	498871	282893	0	0,01	0,16	0,66	0,05	0,05	0,02	0,02
Immigrant share	498871	282893	0,03	0	0,35	0,29	0,13	0,13	0,05	0,05

Table A-2: Individual variables

	Food					Clothing				
	N	Min	Max	Mean	Std.	N	Min	Max	Mean	Std.
Income*	235646	1560	128793	2427,29	1137,71	107471	1560	71017	2488,76	1303,83
Schooling	235646	9	22	11,20	1,43	107471	9	22	11,65	1,55
Experience	235646	1	49	20,73	12,27	107471	-2	49	18,66	11,97
Experience2	235646	1	2401	580,34	566,88	107471	1	2401	491,57	546,62
Managerial job	235646	0	1	0,18	0,39	107471	0	1	0,25	0,43
Sales job	235646	0	1	0,77	0,42	107471	0	1	0,65	0,47
Female	235646	0	1	0,66	0,47	107471	0	1	0,82	0,38
	Household					Special				
	N	Min	Max	Mean	Std.	N	Min	Max	Mean	Std.
Income*	143956	1560	53290	2602,50	977,97	113983	1560	94820	2495,29	1022,13
Schooling	143956	9	22	11,63	1,56	113983	9	22	11,83	1,55
Experience	143956	1	49	18,90	11,37	113983	-1	49	18,14	11,32
Experience2	143956	1	2401	486,35	512,93	113983	0	2401	457,36	506,40
Managerial job	143956	0	1	0,27	0,44	113983	0	1	0,20	0,40
Sales job	143956	0	1	0,56	0,49	113983	0	1	0,67	0,46
Female	143956	0	1	0,38	0,48	113983	0	1	0,52	0,50

Appendix 2: Amenities

Table A-3: Components of urban amenities

Category	Definition
1	Hotels
2	Restaurants and Bars
3	Ferry transportation
4	Airport transportation
5	Movie Theatre
6	Arts
7	Fair centers and Amusement parks
8	Library
9	Museum
10	Botanical and zoological gardens, and nature reserves
11	Sports
12	Beauty and well-being

Appendix 3: Correlations

Table A-4: Pairwise correlations between *Wage* and explanatory variables

<i>Wage</i>	FOOD		CLOTHING		HOUSEHOLD		SPECIALIZED	
	Central	Non Central	Central	Non Central	Central	Non Central	Central	Non Central
Municipal	0.136**	0.256**	0.242**	0.182**	0.070**	0.125**	0.139**	0.207**
Regional	0.113**	0.201**	0.222**	0.198**	0.092**	0.161**	0.108**	0.210**
External	0.016**	-0.018**	-0.006	-0.013*	0.099**	0.049**	0.041**	-0.015**
Retail LQ	-0.001	0.010**	-0.025**	0.040**	0.148**	0.074**	0.005	0.034**
Housing	0.151**	0.278**	0.252**	0.184**	0.144**	0.196**	0.169**	0.248**
Amenity Share	-0.102**	-0.119**	-0.188**	-0.067**	0.017**	-0.074**	-0.122**	-0.126**
Unemployment	-0.116**	-0.201**	-0.200**	-0.171**	-0.126**	-0.080**	-0.094**	-0.160**
Immigrant share	0.121**	0.191**	0.228**	0.119**	0.163**	0.169**	0.131**	0.188**
Store size	0.162**	0.267**	0.379**	0.273**	0.266**	0.173**	0.238**	0.273**
Chain store	0.094**	0.162**	0.089**	0.156**	0.113**	0.114**	0.087**	0.146**
Schooling	0.081**	0.138**	0.173**	0.211**	0.164**	0.099**	0.119**	0.162**
Experience	0.174**	0.152**	0.153**	0.124**	0.188**	0.133**	0.191**	0.147**
Experience2	0.126**	0.108**	0.093**	0.074**	0.134**	0.083**	0.144**	0.103**
Sex dummy	-0.339**	-0.362**	-0.259**	-0.249**	-0.215**	0.216**	-0.244**	-0.265**
Managerial job	0.248**	0.287**	0.386**	0.335**	0.215**	0.219**	0.244**	0.251**
Sales job	-0.231**	-0.281**	-0.473**	-0.368**	-0.251**	-0.173**	-0.214**	-0.215**

**, correlations are significant at the 0.01 level; *, correlation is significant at the 0.05 level

Appendix 4

Table A-5: Retail categories

5-digit SNI	Description	Type
52111	Retail sale in department stores and the like with food, beverages and tobacco predominating	Food
52112	Retail sale in other non-specialized stores with food, beverages and tobacco predominating	Food
52210	Retail sale of fruit and vegetables	Food
52220	Retail sale of meat and meat products	Food
52230	Retail sale of fish, crustaceans and molluscs	Food
52241	Retail sale of bread, cakes and flour confectionery	Food
52242	Retail sale of sugar confectionery	Food
52279	Retail sale of food in specialized stores n.e.c.	Food
52410	Retail sale of textiles	Clothing
52421	Retail sale of men's, women's and children's clothing, mixed	Clothing
52422	Retail sale of men's clothing	Clothing
52423	Retail sale of women's clothing	Clothing
52424	Retail sale of children's clothing	Clothing
52425	Retail sale of furs	Clothing
52431	Retail sale of footwear	Clothing
52432	Retail sale of leather goods	Clothing
52441	Retail sale of furniture	Household
52442	Retail sale of home furnishing textiles	Household
52443	Retail sale of glassware, china and kitchenware	Household
52443	Retail sale of lighting equipment	Household
52451	Retail sale of electrical household appliances	Household
52452	Retail sale of radio and television sets	Household
52461	Retail sale of hardware, plumbing and building materials	Household
52495	Retail sale of wallpaper, carpets, rugs and floor coverings	Household
52462	Retail sale of paint	Household
52471	Retail sale of books and stationery	Specialized
52472	Retail sale of newspapers and magazines	Specialized
52481	Retail sale of spectacles and other optical goods	Specialized
52482	Retail sale of photographic equipment, and related services	Specialized
52483	Retail sale of watches and clocks	Specialized
52484	Retail sale of jewellery, gold wares and silverware	Specialized
52485	Retail sale of sports and leisure goods	Specialized
52486	Retail sale of games and toys	Specialized
52487	Retail sale of flowers and other plants	Specialized
52488	Retail sale of pet animals	Specialized
52491	Retail sale of art; art gallery activities	Specialized
52492	Retail sale of coins and stamps	Specialized
52493	Retail sale of computers, office machinery and computer programmes	Specialized
52494	Retail sale of telecommunication equipment	Specialized
52453	Retail sale of gramophone records, tapes, CDs, DVDs and video tapes	Specialized
52454	Retail sale of musical instruments and music scores	Specialized