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**What are the effects of mass retailers on Lisbon's  
Municipal Markets?**

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# What are the effects of mass retailers on Lisbon's Municipal Markets?

## ABSTRACT

The primary purpose of this research is to analyze the impact of mass retailers on Municipal Markets in the city of Lisboa between 2004 and 2009. A Prais-Winsten regression with specific panel AR(1) and PCSEs was used to estimate the model. The findings reveal that, on average, an increase of 1 supermarket per km<sup>2</sup> within the “*Freguesia*” where the municipal market is located leads to a decrease of 3.48% in the occupation rates while an increase of 0.1 hypermarkets per km<sup>2</sup> leads to a decrease of 5.62% if it is located within the “*Freguesia*” and of 10.10% if it is located in the adjacent ones.

**Keywords:** Municipal Market, Mass retailer, Retail Competition, Portugal

## 1. Introduction

Non-traditional food retailers have changed the retail business landscape around the world. The rapid growth of alternative retail formats has transformed not only the competitive structure of the industry, but also the way in which consumers shop. This trend has increased the competitive pressure on smaller stores which compete in a “monopolistic” framework within their neighborhoods. The grocery industry shifted from an industry dominated by small retailers serving local markets to one characterized by mass retailers.

In Portugal, super and hypermarkets have grown noticeably in the last decades. According to Nielsen (2005) the market share of mass retailers more than doubled between 1985 and 2004 while the market share of traditional food retailers decreased by 27% during the same period. As supermarkets spread and their market share grew the market share of traditional retailers declined.

The purpose of this study is to examine the impact of supermarkets and hypermarkets on the sales of a particular form of traditional retailer – Municipal Markets. Although these markets can be found in any city of any size in Portugal, the analysis is focused only in the city of Lisboa where municipal markets are under “*Câmara Municipal de Lisboa*” (CML) management. It uses a Prais-Winsten regression with specific panel AR(1) and PCSEs to analyze the impact of supermarkets and hypermarkets on 29 municipal markets in the city of Lisboa between 2004 and 2009. To date, no studies have quantified the magnitude of the effect of mass retailers on the business activity of this type of traditional retailers in Portugal. In this way, this study makes a contribution to the literature.

Municipal markets are public structures of traditional food retail housed in buildings owned and operated by the local government. Inside one can find numerous

sellers working individually, owning their own stands and sharing common areas and common resources. Municipal markets sell mostly perishable products such as fruit, vegetables, meat, fish and flowers but some also sell garments and jewelry.

At their beginning municipal markets had a very important role providing the convenience of a one way shopping trip since most urban residents did not own a car. Moreover these places offered lower prices for most of the goods the consumer needed since they gathered a large amount of sellers in just one place. So competition was very fierce. In addition they also functioned as a social place where people could meet and chat about the latest news. They also provided positive spillovers externalities to adjacent areas creating business opportunities in the housing market by increasing housing rents and housing prices.

As households' income increased over time and the means of transportation became more sophisticated consumers were not restricted to shopping trips within their residential areas. Consumers also became more demanding towards their shopping experience. The rise of supermarkets, hypermarkets and convenience neighborhood chain stores helped fulfill some of the new preferences of urban consumers.

In contrast to traditional markets, mass retailers use locational and product mix strategies to obtain greater sales volume. In particular, mass retailers have developed their format in the outskirts of cities where large-scale competitors are essentially non-existent and the price of land is lower. These outlets also offer consumers a more pleasant shopping environment, free parking, wider opening hours and lower prices. A USDA Report (1996) stated that prices for grocery-related items averaged 26% lower in mass retailers than in traditional grocery stores. This is mainly due to economies of size and scope, the adoption of advanced information technology and supply chain management strategies which drastically lower their costs.

As the market share of mass retailers increased, concerns have emerged that large grocers could use their lower cost structure, advantages in marketing, and store design to increase their retailer market power and discourage competition. On the other hand, the effect of increased competition from non-traditional retailers could have forced traditional retailers to change and adopt new food-pricing strategies. Yet, this has not occurred and municipal markets are currently experiencing a decrease in their demand. It is therefore necessary to understand whether mass retailers prove a source of competition to municipal markets and if so measure the magnitude of their impact on this type of traditional retailers. Only then policies can be designed to help increase the competitiveness of municipal markets in a market dominated by mass retailers.

Previous studies (Borraz et al, 2009; Kaliappan et al, 2008; Suryadarma et al, 2007; among others) documented the effect of large scale stores on small retailers' sales and the probability of survival in other countries. In sum, there is clear evidence that the entry and expansion of mass retailers have impact on the existing small retailers. However the sign and the amplitude of the impact of a large retailer on local retailers depend on various aspects such as the type of local retail businesses, the proximity between the business, the size and competitiveness of local retail businesses.

The literature on the impact of supermarkets' entry is tied to specific contexts and therefore could not be applied to different situations. Moreover the lack of findings directly relevant to Portugal also provides further justification for this research.

This study shows that, on average, an increase of 1 supermarket per km<sup>2</sup> within the municipal market's "*Freguesia*" leads to a decrease of 3.48% in the occupation rates while an increase of 0.1 hypermarkets per km<sup>2</sup> leads to a decrease of 5.62% if it is located within the "*Freguesia*" and of 10.10% if it is located in the adjacent ones. Findings also reveal that supermarkets in the adjacent "*Freguesias*" have no impact.

The paper proceeds as follows. The next section provides a brief summary on relevant literature concerning the topic this paper analyzes. Then, the dataset and the methodology are presented. Section 5 discusses the results and Section 6 concludes.

## **2. Literature Review**

This section provides an overview of the related literature available concerning the impact of the supermarkets' entry within the food retailing industry. This review focus on four major subjects and on two methodologies (survey and regression analysis).

### *Impact of supermarkets' entry on traditional retail stores*

Borraz et al. (2009) used a panel data analysis to study the impact of supermarket's entry on small grocery retailers in 18 urban areas of Montevideo, Uruguay, between 1998 and 2007. They estimated the grocery survival probabilities through a panel logit model using the conditional maximum likelihood estimator. Results indicated that the probability of survival of small retailers decreases as the number of supermarkets, or their total area, increases. On average, the entry of one supermarket in a small grocery store's neighborhood increased its chance of exiting the market in that year by 1.2%.

Kaliappan et al. (2008) investigated the impact on local retailers of liberalization of the retail sector via the presence of foreign supermarkets in Malaysia. Both quantitative and qualitative methods (survey and interviews) were used to collect and analyze data. The survey findings revealed that the entry of foreign hypermarkets often affected the business environment of the local retail businesses and that, in general, local retailers had mixed feelings about the presence of hypermarkets. Those who disagreed generally felt that hypermarkets contributed to the closing of several groceries shops and created intense competition among the local retailers as there are significant differences

between hypermarkets and local retailers in terms of store attributes, products offered and prices. Meanwhile those retailers who agreed to a certain extent with the presence of hypermarkets generally are those who are doing complementary business.

Suryadarma et al. (2007) measured the impact of supermarkets on traditional market traders in Indonesia's urban centers using both in-depth interviews and difference-in-difference analysis. On average, traders have experienced a decline in their business over the past three years. The in-depth interviews revealed that the main causes of this decline were the weakened purchasing power of their customers due to the fuel price increases, the increased competition with street vendors who occupy the areas surrounding the markets and the existence of supermarkets. Suryadarma et al. (2007) found evidence that traditional markets located near supermarkets are more adversely affected than those further away. However, this was mainly due to the weak competitiveness of traditional retailers. The quantitative impact analysis found mixed statistical results for various performance indicators of traditional markets, such as profits, earnings, and employee numbers. Only the number of employees is affected by the presence of supermarkets. Traditional retailers are willing to hire more employees the farther they are located from the supermarkets. While there is evidence of retailers that have gone out of business, reasons are more complex than just the entry of supermarkets. Most exits are related to internal market and personal problems. In addition, shoppers who sell mainly to non-households and have maintained a good relationship with customers over a long period are more likely to stay in business.

Martens et al. (2005) evaluated the effects of the entry by supercenters and warehouse clubs on retail grocery sales and the exit of small supermarkets in the U.S. market. The research tests three hypotheses: The entry of a supercenter or warehouse club increases grocery sales within a non-metropolitan county; The entry of a

supercenter or warehouse club decreases grocery sales in neighboring counties; The entry of a supercenter or warehouse club decreases the number of small grocery retailers in immediate non-metropolitan and in adjacent counties. Linear regressions were estimated to determine the effects of entry by large warehouse and supercenter stores on sales and on the change in the number of small supermarkets. Spatial regimes or groupings of similar counties were used. Therefore, two types of spatial effects were tested in both models: spatial heterogeneity and dependence. Results suggested that warehouse and supercenter stores had a significant and large effect on the change in grocery sales and the exit of small supermarkets operating at the country level. Only the third hypothesis, that warehouse club and supercenter store entries decrease the number of small supermarkets in non-metropolitan areas, has been proven incorrect.

#### *Impact of Wal-Mart's entry into the traditional supermarket industry*

Basker and Noel (2009) analyzed the effect of Wal-Mart's entry into the grocery market using a store-level price panel data set comprising four points in time – July 2001, July 2002, July 2003 and July 2004 – and 175 cities in the continental United States. They used OLS and two instrumental-variables specifications to estimate the effect of Wal-Mart's entry on competitors' prices of 24 grocery items across several categories. Wal-Mart's price advantage over competitors for these products averaged approximately 10%. On average, competitors' response to entry by a Wal-Mart Supercenter was a price reduction of 1-1.2%, mostly due to smaller-scale competitors. However the response of the "Big Three" supermarket chains (Albertson's, Safeway and Kroger) was less than half that size. Low-end grocery stores, which compete more directly with Wal-Mart, cut their prices more than twice as much as higher-end stores. Basker and Noel (2009) confirmed the results using a falsification exercise, in which they tested for the Wal-Mart's effect on prices of services that it does not provide.



Singh et al. (2004) provided an empirical study on the impact of a Wal-Mart supercenter entry on sales of a traditional supermarket store located in the East coast of the U.S. By using a frequent shopper database from this store they developed a joint model of inter-purchase time and basket size and allowed for a structural break at the time of competitive entry. The model allowed them to evaluate the impact of Wal-Mart on household store visit frequency and basket size, while allowing for consumer heterogeneity. They investigated the shopping and demographic characteristics of the consumers that are most likely to shift purchases to Wal-Mart. Their results showed that the incumbent store lost 17% volume following Wal-Mart's entry amounting to a quarter million dollars in monthly revenue. Decomposing the lost sales into components attributed to store visits and in-store expenditures, they found that the majority of the losses were due to fewer store visits with a much smaller impact on basket sizes. Also distance to the store explains little of the variation in household heterogeneity. Households that responded to Wal-Mart are likely to be large basket consumers and to have an infant and pet and are more likely to be weekend shoppers. On the other hand, households that spent a large proportion of their grocery expenditures on fresh produce, seafood, and home meal replacement items were less likely to defect to Wal-Mart.

#### *Consumer demographics and retail format choice*

Carpenter and Moore (2006) provided a general understanding of grocery consumer's retail format choice in the U.S. market by identifying the demographic groups who frequent specific formats and examining the store attributes as drivers of format choice. A descriptive method using means and ranks was performed to determine the importance of store attributes on format choice. A linear regression was used to examine the effect of the continuous demographic variables on format choice including age, income, education level, and household size. Results provided interesting

insights. With regard to store attributes, cleanliness is the most important attribute regardless of format. The price competitiveness appeared to be most important among shoppers in the traditional supermarket format and the supercenter format. Surprisingly, price competitiveness did not rank among the top five attributes for occasional shoppers in the supercenter format or the specialty grocery format and ranked only fifth among these shoppers for the warehouse format. While many assert that the grocery industry is strongly driven by price competitiveness, their results suggested that product selection and courtesy of personnel are also very important in determining format choice.

### *Price and Concentration*

Lamm (1981) presented new evidence on the nature of the price structure relationship for the food retailing industry using individual market shares and 1-firm through 4-firm concentration ratios as structure measures. The analysis is based on a simple food price determination model estimated using a pooled cross section and time series data set consisting of 72 observations for 18 urban areas from 1974 to 1977. The basic dependent variable included in the study is the price of an approximately homogenous food market basket for a family of 4. The study shows that the choice of a market structure measure is important for determining the nature of the structure-price relationship in the food retailing industry. In particular, the equal weight scheme inherent in the use of the concentration ratio is found to mask some of the important aspects of firm-share distribution. Growth in 3-firm concentration causes food prices to rise with the second largest firm's share has an offsetting effect, however. From a policy perspective, this suggests that attention might be focused on food retailing markets where the second largest firm is expanding rapidly, while significant growth in the fourth largest firm's share could be viewed with little alarm.

In sum, even though there are not many comprehensive studies on the impact of mass retailers on traditional retailers, there is clear evidence that the entry and expansion of mass retailers will exert impacts on the existing small businesses. Whether the impact is positive or negative, small or huge, depends on various factors such as the type of local retail businesses, the proximity of existing business and the new entrant, the size and competitiveness of local retail businesses.

### **3. Data Description**

This section describes how the dataset used in this analysis was built. The unit of analysis is the municipal market and the period of analysis comprises the years between 2004 and 2009. Therefore there are 29 group variables corresponding to the 29 municipal markets and 6 time variables corresponding to the years 2004, 2005, 2006, 2007, 2008 and 2009.

All variables except for those related with municipal markets' characteristics are measured at the "*Freguesia*" level. We excluded from the analysis all "*Freguesias*" that did not have a municipal market. In total we collected data for 23 "*Freguesias*" of Lisboa. A list of the various types of variables used in this analysis is exhibited in Table 1 in Appendix A and a description of the sample is exhibited in Table 2 in Appendix B.

#### **3.1. Dependent Variable**

One would expect that the sales volume of municipal markets would be used as our dependent variable. However, data on the volume of sales over time is either not available in some cases or very difficult to collect. Information on the volume of sales is gathered by each seller in each municipal market. Most sellers do not have an organized accounting and this type of information is not kept over time on a database. Moreover,

some of the sellers have already retired or passed away which makes it more difficult to put together a dataset on the amount of sales and number of sellers operating in each municipal market over time. We have thus used a proxy to capture these sellers business performance over time.

Competition within each market is very high and since there are many sellers with similar cost structures selling very similar products, we can say that within each market competition resembles that of monopolistic competition. In a monopolistic competitive market the existence of economic profits will attract new entrants until each firm's economic profit is zero. This implies a very particular geometrical relationship. Both the demand and the average cost curves must be tangent to each other.

Sometimes, however, firms are operating below the tangency point, earning negative profits. This happens because if above average variable cost curve firms could avoid bigger losses. Firms are still able to cover part of their fixed costs. This situation could not however be sustained forever. If firms continue operating below the tangency point in the long run they will exit the market. This suggests that municipal markets' occupation could be used as a proxy for its business activity. The occupation rate is measured as a percentage of the places – shops and stands - occupied in each year. It can be measured in terms of number of occupied places or in terms of occupied area.

Data for the dependent variable came from “*Listas de Emissão Mensais*” made available by “*Câmara Municipal de Lisboa*” (CML). These lists contain monthly information on the rents paid by each shopper/seller to CML and on other features such as the size of the shops/stands rented and the number of shops/stands rented by each shopper/seller. It should be mentioned that “*Listas de Emissão Mensais*” are just available in paper format and that there is a lack of criteria regarding its organization. In particular, the information is not organized by shop/stand neither by shopper/seller. As a

result, it was necessary to build a more consistent and clean dataset which was very time consuming. In particular, variables were grouped according to the following criteria: total number/area of shops/stands in each Municipal Market in each year; total number/area of occupied shops/stands in each Municipal Market in each year; total number of shoppers/sellers in each Municipal Market in each year; the average annual rent paid by the shoppers/sellers to CML in each Municipal Market in each year; and the same for each product category.

### **3.2. Independent Variables**

There are several factors that can influence occupation rates. We included in our analysis several variables that capture the competitive environment within the influence area of each municipal market. We also used variables that captured the characteristics of municipal markets, the neighborhood where the municipal market is located and the characteristics of local residents. Table 1 in Appendix A presents all the variables used.

Variables on the municipal market's characteristics were built with information from the "*Anuário de Caracterização dos Mercados Municipais*" and from "*Listas de Emissão Mensais*", both provided by CML. Variables on the trade environment of each "*Freguesia*" came from "*Recenseamento dos Estabelecimentos de Comércio a Retalho e Restauração e Bebidas da Cidade de Lisboa*" also provided by CML.

Six variables concerning competition in each "*Freguesia*" were also computed using the previous CML data source. Data on the adjacent "*Freguesias*" was also collected since consumers also shop on mass food retail stores outside their residential areas. The variables computed were the number of mini, super and hypermarkets per km<sup>2</sup> within the municipal market's "*Freguesia*" and within the adjacent "*Freguesias*".

Demographic variables were computed using data from the 2001 and 2011 *Censos*. The 2001 *Censos* was used to characterize population in each “*Freguesia*” from 2004 until 2006. The 2011 *Censos* was used to characterize population from 2007 until 2009. Although income is a relevant variable as the studies in the literature review show, this data is only available at the “*Concelho*”. Instead one used education as a proxy. One expects that households with higher education have higher income levels on average.

#### 4. Model Specification

This analysis rests on the development of an econometric model for municipal markets’ occupation rates. This section briefly describes our econometric model specification. For further details on the model specification please see Appendix B.

A key question is whether one should use the fixed effects (FE) estimator or the random effects (RE) estimator. A more conservative approach is to assume that the unobserved effect is correlated with the explanatory variables and use the FE estimator.

Our *Hausman* statistic is relatively small (13.60 with p-value = 0.1919) which implies that the differences between the coefficients are not big enough to be significance.<sup>1</sup> So, one fails to reject (with 5% significance) the null hypothesis. Therefore, RE should be used. In particular we used the *sigmamore* version. We also tested for serially correlated errors using the Lagrange multiplier (LM) test.<sup>2</sup> After running the Lagrange multiplier test (statistic = 2.89; p-value = 0.0892) and taking into

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<sup>1</sup> The result of the *Hausman* test indicates that this research should use a RE model instead of a FE one. The *Hausman* test checks a more efficient model against a less efficient but consistent model to make sure that the more efficient one also gives consistent results. The bigger the difference, the higher the *Hausman* statistic.

<sup>2</sup> The LM test helps to decide between a RE regression and a simple OLS regression. The null hypothesis is that variances across entities are zero, this is, no panel effect. If one fails to reject the null of no serial correlation OLS is appropriate.

consideration a 10% significance level we did not fail to reject the null that  $\sigma_\alpha^2 = 0$  and conclude again that RE is appropriate.

The *Prais-Winsten* Estimation is a procedure that accounts for serial correlation of type AR(1). However, because we are interested on first-order autocorrelation within panels with panel specific AR(1) coefficients, a panel specific AR(1) should be computed instead of the usual AR(1). Therefore, we have employed the following model specification (Prais-Winsten regression with specific panel AR(1) and PCSEs):

$$y_{it} = \beta_0 + \sum_{k=1}^K \beta_k x_{kit} + \varepsilon_{it}, \quad \varepsilon_{it} = \rho_i \varepsilon_{it-1} + \omega_{it} \quad (1)$$

where  $i = 1, 2, \dots, N$  refers to a cross-sectional unit;  $t = 1, 2, \dots, T$  refers to a time period and  $k = 1, 2, \dots, K$  refers to a specific explanatory variable. Thus,  $y_{it}$  and  $x_{it}$  refer respectively to the dependent and independent variables for unit  $i$  and time  $t$ ;  $\varepsilon_{it}$  is a random error and  $\beta_0$  and  $\beta_k$  refer, respectively, to the intercept and the slope parameters. Moreover we can denote the  $NT \times NT$  variance-covariance matrix of the errors with typical element  $E(e_{it}e_{js})$  by  $\Omega$ . Equation 1 was estimated using the statistical package STATA.

## 5. Results

This section presents and discusses the results. Table 1 presents the estimated coefficients and correspondent standard errors and p-values for all variables.

**Table 1:** *Estimation Results*

<b>Dependent Variable</b>			
Occupation_Rate_m2			
<b>Explanatory Variables – Municipal Markets’ Characteristics</b>			
<b>Variable</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>P &gt;  Z </b>
Age	-.0103417	.0016064	*0.000
Age^2	.0000565	9.41e-06	*0.000

Ln(Total_Area)	.099945	.0175594	*0.000
Closure_Afternoon	.0599693	.0108711	*0.000
Supermarket_Area	-.0001823	.0001782	0.306
Supermarket_Area^2	1.72e-07	1.72e-07	0.319
Parking_Area	-.0006162	.0000671	*0.000
Parking_Area^2	2.29e-07	2.79e-08	*0.000
ATM_Area	.1043597	.0296789	*0.000
ATM_Area^2	-.03247	.0072967	*0.000
Stands	3.985119	.4224504	*0.000
Sellers	.3729489	.0801037	*0.000
Average_Shop_Dimension	.0040441	.0018752	**0.031
Average_Stand_Dimension	-.0773487	.0155105	*0.000
Ln(Average_Annual_Rent)	.178409	.022897	*0.000

#### Explanatory Variables – Trade Environment

Variable	Coefficient	Standard Error	P >  Z
FoodBeverage_Area	1.438681	1.191979	0.227

#### Explanatory Variables – Competition

Variable	Coefficient	Standard Error	P >  Z
Mini	.0041492	.00471	0.378
Super	-.034823	.0097261	*0.000
Hyper	-.562471	.2477272	**0.023
Mini_Adj	.0096856	.0093362	0.300
Super_Adj	-.0385587	.0311815	0.216
Hyper_Adj	-1.009818	.3492053	*0.004

#### Explanatory Variables – Demographics

Variable	Coefficient	Standard Error	P >  Z
Population	.0000142	4.10e-06	*0.001
Average_Age	-.0277336	.0097489	*0.004
Education_HigherEd	-.1799537	.1340959	0.180
Ln(Area)	.1073502	.0250335	*0.000

#### Intercept

Variable	Coefficient	Standard Error	P >  Z
Intercept	-2.447124	.4054661	*0.000

#### Statistics

Number of Observations	174
Group Variable (N=29)	<i>Mercado_Municipal</i>
Time Variable (T=6)	<i>Year</i>
R-squared	0.9492

\*, \*\* denotes significance at the one and five percent level respectively



About 95 percent of the variability in occupation rates is accounted by the model. As such our model has a good explanatory power. All variables in the model are statistical significant except the area of supermarkets within the market's building, food and beverage stores' area, percentage of population with higher education, minimarkets within the "*Freguesia*" and mini and supermarkets within adjacent "*Freguesias*".

The total area of the municipal market is a statistical significant factor affecting occupation rates. On average, an increase of 10 m<sup>2</sup> causes an increase of 1.00% in the occupation rates. Opening and closing hours are also important explanatory variables. A wider schedule would allow municipal markets to target other customers apart from retired people, housemaids and free-schedule workers. The coefficient on the afternoon closing timing is positive and statistically significant at the 1% level. An increase of 1 hour causes an increase of 6.00% in the occupation rate on average.

The age of the building where the municipal market sits is also a relevant factor and it can proxy for the maintenance conditions of the market infrastructure. Older commercial buildings tend to have a less attractive shopping environment if not maintained properly. The sign associated with this variable is negative until 183 years being therefore positive. The positive impact could be due to historical reasons. From a certain age buildings start to be visited as monuments and customers go there not to buy perishable products but to admire the building. However once there they might shop.

The effect of parking is only negative until 2690.830 m<sup>2</sup> being therefore positive. These results suggest that the area of parking matters. One would expect that parking would have no influence on the occupation rates since this format's customers tend to live near the municipal markets and tend to buy on a weekly basis and small purchasing volumes. The positive effect could then be explained by the presence of customers that

do not live near the market and/or do not have time to weekly shopping trips and therefore buy in bulk.

The effect of ATMs is only positive until 3.214 m<sup>2</sup> being therefore negative. Since only one municipal market as an ATM area bigger than 4 m<sup>2</sup> we should only take into consideration the function within [0; 3.214]. In this region the ATM area has always a positive effect. It is also possible to conclude that the first ATM is more important than the remaining ones, having a bigger impact.

Occupation rates also increase as the average number of stands per km<sup>2</sup> increases. An increase of 1 stand per km<sup>2</sup> causes an increase of 0.40% in the occupation rate on average. If the municipal market has more space dedicated to other activities it has necessarily less space dedicated to stands which is its core business and distinctive advantage. Less space dedicated to it will therefore keep consumers away.

The coefficient on the average number of sellers per stand is positive and statistically significant at the 1% level. An increase of 0.1 seller per stand leads to an increase of 3.73% in the occupation rate on average (this explanatory variable only varies between 0 - no stands - and 1 - one stand per seller; any number between means more than one stand per seller). Less stands per seller means higher competition and therefore lower prices. Less stands per seller also means less probability of dumping.

The average size of shops and stands also impact the occupation rates. On average, an increase of the shop's average size in 1 m<sup>2</sup> will lead to an increase of 0.40% in the occupation rates. This means that in general, municipal markets with higher shops have higher occupations rates. On the other hand, an increase of the stand's average size in 1 m<sup>2</sup> will lead to a decrease of 7.73% in the occupation rates on average. Higher stands will lead to less competition that will lead to higher prices and lower occupation rates.

The coefficient on the logarithm of the average annual rent is positive and statistically significant at the 1% level. An increase of 10€ causes an increase of 1.78% in the occupation rate on average. This result seems counterintuitive at first glance but it is not. Sellers usually tend to work in order to meet their cost's obligations and in order to save some money that can be understood as their salaries. If they have to pay higher rents they will have to make an effort to improve their performance which will attract more customers and therefore new sellers.

The number of minimarkets within the "*Freguesia*" does not impact occupation rates. This retail stores ( $< 200 \text{ m}^2$ ) tend to be family business replicating a lot of municipal markets' characteristics. Therefore they tend to not have an impact on municipal markets. The number of mini and supermarkets within the adjacent "*Freguesias*" also does not impact occupation rates. These two formats of retail are well spread throughout the city of Lisboa (on average each "*Freguesia*" has 4 minimarkets and 1 supermarket). Then, one does not have to go to the neighborhoods to find one of them, explaining the level of significance of those two variables.

The coefficient on supermarkets per  $\text{km}^2$  within the "*Freguesia*" is negative and statistically significant at the 1% level. An increase of 1 supermarket per  $\text{km}^2$  causes a decrease of 3.48% in the occupation rate on average. Since supermarkets can offer some features that municipal markets cannot such as lower prices, its presence tend to affect negatively the occupation rates of municipal markets.

Both hypermarkets within the "*Freguesia*" and hypermarkets in the adjacent "*Freguesias*" are statistically significant at 5% level. The impact of these retailers is even higher if located in an adjacent "*Freguesia*". This makes sense since there are only few hypermarkets in the city of Lisboa and therefore it is more likely to have a hypermarket on an adjacent "*Freguesia*" than within the "*Freguesia*" of analysis. This

also makes sense since households tend to choose this format for high volume purchases, needing to use their car. On average, an increase of 0.1 hypermarkets per  $\text{km}^2$  within the “*Freguesia*” leads to a decrease of 5.62% in the occupation rates while an increase of 0.1 hypermarkets per  $\text{km}^2$  within the adjacent “*Freguesias*” causes a decrease of 10.10% in the occupation rates.

Population density is a statistically significant factor affecting occupation rates. For every 1000 person increase per  $\text{km}^2$ , occupation rates increase 1.42%. Average age of urban residents is also relevant. An increase of 1 year causes a decrease of 2.77% in the occupation rate on average. Older people tend to have lower purchasing power leading to lower occupation rates.

The coefficient on the percentage of the population with higher education is not statistically significant at the 10% level. High income people could afford to buy in municipal markets where prices tend to be higher. However as the level of education of the “*Freguesia*” residents increase, consumers may switch to other grocery outlets or may increase expenditures in the away-from home market. These two contradictory effects could explain the insignificance of the variable.

Results also show that the occupation rate increases as the size of the “*Freguesia*” in  $\text{m}^2$  increases. An increase of 10  $\text{m}^2$  causes an increase of 1.07% in the occupation rate on average. Then, bigger “*Freguesias*” tend to have higher occupation rates.

## **6. Concluding Remarks**

Mass retailers such as supermarkets and hypermarkets are new competitors for traditional food retailers and in particular, for municipal markets. In this paper, the impact of minimarkets, supermarkets and hypermarkets on occupation rates (used as a

proxy for the municipal market business activity) of municipal markets located in Lisboa was analyzed. To accomplish this task, we employed a Prais-Winsten regression with specific panel AR(1) and PCSEs model specification. Data for this analysis cover annual time periods from 2004 to 2009 for 29 municipal markets within the city of Lisboa.

Our results suggest that super and hypermarkets have a negative impact on municipal markets' occupation rates. Supermarkets within the "*Freguesia*" where the municipal market is located have impact while supermarkets in adjacent "*Freguesias*" do not. Hypermarkets regardless of their location have a negative impact on municipal markets. On average an increase of 1 supermarket per km<sup>2</sup> leads to a decrease of 3.48% in the occupation rates while an increase of 0.1 hypermarkets per km<sup>2</sup> leads to a decrease of 5.62% if it is located in the same "*Freguesia*" and a decrease of 10.10% if it is located in the adjacent ones.

What implications can we draw from this study? Municipal markets will face heightened competition from mass retailers such as hypermarkets and supermarkets like "*Continente*" and "*Pingo Doce*" and at the same time, but to a lesser degree, from minimarkets. To stabilize market share, municipal markets should make additional efforts to reduce prices and yet maintain profit margins. They should also try to engage in more aggressive differentiation strategies by offering greater variety of products and a wider schedule, advertising and investing in the shopping environment. Municipal markets should also try to lower their cost structure and improve their competitive position vis-à-vis mini and supermarkets in close proximity. That may imply take tougher stances in the negotiations of the infrastructure rents and utilities with CML.

Any plan to rehabilitate municipal markets should not aim to replicate mass retailers, betting on their core aspects such as lower prices and huge diversity of

products. Municipal markets' have no conditions to compete with these formats. They should bet on their distinctive advantages like their locations within residential areas and their personalized and attentive service.

Municipal markets could also bet on their “*social dimension*”. They usually symbolize the “*Freguesia*” where they are located and they are therefore a reference of the neighborhood. “*Unintentional monuments*” and places of “*memory and identity*”, municipal markets can be unique places in the city of Lisboa. They should therefore be preserved as locations of solid social relations between residential populations, acting as “*Living Monuments*”. They could be marketed as historic amenities that give a flavor to the “*Freguesia*” and used as urban amenities to attract population into the city.

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## APPENDIX A

**Table 1:** Summary of the variables computed for the econometric model

<b>Dependent Variable</b>		
Variable	Variable Description	Variable Source
Occupation_Rate_N	# occupied places/ # total places	<i>Listas de Emissão Mensais, CML (2004-09)</i>
Occupation_Rate_m2	m <sup>2</sup> occupied places/ m <sup>2</sup> total places	
<b>Explanatory Variables – Municipal Markets’ Characteristics</b>		
Variable	Variable Description	Variable Source
Age^2	(Market’s Age in years) <sup>2</sup>	<i>Anuário de Caracterização dos Mercados Municipais, Feiras e Venda Ambulante, CML (2004 - 2009)</i>
Ln(Total_Area)	Ln(Market’s total area in m <sup>2</sup> )	
Ln(Commercial_Area)	Ln(Market’s commercial area in m <sup>2</sup> )	
OpeningHours_Morning	# of opening hours during the morning	
Opening_Morning	Opening hour in the morning	
Closure_Morning	Closure hour in the morning	
OpeningHours_Afternoon	# of opening hours during the afternoon	
Opening_Afternoon	Opening hour in the afternoon	
Closure_Afternoon	Closure hour in the afternoon	
Refrigerators	# of Market’s Refrigerators	
Supermarket_Area	(Supermarket Area in m <sup>2</sup> ) + (Supermarket Area in m <sup>2</sup> ) <sup>2</sup>	
Supermarket_Area^2		
Parking_Area	(Parking Area in m <sup>2</sup> ) + (Parking Area in m <sup>2</sup> ) <sup>2</sup>	
Parking_Area^2		
ATM_Area	(ATM Area in m <sup>2</sup> ) + (ATM Area in m <sup>2</sup> ) <sup>2</sup>	
ATM_Area^2		
Shops	# Shops/ Market’s total area in m <sup>2</sup>	<i>Listas de Emissão Mensais, CML (2004 - 2009)</i>
Stands	# Stands/ Market’s total area in m <sup>2</sup>	
Shoppers	# Shoppers/ # occupied shops	
Sellers	# Sellers/ # occupied stands	
Average_Shop_Dimension	Total shop’s area/ # shops	
Average_Stand_Dimension	Total stand’s area/ # stands	
Ln(Average_Annual_Rent)	(Rent shops + Rent stands)/#(shoppers + sellers)	
Shop.i_Area <sup>*</sup>	Area i/ Total shops’ area (m <sup>2</sup> )	
Stand.i_Area <sup>**</sup>	Area i/ Total stands’ area (m <sup>2</sup> )	
Shop.i_Number <sup>*</sup>	# of shop i/ # shops	
Stand.i_Number <sup>**</sup>	# of stand i/ # shops	



<b>Explanatory Variables – Trade Environment</b>		
<b>Variable</b>	<b>Variable Description</b>	<b>Variable Source</b>
Ln(Category_i)***	Ln(Area of Category i)	<i>Recenseamento dos estabelecimentos de comércio a retalho e restauração e bebidas da cidade de Lisboa. CML (2004 - 2009)</i>
Ln(SubCategory_i)****	Ln(Area of Category i)	
Category.i_Area ***	Area Category i/ Area of “Freguesia”	
Subcategory.i_Area ****	Area Subcategory i/ Area of “Freguesia”	
<b>Explanatory Variables – Competition</b>		
<b>Variable</b>	<b>Variable Description</b>	<b>Variable Source</b>
Mini	# Minimarkets/ Supermarkets/ Hypermarkets per km <sup>2</sup> in the “Freguesia”	<i>Recenseamento dos estabelecimentos de comércio a retalho e restauração e bebidas da cidade de Lisboa. CML (2004 - 2009)</i>
Super		
Hyper		
Mini_Adj	# Minimarkets/ Supermarkets/ Hypermarkets per km <sup>2</sup> in the adjacent “Freguesia”	
Super_Adj		
Hyper_Adj		
<b>Explanatory Variables – Demographics</b>		
<b>Variable</b>	<b>Variable Description</b>	<b>Variable Source</b>
Population	# inhabitants per km <sup>2</sup>	<i>Censos 2001 and 2011</i>
Average_Age	Weighted average of the midpoints of the age’s intervals	
Education_None	Percentage of the inhabitants with none education	
Education_Basics1	Percentage of the inhabitants with 1 <sup>st</sup> cycle of basics completed	
Education_Basics2	Percentage of the inhabitants with 2 <sup>nd</sup> cycle of basics completed	
Education_Basics3	Percentage of the inhabitants with 3 <sup>rd</sup> cycle of basics completed	
Education_Secondary	Percentage of the inhabitants with secondary completed	
Education_PostSecondary	Percentage of the inhabitants with a post-secondary course completed	
Education_HigherEd	Percentage of the inhabitants with a higher education course completed	
Average_N.Persons_Family	Average # of persons per family	
Ln(Area)	Ln(“Freguesia’s” Area)	

\*i(shop) = Talhos; Criação e Caça; Leitão Assado e Churrasqueira; Fumados e Queijos; Leite e Derivados; Padaria; Peixe Fresco; Produtos Hortofrutícolas; Congelados; mercearia e Charcutaria; Artigos de Jardim e Flores; Drograrias; Artigos de Vestuário Diverso; Retrosarias e Bijuterias; Sapatarias e Reparação de Calçado; Material de Escritório e Papelarias; Estabelecimentos de Restauração e Bebidas; Lavandarias

\*\*i(stand) = Produtos Hortofrutícolas; Produtos Frutícolas; Peixe Fresco; Criação e Caça; Leitão Assado e Churrasqueira; Fumados e Queijos; mercearia e Charcutaria; Congelados; Padarias; Bolos; Artigos de Jardim e Flores; Artigos de Vestuário Diverso

\*\*\*i(category) = Food retail stores; Non-food retail stores; Food and beverage

\*\*\*\*i(subcategory) = Specialized food retail stores; Non-specialized food retail stores; Personal use items; Household equipment; Hygiene and health; Culture and leisure; Other non-food retail stores; Food and beverage.

## APPENDIX B

**Table 1:** *Location of Municipal Markets within the City of Lisboa*

<b>Municipal Market</b>	<b>“Freguesia”</b>
Ajuda	Ajuda
Alcântara	Alcântara
Alvalade Norte	São João de Brito
Alvalade Sul	Alvalade
Arco Cego	São João de Deus
Arroios	São Jorge de Arroios
Bairro Alto	Encarnação
Bairro de São João	S. Domingos Benfica
Bairro Padre Cruz	Carnide
Bairro Santos	Nossa Sra. Fátima
Benfica	Benfica
Campo de Ourique	Santo Condestável
Encarnação Norte	Santa M <sup>a</sup> Olivais
Encarnação Sul	Santa M <sup>a</sup> Olivais
Forno de Tijolo	Anjos
Galinheiras	Charneca
Lumiar	Lumiar
Olivais Sul B	Santa M <sup>a</sup> Olivais
Olivais Sul E	Santa M <sup>a</sup> Olivais
Picheleira	Beato
Rato	São Mamede
Santa Clara	São Vicente Fora
São Bento	Mercês
S. Domingos Benfica	S. Domingos Benfica
Sapadores	Penha de França
Xabregas	Beato
Zona J de Chelas	Marvila
31 de Janeiro	São Jorge de Arroios
24 de Julho	São Paulo

**Table 2: Summary Statistics of the variables**

<b>Dependent Variable</b>					
<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>	<b>Obs</b>
Occupation_Rate_N	0.7921592	0.1812562	0.2778	1	174
Occupation_Rate_m2	0.8304897	0.1612449	0.2083	1	174
<b>Explanatory Variables – Municipal Markets’ Characteristics</b>					
<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>	<b>Obs</b>
Age	43.65517	32.03821	1	132	174
Age^2	2926.322	4412.887	1	17424	174
Ln(Total_Area)	7.475671	1.244186	5.193	9.4271	174
Ln(Commercial_Area)	6.079351	1.220678	2.6391	7.6946	174
OpeningHours_Morning	6.821839	0.4560259	6	8	174
Opening_Morning	7.143678	0.4294643	6	8	174
Closure_Morning	13.96552	0.1829922	13	14	174
OpeningHours_Afternoon	1.281609	2.124997	0	5	174
Opening_Afternoon	14.03448	0.1829922	14	15	174
Closure_Afternoon	15.31609	2.176616	14	19	174
Refrigerators	1.471264	1.247787	0	5	174
Supermarket_Area	73.0977	290.2053	0	1350	174
Supermarket_Area^2	89078.37	369540.2	0	1822500	174
Parking_Area	590.2759	1075.514	0	4050	174
Parking_Area^2	1498508	3503340	0	1.64e+07	174
ATM_Area	0.954023	1.570376	0	7.5	174
ATM_Area^2	3.362069	10.69707	0	56.25	174
Shops	0.0126759	0.0132409	0	0.063	174
Stands	0.0275707	0.0465723	0	0.25	174
Shoppers	0.7673115	0.302321	0	1	174
Sellers	0.4460534	0.2916104	0	1	174
Average_Shop_Dimension	20.92793	10.68118	0	42	174

Average_Stand_Dimension	2.121317	1.300889	0	5.0976	174
Ln(Average_Annual_Rent)	7.534873	0.5049589	5.5763	8.6263	174
<b>Explanatory Variables – Trade Environment</b>					
<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>	<b>Obs</b>
LN(FoodRetail)	8.351459	1.095967	5.9839	10.1764	174
LN(NonFoodRetail)	9.844152	1.015174	7.1164	11.1998	174
LN(FoodBeverage)	9.027209	0.8098071	7.1793	10.406	174
LN(SpecializedFoodRetail)	6.892741	0.7141495	4.9558	7.954	174
LN(NoSpecializedfoodRetail)	8.000292	1.293984	5.0499	10.1157	174
LN(PersonalUse)	7.874902	1.443676	3.912	10.0093	174
LN(HouseholdEquipment)	8.383504	1.064576	5.3936	10.1879	174
LN(HygieneHealth)	6.694903	0.9287661	4.3175	7.9572	174
LN(CultureLeisure)	7.499152	0.9915469	4.7958	9.3042	174
LN(OtherNonFoodRetail)	8.799995	1.189675	5.9243	10.2688	174
FoodRetail_Area	0.0027799	0.0016671	0.0006	0.0071	174
NonFoodRetail_Area	0.0163718	0.0155397	0.0007	0.0559	174
FoodBeverage_Area	0.007831	0.0112494	0.0008	0.0618	174
SpecializedFoodRetail_Area	0.0007914	0.0007702	0.0001	0.0043	174
NoSpecializedfoodRetail_Area	0.0019943	0.0012738	0.0004	0.0048	174
PersonalUse_Area	0.0030615	0.0037054	0	0.0176	174
HouseholdEquipment_Area	0.0049874	0.0060523	0.0001	0.0235	174
HygieneHealth_Area	0.0007161	0.0006784	0	0.0025	174
CultureLeisure_Area	0.0017172	0.0018651	0.0001	0.0103	174
OtherNonFoodRetail_Area	0.0051621	0.004667	0.0003	0.0354	174
<b>Explanatory Variables – Competition</b>					
<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>	<b>Obs</b>
Mini	3.683594	2.759041	0	14.6341	174
Super	0.7654184	1.150702	0	5.3097	174
Hyper	0.0379828	0.0794447	0	0.3185	174
Mini_Adj	3.315504	1.634643	1.7143	11.6564	174

Super_Adj	0.7772759	0.5959938	0.1153	3.2258	174
Hyper_Adj	0.0638483	0.0700455	0	0.1813	174

**Explanatory Variables – Demographics**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>	<b>Obs</b>
Population	9742.972	5214.331	3176.082	21213.33	174
Average_Age	42.44415	2.227613	35.0781	45.6935	174
Education_None	0.1706776	0.0423892	0.1071	0.335	174
Education_Basics1	0.216031	0.0562391	0.1093	0.3197	174
Education_Basics2	0.0888103	0.0172166	0.0583	0.1326	174
Education_Basics3	0.1365414	0.0155343	0.1002	0.1741	174
Education_Secondary	0.11515	0.0271678	0.0582	0.1654	174
Education_PostSecondary	0.0616121	0.0488977	0.0098	0.1551	174
Education_HigherEd	0.2111586	0.1038285	0.0117	0.4225	174
Average_N.Persons_Family	2.239549	0.2564586	1.8403	3.0028	174
Ln(Area)	14.42231	1.215267	11.9184	16.182	174

## Model Specification

A key question is whether one should use the fixed effects (FE) estimator or the random effects (RE) estimator. A more conservative approach is to assume that the unobserved effect is correlated with the explanatory variables and use the FE estimator.

However, if the unobserved effect is uncorrelated with the explanatory variables then the RE estimator is more efficient. A FE model is also used if one has data on all the members of the population. If not, the RE model is better because it saves degrees of freedom since some parameters are random variables.

However FE will not work well for minimal within-cluster variation or for slow changing variables over time since they are designed to study the causes of changes within an entity. A time-invariant characteristic cannot cause such a change because it is constant for each unit. Then, FE can cause serious econometric problems. This is so because in situations that have many independent variables that change slowly over time, the FE are highly collinear with some of them.

In contrast, RE assume that the entity's error term is not correlated with the predictors and allow for time-invariant variables to play a role as explanatory variables. Because there are reasons to believe that differences across entities have some influence on the dependent variable a RE model should be used in this case. To avoid the omitted variable bias all those individual characteristics that may or may not influence the predictor variables were also included.

Because RE estimator makes an assumption that FE estimator does not, if this assumption is wrong, the RE estimator will be inconsistent, but the FE estimator is unaffected. Hence, if the assumption is wrong, this will be reflected in a difference

between the two set of coefficients. *Hausman* (1978) proposed a test for such a situation. The bigger the difference, the bigger the *Hausman* statistic. The *Hausman* test checks a more efficient model against a less efficient but consistent model to make sure that the more efficient one also gives consistent results.

*H0:  $x_{kit}$  and  $\alpha_i$  are uncorrelated  $\Rightarrow$  GLS (Random Effects) consistent and efficient, LSDV (Fixed Effects) is consistent and inefficient.*

*Ha:  $x_{kit}$  and  $\alpha_i$  are correlated  $\Rightarrow$  LSDV (Fixed Effects) is consistent but not efficient, GLS (Random Effects) is not consistent.*

It is also always appropriate to test for serially correlated errors using a Lagrange multiplier (LM) test. The LM test, helps to decide between a RE regression and a simple OLS regression. The null hypothesis is that variances across entities are zero, this is, no panel effect. If one fails to reject the null of no serial correlation then OLS is appropriate:

*H0:  $\sigma_\alpha^2 = 0$ , Simple OLS Regression*

*Ha:  $\sigma_\alpha^2 > 0$ , Random Effects Regression*

Ordinary least squares (OLS) is not the best linear unbiased estimator (BLUE) and can produce incorrect standard errors when the errors are nonspherical. Generalized least squares (GLS), which incorporates information about the errors and thereby makes up for the inefficiency of OLS, is BLUE and will give correct standard errors. However, GLS assumes that the variance-covariance matrix ( $\Omega$ ), which is used to weight the data, is known when in practice it is not. Instead, one can employ feasible GLS (FGLS), which involves using an estimate of the variance-covariance matrix ( $\hat{\Omega}$ ).

Beck and Katz (1995) showed, however, that the FGLS method advocated by Parks (1967) and Kmenta (1986) produces incorrect standard errors when applied to TSCS data and argued that a superior way to handle complex error structures in TSCS analysis is to estimate the coefficients by OLS and then compute panel corrected standard errors (PCSEs). When computing the standard errors and the variance-covariance estimates, it assumes that the disturbances are heteroskedastic and contemporaneously correlated across panels. The parameters are estimated by OLS or by a Prais-Winsten regression.

A crucial assumption for the method of PCSEs is that the errors are free of serial correlation. Yet it is reasonable to expect that such correlation would be common in TSCS data. Before this method is applied, the serial correlation must be removed.

The Prais-Winsten Estimation is a procedure meant to take care of serial correlation of type AR(1) in a linear model. However because we are interested on first-order autocorrelation within panels in which the coefficient of the AR(1) process is specific to each panel instead of being common to all the panels a panel specific AR(1) should be computed instead of the usual AR(1). Therefore a Prais-Winsten regression with specific panel AR(1) and PCSEs should be used to estimate the model:

$$y_{it} = \beta_0 + \sum_{k=1}^K \beta_k x_{kit} + \varepsilon_{it}, \quad \varepsilon_{it} = \rho_i \varepsilon_{it-1} + \omega_{it} \quad (1)$$

where  $i = 1, 2, \dots, N$  refers to a cross-sectional unit;  $t = 1, 2, \dots, T$  refers to a time period and  $k = 1, 2, \dots, K$  refers to a specific explanatory variable. Thus,  $y_{it}$  and  $x_{it}$  refer respectively to the dependent and independent variables for unit  $i$  and time  $t$ ;  $\varepsilon_{it}$  is a random error and  $\beta_0$  and  $\beta_k$  refer, respectively, to the intercept and the slope parameters. Moreover we can denote the  $NT \times NT$  variance-covariance matrix of the errors with typical element  $E(e_{it} e_{js})$  by  $\Omega$ .



### *Estimation Procedure*

By using the dataset already computed and the econometric model previously presented the estimation procedure was conducted. In order to compute the coefficients the STATA Software was used. The Prais-Winsten regression with panel specific AR(1) and PCSEs was estimated using the command `xtpcse y x1 x2 ... xk, corr(psar1)` where  $y$  stands for the dependent variable and  $x_i$  with  $i= 1, 2, \dots, k$  for the explanatory variables.

Although in the majority of the times linear relationships are estimated between the dependent and independent variables, because linear relationships are not nearly general enough for all applications, functional forms were used in some cases. Some independent variables appear in the logarithmic such as Market's Total Area, Market's Average Annual Rent, and "*Freguesia's*" area, while others appear in the quadratic form such as the Market's Age. There are also some cases where independent variables appear both in the normal and in the quadratic form which is the case of the areas of supermarkets, ATMs and parking within the Municipal Markets.