Regional retail regulation and supermarket entry in Spain

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Abstract

This paper analyses the impact of regional retail regulation on entry decisions by supermarkets in Spain. A structural entry model that includes the level of retail regulations as a cost component is estimated with a sample of geographically isolated markets. Retail regulations are shown to have significant cost impacts, both as an aggregate and when decomposed into the specific need of a second opening licence according to the size of the establishment and the imposition of limits on opening hours. Different effects are found according to the size of the establishment and the type of opening times restrictions (workdays or Sundays and bank holidays). The estimated model is used to measure the impact of the regulatory changes that have taken place after the transposition of the EU Services Directive, which have reduced regulatory levels to those of the mid-nineties. A significant increase in the entry of new supermarkets into local markets can be expected as a consequence of those changes.

Keywords: retail regulation, entry model, supermarkets, Spain, Services Directive.

JEL: L52, L81, K23, R52.

1 Introduction

In Spain, as in other countries, there is a growing concern about market power issues related to the food market. Most media attention (but also that of competition authorities, see CNC, 2010, 2011) focuses on the potential existence of buyer power by large distribution chains with respect to producers or wholesalers. However, food retailers may also exercise market power thanks to the existence of entry barriers for new establishments, which reduce competition in

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retailing. Regulation, which is the main reason for the existence of such barriers for new establishments, is usually justified as a way of protecting small, traditional or urban retailers.

The approval of the EU Services Directive (2006/123/EC) and its transposition into national legislation forces a revision of such regulations, given that one of the aims of the directive is to rationalise regulation so that it achieves its goals without distorting market outcomes (Delgado, 2007). The directive reflects the conclusions of a growing body of empirical research that has quantified the economic impacts of restrictive regulations in different markets.

Bertand and Kramarz (2002) were among the first authors who measured the effects of restrictive retail regulations, as they estimated the impact on employment of differences at the French *département* level in the application of the Loy Royer. Using approval rates for new retail stores as an index of regulatory restrictiveness, they find that the measures put in place by the law have had a negative impact on employment in the retail sector of at least 3%, with an upper estimate of 15%. Jódar (2009) estimates the impact of the subsequent imposition of additional barriers to supermarkets (Loy Raffarin) as a 6% increase in their costs. She uses an entry model based on Bresnahan and Reiss (1990, 1991) which is also the framework employed by Griffith and Harmgart (2008) in their analysis of entry decisions by UK grocery retailers in a context of restrictive planning regulation by local authorities. Such legislation, introduced in the mid-nineties, has been effective in restricting the opening of large out-of-town supermarkets. Using additional price data, Griffith and Harmgart are also able to quantify the consumer welfare losses due to the resulting limited supply at 10 million pounds per year. In Italy, Schivardi and Viviano (2011) analyse the effects of the regulatory entry barriers set up after 1998 in the form of maximum allowed floor space per province and find that they had clear impacts on performance, since they increased profits, prices and labour costs while reducing productivity and employment.

In the case of Spain Matea and Mora (2009, 2012) estimate the effect of retail regulation during the period 1997-2007. With the help of a purpose-built index of regulation at regional level they estimate the impact of regulation on commercial density, inflation rates and retail employment. They identify a positive impact of regulation on inflation and a negative one on employment. In the case of commercial density they find that given that regional regulation was more clearly directed towards avoiding the entry of large hypermarkets, it has had a positive effect on the number of smaller supermarkets, which have become the main format of food retailing in Spain (see also CNC 2011).

Orea (2010) also uses Matea and Mora's regulation index as a determinant of the entry of large commercial centres, supermarkets and small retailers into Spain's main cities. Orea also finds a negative impact of regulation on the number of commercial centres, but a positive one on the number of supermarkets, traditional food shops and non-food shops. In a companion paper (Orea, 2012) a stochastic frontier approach in which regulatory barriers and political variables are considered as inputs is employed to identify the efficient number of commercial centres in Spanish regions during the period 2002-2007. The regions

with nationalistic (i.e. regionalistic) governments are found to be more prone to limit the entry of large establishments. Without political or legal barriers, the number of commercial centres would increase by 14% in the whole of Spain, although in some regions such as Catalonia the impact would be a 50% rise.

Hoffmaister (2010) is another example of estimation of regulation outcomes in Spain using indexes of regional legislation. He finds that one regulatory constraint (no matter of which type) has a positive albeit small impact on the regional price index, while additional regulations do not contribute to further increases. This result would be consistent with a model of competition between two types of retailers (traditional high-cost ones versus low-cost entrants) that, due to regional regulatory differences, generates persistent price gaps among regions. Using the same data to measure regional regulation, Ciarreta et al. (2009) find that restrictions on the entry of large retailers have negative effects on employment.

This paper contributes to this literature by empirically examining the impact of regulation on entry decisions by food retailers in Spain. It addresses one criticism that can be made on previous research in the Spanish case, as is the lack of a structural model that explicitly incorporates the role of regulation. Such a model is estimated here using a previously unexploited dataset and a precise definition of isolated local markets, in combination with the previously mentioned regulation indexes. The results show the significant impact that retail regulation has a barrier to entry due to the costs it imposes. The use of detailed local data makes it possible to further decompose the regulatory costs into those due to entry restrictions for large establishments and those that set limits on opening hours. Each one is found to have different effects. Moreover, the availability of data on regional retail regulation after the transposition of the Services Directive makes it possible to measure the impact of those changes in terms of entry by new supermarkets, which is found to be substantial.

The rest of the paper is organised as follows. Section 2 develops the entry model and section 3 describes the framework of retail regulations in Spanish regions. The data used in the empirical model, including a description of the different indexes that have been built to quantify retail regulation, are discussed in section 4, while the estimation results are presented in section 5. Section 6 reports the impact of changes in regional regulation after the Services Directive and section 7 concludes.

2 The model

The entry model used here is based on the methodology by Bresnahan and Reiss (1990, 1991) which, with different modifications that progressively relax some of its assumptions, has been widely applied to the empirical estimation of entry decisions in a variety of industries such as airlines (Berry, 1992), motels (Mazzeo, 2002), hospitals (Abraham *et al.*, 2007), video rental shops (Seim, 2006), pharmacies (Schaumans and Verboven, 2008) or supermarkets (Cleeren

et al., 2010) among many others. Berry and Reiss (2007) and Dranganska *et al.* (2008) provide surveys and discussions of methodological issues.

Assuming that the observation of the number of active supermarkets in a given market reveals an equilibrium and considering those supermarkets as homogeneous, the entry model is based on the following revealed preference principle: if a given number of supermarkets are active at a given location it must be because a) they all obtain a positive profit, and b) any new additional entrant would incur into losses. Thus, defining $\Pi_m(n)$ as the profit of a supermarket in market m where a total of n supermarkets compete, the equilibrium conditions implied can be stated as: $\Pi_m(n) > 0$ and $\Pi_m(n+1) > 0$. Given a specification of the profit function these conditions lead to an empirical model of market entry whose parameters can be estimated using sample information. In the research reported in this paper the sample is a set of Spanish towns with specific features of size and isolation that make them appropriate candidates for the estimation of this type of model, as explained below.

The only condition that needs to be imposed on the profit function is that it be decreasing in the number of competitors. The specification chosen by authors such as Abraham et al. (2007) leads itself with a simple transformation into a linear function that makes it possible to directly transfer the parameters estimated in the econometric model into the profit function. This allows for a straightforward interpretation of the results and the simulation of alternative policy scenarios. Therefore, the profit function of a given supermarket in a market m where a total of N_m competitors are active is assumed to take the form

$$\Pi(N_m) = \frac{S_m}{N_m}V_m - F_m \tag{1}$$

Where S_m is a measure the size of the market (typically population, although it may include additional factors), N_m is the number of supermarkets, V_m are the variable profits per unit of market size (i.e. in per capita terms if size is identified with population) and F_m are the fixed costs that an active supermarket faces every period. The idea behind this relatively simple profit function is that the whole market S_m is evenly divided among N_m (homogeneous) supermarkets, each one of them obtaining a variable profit, measured by the first term on the right hand side of (1), that needs to be larger than its fixed costs (F_m) for profits to be positive and, thus, for it to remain in the market.

Avoiding the m sub index in what follows, the variables S, V and F are made dependent on observable market characteristics according to the following expressions:

$$S = \exp(\alpha'X + \varepsilon_S) \tag{2}$$

$$V = \exp(\beta'Y - \delta_N + \varepsilon_V) \tag{3}$$

$$F = \exp(\gamma'Z + \varepsilon_F) \tag{4}$$

Where X, Y and Z are the vectors of variables that determine the size of the market, the variable profits per unit of market size and the fixed costs, respectively. Additionally, the expression on variable profits includes the term δ_N

that captures the intensity of competition with additional entrants. This term is needed to take into account the fact that a different number of competitors not only modifies the share of the market available to each supermarket, but it also affects the variable profit margins that each supermarket can obtain.

Given these functional forms, the probability that a supermarket obtains positive profits when the overall number of competitors is N can be expressed as

$$\Pr\left(\Pi\left(N\right) > 0\right) =$$
$$\Pr(\alpha'X + \beta'Y - \gamma'Z - \delta_N - \ln N + \varepsilon_S + \varepsilon_V - \varepsilon_F > 0) =$$
$$\Pr(\alpha'X + \beta'Y - \gamma'Z - \mu_N + \varepsilon_\Pi > 0) \tag{5}$$

where $\mu_N = \delta_N + \ln N$ and $\varepsilon_\Pi = \varepsilon_S + \varepsilon_V - \varepsilon_F$. The probability that a given market has exactly n^* supermarkets is

$$\Pr(N = n^*) = \Pr(\Pi(n^*) > 0 \ and \ \Pr(\Pi(n^* + 1) < 0) =$$
$$\Pr(\mu_{n^*} < \alpha'X + \beta'Y - \gamma'Z + \varepsilon_\Pi < \mu_{n^*+1}) \tag{6}$$

These expressions lead to an empirically estimable model when a distribution is assumed for the error term ε_Π. If, as it is standard, it is assumed to be normally i.i.d. across markets, with mean zero and variance σ, the expression leads to an ordered probit specification:

$$\Pr(N|\theta, X, Y, Z) = \Phi(N + 1) - \Phi(N) \tag{7}$$

whose parameters $\theta = (\alpha, \beta, \gamma, \mu)$ can be directly estimated under the normalisation condition of unit variance.

An important requirement for the estimation of an entry model such as the one proposed here is the availability of a well-defined sample of markets where the number of firms is observed. The geographical characterisation of the relevant market is a fundamental step in the definition of such sample. A too narrowly defined market may not include all the firms that actually belong to the market and lead us to observe that there is less entry than there really is, therefore biasing the estimates of the competition parameters downwards. On the other hand, a too large market may include firms that do not really belong to the relevant market, with the opposite effect. This empirical question needs to be addressed in each setting to which the model is applied, imposing isolation and size conditions on the definition of the geographic markets. Bresnahan and Reiss (1991) worked with a sample of isolated US counties that were at least 20 miles from the nearest county of 1,000 habitants and more than 100 miles from the nearest city larger than 100,000. Besides such isolation conditions, some restrictions on population size need to be imposed too, since otherwise the sample may include cities that have different markets within them. Section 4.1. discusses the application of these conditions in the sample used here. Before that a brief account of the institutional framework of retail regulations in Spain is provided.

3 Regional retail regulation in Spain.

In Spain the central government sets the general regulatory framework for trade and retail activities, while regional governments are responsible for the detailed regulation. A high degree of political decentralisation has resulted in significant differences in the levels of regulation among regions. Although the tools used to regulate retail activities have been diverse, the main ones are the requirement of specific licenses for the opening of 'large' retail establishments and the limits on the opening hours[1].

The basic national framework was set in 1996 by a law (7/1996: *Ley de Ordenación del Comercio Minorista*) that has remained basically unchanged until the transposition of the EU Services Directive (2006/123/CE) in 2010 (Law 1/2010). The 1996 law made it compulsory for large commercial establishments (defined as retailers with floor space above 2,500 m^2) to obtain an opening licence issued by the regional authorities, who could also modify such threshold downwards making it dependent on other variables[2]. Most regions did so setting the limits as a function of the population of the municipality where entry was requested, with more strict limits for smaller municipalities. Other measures related to this one that have been in place in some regions are the automatic definition of a firm as large when it is more than 25% owned by another large one, or the need to reapply for the opening licence when the establishment is sold to another retailer. Regional governments have also regulated opening times (defining specific limits during workdays and Sundays or bank holidays, within the wider limits of national legislation), seasonal sales periods, specific taxes on particular types of retailing, limits on the opening of hard discount stores and even outright bans (moratoria) for new entrants during some periods.

The transposition of the EU Services Directive into Spanish law implied a change in the ability of regional authorities to impose restrictive entry conditions, given that the 1/2010 law abolishes the definition of 'large commercial establishment' and imposes what should, in principle, be a free entry regime. However, the law also allows regional authorities to define reasons of "general interest" that would require potential entrants to obtain a specific authorisation by the regional administration. Given that the issues that are considered of general interest include concepts such as environmental and urban protection, urban planning, preservation of historical heritage or consumer protection, the application of the Services Directive to regional legislation has not resulted in the free-entry regime envisaged by the European Commission[3]. However, as

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[1] See Matea and Mora (2009, 2012) for a detailed account of the retail regulation framework in Spain and its evolution during the last years.

[2] Different regions had introduced the second licence in their legislation previously to the 1996 law: the Basque Country in 1983, Valencia in 1986, Catalonia in 1987, Galicia and Navarre in 1988, Aragón in 1989 and the Canary Islands in 1994. Andalusia introduced such requirement only in 1996 (Ciarreta et al. 2009).

[3] See CNC (2011) for a critique of the way in which the Services Directive has been transposed into Spanish legislation and has allowed the regions to maintain restrictive entry regulations.

will be shown below, the changes in regulation after the transposition of the Services Directive have resulted in a significant reduction of regulatory barriers.

4   The data

This section explains the sources and definitions of the different variables used to estimate the empirical entry model proposed in section 2. The identification of the sample of local markets is explained first, followed by the dependent and independent variables of the model.

4.1   Geographical sample of local markets.

Spain is divided into a hierarchy of 17 regions (*comunidades autónomas*), 50 provinces (mainly administrative) and 8,116 local authorities (municipalities)[4]. Neither the region nor the province is an appropriate measure for the geographic definition of the catchment area of supermarkets, with the municipality being the best available option. However, municipalities vary too much in size, population and characteristics to directly identifiy them with the relevant market: very populated municipalities can easily contain different geographic markets, the relatively small size of most municipalities leads to a proportion of shopping being made in diverse municipalities, in particular in high density areas.

The solution employed to solve the problem created by the fact that municipal limits are not always appropriate for the geographic analysis of local markets follows the one adopted by Bresnahan and Reiss (1990, 1991) in the definition of a sample of local markets (counties in their case) with the relevant size and isolation conditions that make it possible to treat them as the appropriate geographic markets for food retailing activities. This amounts to choosing a sub-sample of municipalities that fulfil certain size and isolation conditions. Thus, the empirical results obtained will not be directly applicable to the whole country, but in as much as they reflect the behaviour of food retailing entrants in Spain they can be adapted to other properly defined local markets.

The size condition is that the municipality has a population between 5,000 and 100,000 inhabitants. The upper limit is set in order to avoid sampling municipalities that have more than one geographic market within them, while the lower limit avoids working with small villages that by all means would be too small to include a single supermarket. The isolation condition implies that no sampled municipality can be less than 15 kms away from the nearest one of more than 5,000 inhabitants, or at a distance of more than 30 kms from the capital of its province, which is the city that usually generates most attraction for commercial or administrative purposes. These two conditions generate a sample of 202 isolated municipalities that belong to 44 of Spain's 50 provinces[5].

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[4]The two north African 'autonomous cities' of Ceuta and Melilla are self-standing municipalities. They are excluded from the analysis carried out here given their particular regulatory regimes and their commercial relationship with their Moroccan hinterland.

[5]Matea and Mora (2011) use the regions as their geographic market, while Orea (2010,

4.2 Supermarkets

Measuring what a "supermarket" is implies deciding on the relevant product definition of the market. The decision has to be taken both in terms of the range of products sold (avoiding specialist shops that only provide limited types of food, or wholesalers that sell to other retailers, bars or restaurants) and the size of the shops (which implies specifying the size range of retailers that are regarded as substitutes from the consumer's point of view).

The range of firms that can be thought of as belonging to the food retail markets includes specialized shops (butchers, bakeries, groceries, etc.), traditional marketplaces, small over-the-counter shops, self service shops of different formats, supermarkets of different sizes and large hypermarkets. Some of these shops may provide products other than food, but their basic characteristic is that most would be able to provide at least the basic foodstuff of a household, although they of course do so at different levels of prices and choice availability. All the competitors that would result from the previous categories are not usually thought of as belonging to the same market. It is more reasonable to consider different markets within this range, usually defined in terms of size. The idea is that the service that supermarkets and hypermarkets provide, given the wide range of brands and products on offer, does not directly compete with that of traditional or specialised shops.

Industry data in Spain usually defines supermarkets as those shops selling all types of food on a self-service basis, with floor space between 400 and 2,500 m^2. Large supermarkets would be those above 1,000 m^2. Hypermarkets, which typically also sell products beyond food, are defined as those with selling areas above 2,500 m^2. In different cases, competition authorities in Spain have used the 1,000 m^2 threshold to define a single category of retailers (see TVDC 2009 for a discussion on competition between different types of food retailers).

In the empirical analysis reported in this paper the definition of 'supermarket' will refer to any non-specialist food retailer with selling area above 1,000 m^2, therefore adopting the industry definition of large supermarkets and hypermarkets. The data of the actual number of supermarkets in each one of the sampled municipalities has been obtained in mid 2011 from the website of Alimarket, a commercial provider of retailing information[6].

4.3 Market size

Market size is measured as resident population in the municipality, with data referring to January 2009. This variable includes both national and foreign citizens that are registered as permanent residents in the municipality. However, the size of the municipality in terms of the potential number of shoppers in its

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2011) works with the main cities following the definition of 'commercial areas' published by a savings bank (La Caixa, various years), and measures the number of commercial centres in municipalities at distances up to 30 or 40 kms.

[6]See www.alimarket.es .The same source has been used for efficiency analyses of the supermarket chains in Spain by Sellers-Rubio and Mas-Ruiz (2006, 2009), but to my knowledge this is the first entry model that employs it.

supermarkets may also be affected by the number of non-permanent residents. Given that no data exists in Spain at municipal level on the number of non residents that may have a second home there and that data on nights spent in hotels or touristic apartments are not reliable at municipal level, a dummy variable is included to take into account the touristic nature of the municipality. This variable takes the value 1 if the municipality is sampled by either the Hotel Occupancy Survey (*Encuesta de Ocupación Hotelera*) or the Touristic Apartments Survey (*Encuesta de Apartamentos Turísticos*), the two main tourist surveys carried out by the National Statistical Institute (INE), which collect data locally.

4.4   Income

No official data of income levels exists at municipal level. Indirect sources such as the economic activity index reported by La Caixa (various years) is partly dependent on retailing activity, and therefore includes supermarkets as one key component. The chosen measure is household net disposable income in per capita terms, available at provincial level, which is imputed to all municipalities in the province. This method may generate a certain degree of bias given that per capita incomes may vary more within a given province according to the rural/urban nature of its municipalities than across provinces. However, for the purpose of identifying income differences within a sample of municipalities formed by self-standing towns of small and medium size, provincial income differences are probably the best available measure. In any case, given that incomes are likely to be higher in larger cities, the estimated coefficients on income will probably be biased upwards.

4.5   Fixed costs

The fixed costs of operating a supermarket are not observable, and therefore need to be proxied by other variables available at municipal level. Population density is initially considered as one of them in order to take into account the possible effect of higher land values on costs. However, densities may also capture the fact that access costs are also likely to be lower, thus resulting in a positive coefficient in the model. In that case density should be interpreted as an element of the variable profit component in (1), in as much as better accessibility results in the supermarket being able to obtain a higher margin per customer.

A dummy variable to take into account the extra transport costs for the 4 sampled municipalities that are located in islands (two in the Balearics and two in the Canary Islands) is also included. Finally, the most important cost component for the purpose of this paper is a measure of the regulation applicable to retail activities in the region to which the municipality belongs, which have been developed by different authors and whose details are discussed next.

4.6 Regulation indexes

Different authors have undertaken the hard task of summarising the retail regulatory regimes of the regional governments into indexes that make it possible to compare the strictness of regulation in each region, or its evolution over time. Table 1 summarises the results of such efforts.

The first available measure of regulatory activity was the one built by Rodríguez (2001), from which De la Fuente and Vives (2003) report a categorised synthetic indicator of the level of interventionism by regional governments (defined as high, medium, low or very low) into retail markets using information on opening hours, large establishments' ability to enter, existence of outright bans and the number of times the regulations of the central government had been legally challenged by regional authorities. The data refer to 2001. A similar indicator is the count index constructed with 2005 data by Institut Cerdà which, as reported by Gual et al. (2006), takes into account the existence of regional retail plans, restrictions on opening hours on top of what is specified by national legislation and a measure of the restrictiveness with which the region awards its opening licences. The latter is obtained combining information on the thresholds used to characterise an establishment as large, the existence of a regional moratorium on the opening of new establishments and the setting up in the region of a specific administrative body to evaluate entry proposals on a case by case basis.

Hoffmaister (2010) builds count indexes taking into account how many of the retail barriers identified by the Spanish antitrust authority are in place in each region[7]. The barriers refer to the following measures: using municipal population as a measure of whether a potential entrant is large and thus would require a regional opening licence; relying on multiple criteria to determine if the entrant is large; defining an entrant as large when more than 25% is owned by a large firm; imposing specific requirements to hard discount stores; restricting the expansion or change in the ownership of a firm by forcing it to obtain a new licence; requiring financial viability plans in order to award a licence; and imposing outright bans on the opening of large retail outlets. The resulting count index is computed for each year of the period 1996-2005.

Matea and Mora (2009) also build their index as a panel of data for each region and year, in this case between 1997 and 2007. They use seven regulatory variables defined in quantitative terms for each region and year on the basis of the legislation in force in each case. Their variables refer to the definition of an establishment as large, limits on weekly opening hours, on holiday openings, on sales periods, specific taxes imposed on certain types of stores, restrictions on the opening of hard discount stores and the imposition of outright bans during certain periods for the awarding of licences for large commercial establishments[8].

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[7]See TDC (2003). The TDC (*Tribunal de Defensa de la Competencia*) was merged in 2007 with the SDC (*Servicio de Defensa de la Competencia*) into the current CNC (*Comisión Nacional de Competencia*).

[8]The index cannot be computed for the Basque Country region given the particular context in this region's regulation of opening hour limits: although until recently no regional legislation existed on this issue, so the more permissive national limits applied, in practice large

After rescaling each variable they compute their relative weights in the index with factorial analysis.

Although it is not the objective of this paper to discuss the relative merits of the different indicators of retail regulation, the one constructed by Matea and Mora is considered the most appropriate one to estimate the costs imposed by retail regulations on supermarkets. Not only it is the most precise one in quantitative terms, but its authors also provide very detailed methodological information that allows for its decomposition and application to the specific municipal nature of the markets in the sample used here. Therefore, while the other indexes will be used for robustness checks, the retail regulation indicator of Matea and Mora for 2007 will be considered the main measure of regulatory costs. Moreover, Matea (2011) has computed the value of the index in 2011, after the transposition of the Services Directive. This will be the basis of the policy simulation exercise reported in section 6, where the effects of such regulatory change in terms of entry by new supermarkets are evaluated.

4.7   Descriptive statistics

Table 2 summarises the descriptive statistics for the explanatory variables that are used in the main specification of the model. The table reports the averages for the full sample and for each subsample of municipalities according to its number of supermarkets. Although the range of establishments is relatively wide, with one municipality in the sample having as many as ten, the average number of supermarkets is just 1.66, and 77 municipalities out of 202 do not have any. Population is positively related with the number of supermarkets, which is also apparent in the percentage of municipalities characterised as touristic. The opposite happens with the regulation indicator of Matea and Mora for the year 2007. Although average per capita income in the municipalities with no supermarket is below the sample average, this happens as well in the cases of municipalities with 8 or 10 supermarkets.

5   Results

Table 3 reports the estimation results of the model with different specifications and definitions of the dependent variable. All models include the previously discussed explanatory variables of market size, variable profits and fixed costs. As expected, the estimated coefficients of population and income variables are highly significant in all models. Residential density has a significant positive estimate, which implies that its interpretation in terms of improved accessibility would be more appropriate than as a proxy of land costs. Although the

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commercial establishments never opened on holidays. Matea and Mora (2009) explain that using any of the extreme values that would be implied by such situation would have significantly distorted their overall results, leading them to drop this region from their index. This does not affect the empirical exercise reported here, since no municipality from the Basque Country is included in the sample (none fulfils the isolation conditions discussed in 4.1.).

coefficients of the dummies capturing the touristic and island character of the municipalities are only significantly different from zero in some specifications, they have the expected signs in most cases. They are maintained in all models but the estimates that are not significantly different from zero are not used in the policy simulations reported in the next section.

The main interest lies in the coefficient of the regulatory index. The following paragraphs discuss its estimates in the different specifications of the empirical model and the differences between the models defined on different supermarket sizes.

Model 1 is the basic model. It explains the number of supermarkets larger than 1,000 m^2 in 2011 as a function of the previously mentioned variables and the regulation index of Matea and Mora for the year 2007. The coefficient of the index is negative and highly significant. Its value of -0.585 implies that at the sample means a reduction of 10% in the regulation index would have the same consequences on supermarket profits as increases of 7.73% in population or of 6.51% in per capita average income.

Table 4 summarises the predictive ability of model 1 in terms of supermarkets per municipality, comparing the observed number with those that result from applying the estimated coefficients of model 1 into equations (1) to (4). For each municipality the prediction equals the maximum number of supermarkets that would obtain non-negative profits according to the significative coefficients of model 1. The model is seen to overestimate the number of municipalities with just one supermarket, but predicts the exact number in 90 out of the 202 cases.

Models 2 and 3 show the results of applying the specification of model 1 to explain entry by supermarkets according to their size: those below or above the 2,500 m^2 threshold. In both cases the coefficient of the regulation index is clearly negative, implying that restrictive retail regulation negatively affects entry by supermarkets of both types. This result may seem to be at odds with the conclusions reached by Matea and Mora (2012) or Orea (2010) who find restrictive regulation to have positive effects on the number of smaller retailers[9]. Although this may in part be due to the use of methodologies which are not coincident, my explanation of such differences lies in the definition of what is considered to be a supermarket in each case. Matea and Mora (2012) and Orea (2010) use data by La Caixa (various years)[10] to compute a relative measure of retail floor space per habitant, with which they identify different categories of retailers (small retailers, supermarkets and hypermarkets; traditional, supermarkets and non-food retailers, respectively) that are used as dependent variables in their models. The use of that source of data implies that their definition of 'super-

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[9] Orea (2010)'s coefficient on the impact of regulation on small retailers is only significant at a 10% when the competition by large commercial centres is taken into account.

[10] Although the data is cross-checked with other sources, the main source of La Caixa is the *Impuesto de Actividades Económicas* (IAE), a local tax which underwent a major reform in 2002 when all establishments with sales under 1 million euros were declared exempt. Although registration in the tax database continues to be compulsory after that date, the quality of the information for small business may have decreased.

market' may include establishments as small as 120 m^2, a substantial difference with the 1,000 m^2 threshold used here. It should therefore be no surprise that larger supermarkets are negatively affected by regulations designed to restrict the entry of large establishments. In fact, taking into account that the definition of 'large establishment' depends on the population of the municipality, it can be calculated that 58% of the local markets in the sample used here require a supermarkets of 1000 m^2 to obtain a regional entry licence. It is therefore not suprising that such segment is negatively affected by regional regulations in the way shown by the empirical results.

The segmentation of the sample between supermarkets and hypermarkets also shows that the touristic character of the town positively affects the entry of the former, while it does not have an impact on hypermarkets. This result is in accordance with anecdotal evidence pointing to hypermarkets focusing mainly on permanent residents while supermarkets may be placed in areas more accessible to tourists.

Models 4 to 7 are used to test if the results are robust to the use of alternative indexes of retail regulation. Model 4 tests if contemporaneous levels of regulation explain better than past ones the number of supermarkets active in the market. Although negative in sign, the coefficient of the 2011 level of Matea and Mora's index is not significant at the 95% level, implying that lagged regulation is the correct measure[11]. The indexes of models 5 to 7 show the correct signs and only in the case of the one by Institut Cerdà there are significance problems. The overall results of these models are regarded as providing evidence in favour of the robustness of the results in model 1.

One more step is taken in the evaluation of the importance of retail regulation as a barrier to the entry of supermarkets. Taking advantage of the detailed information on the regulatory framework of each region provided by Matea and Mora (2009, 2012), three indexes of retail regulation that capture most of the regulatory variability among regions relevant for supermarkets are constructed and included as explanatory variables in the model. Two are the measures on the limitations imposed on the number of opening hours allowed on workdays and on Sundays and bank holidays. The third is a purpose-built measure of the importance of the second licence requirement at municipal level: for each municipality in the sample, the size limit for which a second licence would be required is identified and converted into a relative index (municipalities where the size limit is 2,500 m^2 get a zero, while an eventual lack of limit would result in a value of one). Therefore, this variable provides precise information at the local level about how restrictive regional regulations are in restring entry according to the size of the establishment.

The results of including such decomposition of the index as explanatory variables for all the supermarkets and for the two size groups are shown in models 8 to 10. The size limit for which a second licence is required and the restrictions on opening hours during workdays have separate effects, both pointing in the

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[11]The four year lag of regulation implicit in model 1 coincides with the one assumed by Bertrand and Kramarz (2002) for retailers in France, or the 4.5 years found by Matea and Mora (2012).

same direction. Supermarkets are more affected by the limits to open more hours on workdays, while hypermarkets care more about restrictions on Sundays and bank holidays, which can be intuitively explained by the different shopping habits of their respective customers.

As an additional check on the robustness of the results obtained when segmenting the sample between supermarkets and hypermarkets, table 5 reports the results of taking into account the potential competition due to the presence of other formats. The models replicate the segmented sample specifications of table 3 including the effect of other formats: in the models whose dependent variable is the number of supermarkets under 2,500 m^2, the number of hypermarkets is included as an additional explanatory variable, as is the municipal index of small retailing activities of La Caixa for 2010. Equivalent symmetric models are estimated when the number of hypermarkets is the explanatory variable. The coefficients of the additional variables do not have the expected negative signs, and in most cases they are not significant. This can be due to the correlation between these variables and the income and population variables, in the sense that they are probably capturing market-size effects. Although the models do not seem to correctly capture the potential competition among formats, the coefficients of the regulation variables maintain the significant negative sign obtained in the other specifications, thus providing additional robustness checks.

6 Policy simulations

The transposition of the EU Services Directive has significantly modified the regulatory environment of retail activities in countries like Spain, where it has been traditionally restrictive towards new entrants, as pointed out by Matea and Mora (2012) and Hoffmaister (2010). With the objective of removing obstacles to the freedom of establishment by services' providers, the Services Directive establishes a set of regulatory principles which prohibit the imposition of territorial restrictions, a measure that is at odds with the traditional regulatory practice of most regional governments in Spain. Although the transposition of the directive into Spanish legislation has resulted in the elimination of the requirement of a second licence on the basis of the size of the establishment, the law that transposed the directive into Spanish legislation allows regional governments to introduce a new administrative regime based on "general interest" reasons. As reported by Matea (2011), all regions but one (Madrid) have introduced such regime in their modified retail regulations.

Such changes plus other regulatory modifications (some of which were not imposed by the Services Directive) are recorded in Matea's (2011) update of the regulation index of Matea and Mora to the context existing in 2011. As can be seen in table 1, the modification of retail regulation results in a reduction of the index in all regions but two, where it remains constant. The (unweighted) national average of the index in 2011 is exactly the same as the one in 1997,

which would imply that the changes have had the effect of correcting the upward regulatory trend of the last years.

Given the availability of the index with 2011 values, the emprical question of the likely impact of the regulatory changes in terms of entry of new supermarket arises naturally. With the estimated coefficients of the models reported in the previous section it is straightforward to forecast the equilibrium number of supermarkets with the new regulation. Keeping all other variables constant, the coefficients can be used to calculate the number of supermarkets that would find it profitable to operate with the costs implied by the 2011 regulation index, according to functions (1)-(4). Table 6 shows the predicted number of supermarkets with the 2011 regulation and the estimated ones with the 2007 values, based on the significant coefficients of model 1. The changes are very relevant, with an increase of 58% in the number of supermarkets in the whole sample. Only one of the 74 municipalities for which the model predicted a complete lack of supermarkets would remain in such situation. Although not all the increase can be directly attributed to the modifications forced by the Services Directive (since, for instance, limits on opening hours have been modified in some regions in parallel to the transposition of the directive, but not at its requirement) it shows a substantial impact of regulatory changes in this market.

7   Conclusions

This paper has estimated an entry model for supermarkets in isolated local markets in Spain taking into account the cost effects of different regulation levels according to regional legislation. The main result that is obtained is the quantification of such regulatory cost. For the average values of the sample, a 10% reduction in the preferred regulation measure is equivalent to increases in market size or per capita incomes of 7.73% and 6.51%, respectively. These effects are in accordance with results found in other European countries or in Spain applying different methodologies. The estimation of the model using local (municipal) data makes it possible to measure the different regulatory costs due to the imposition of size limits for which a specific opening licence is required and to the existence of limits on opening hours during workdays and Sundays or bank holidays. These effects have been shown to have different impacts on entry decisions by supermarkets and hypermarkets.

A structural model of entry decisions is a useful tool for the simulation of policy changes, such as the modification of regulation after the transposition Services Directive of the European Union. Although not all changes in regional legislation are directly due to the requirements of the directive, such changes are predicted to have a substantial impact on entry decisions by supermarkets in Spain in the next years.

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Table 1. Indexes of regional retail regulation in Spain

Authors:	Matea and Mora			Hoffmaister		Institut Cerdà	De La Fuente and Vives
Method:	synthetic indicator			count index		count index	Categorised. synth. ind.
	1997	2007	2011	1996	2005	2005	2001
Andalusia	3.5	5.1	3.5	0	2	6.5	Medium
Aragón	4.1	5.5	4.9	1	2	10	Medium
Asturias	3.5	6.2	5.0	0	3	8	Low
Balearic Islands	4.0	5.2	4.6	1	3	7	High
Canary Islands	4.5	5.3	3.4	0	2	6	Low
Cantabria	3.3	4.5	3.3	0	1	4	Very Low
Castile and León	3.8	5.3	3.5	1	2	9.5	Low
Castile-La Mancha	3.3	4.0	3.3	0	0	5.5	Low
Catalonia	4.1	5.4	5.0	0.5	3	10	High
Estremadura	3.3	5.5	3.5	0	1	1	Low
Galicia	4.1	3.3	3.3	1	1	5	Low
La Rioja	4.0	3.7	3.7	0	1	1.5	Medium
Madrid	3.2	4.0	2.0	0	3	0.5	Very Low
Murcia	3.5	5.0	3.5	0	2	2	Medium
Navarre	3.9	5.0	5.0	0	3	6.5	Low
Basque Country	n.a.	n.a.	n.a.	0	3	7	Low
Valencia	4.6	4.2	3.2	1	1	2	High
Average	3.79	4.83	3.79	0.32	1.94	5.41	-

Note: In all numerical indexes, higher values imply more restrictive regulation. Matea and Mora (Matea and Mora [2009, 2012], Matea [2011]) is a synthetic indicator which takes values between 0 and 10; Hoffmaister (2010) is a count index between 0 and 7; Institut Cerdà is a 0 to 10 synthetic indicator (data from graph 3.3 in Gual et al. 2006); De la Fuente and Vives is a 4-level categorical index of retail policy (see De la Fuente and Vives, 2003, p. 210) based on Rodríguez (2001).

Table 2. Descriptive statistics.

Means of explanatory variables at range of supermarkets in each municipality						
Supermarkets	Municipalities	Population	% tourist	Per capita income (€ 2008)	Density (hab/km^2)	Regulation Matea and Mora 2007
0	77	7,268	4%	13,860	63.8	5.0
1	39	9,537	13%	14,387	94.9	4.9
2	39	14,609	15%	14,418	122.4	4.8
3	18	17,211	17%	14,451	250.8	4.9
4	12	21,770	17%	14,946	249.2	4.4
5	4	25,494	25%	14,499	170.0	4.3
6	4	23,042	25%	15,649	167.5	4.3
7	3	37,468	33%	14,430	436.0	5.1
8	4	57,035	0%	12,186	58.0	5.1
9	1	68,736	100%	14,946	24.9	4.9
10	1	88,856	0%	12,076	478.9	4.0
1.66*	202	13,686*	11%*	14,206*	121.3*	4.86*
* Full sample mean values (202 municipalities).						

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Table 3. Estimation results. Ordered probit model.

Dependent variable: number of supermarkets at each municipality.

Model	1	2	3	4	5	6	7
Supermarket size:	$> 1,000\ m^2$	$1,000\ m^2$ $-2,499\ m^2$	$> 2,500\ m^2$	$> 1,000\ m^2$	$> 1,000\ m^2$	$> 1,000\ m^2$	$> 1,000\ m^2$
Population	0.125	0.090	0.072	0.117	0.120	0.116	0.122
(000 hab)	(11.01)	(9.91)	(7.93)	(10.65)	(10.82)	(10.62)	(10.88)
Touristic	0.355	0.568	-0.068	0.317	0.324	0.301	0.279
(1/0)	(1.37)	(2.12)	(-0.21)	(1.22)	(1.25)	(1.16)	(1.08)
Income	0.143	0.079	0.186	0.172	0.172	0.142	0.114
(000 €)	(3.71)	(2.10)	(3.92)	(3.13)	(3.83)	(3.20)	(3.05)
Density	0.643	0.616	0.304	0.729	0.748	0.768	0.725
($000h/km^2$)	(1.93)	(1.82)	(0.87)	(2.19)	(2.26)	(2.32)	(2.19)
Island	-0.866	-1.027	0.151	-0.708	-0.708	-0.922	-0.721
(1/0)	(-1.33)	(-1.58)	(0.21)	(-1.34)	(-1.09)	(1.43)	(-1.11)
Regulation indexes[*]:							
Matea & Mora: 2007	-0.585	-0.405	-0.593				
	(-4.78)	(-3.36)	(-4.30)				
Matea & Mora: 2011				-0.308			
				(-1.68)			
Hoffmaister: 2005					-0.314		
					(-2.75)		
Inst.Cerdà: 2005						-0.054	
						(-1.58)	
De La Fuente & Vives:2001							-0.380
							(-3.09)
Observations	202	202	202	202	202	202	202
Dep.Var.Levels	10	8	5	10	10	10	10
Log Likelihood	-251.2239	-226.0569	-124.2901	-261.2979	-258.9142	-261.4751	-257.8610
LR index	0.28	0.25	0.29	0.25	0.26	0.25	0.26

[*]see table 1 or section 4.6 for details. t-statistics in parentheses.

(cont.)

Table 3 (cont.). Estimation results. Ordered probit model.

Dependent variable: number of supermarkets at each municipality.

Model	8	9	10
Supermarket	$> 1,000 \ m^2$	$1,000 \ m^2$	$> 2,500 \ m^2$
size:		$-2,499 \ m^2$	
Population	0.107	0.078	0.063
(000 hab)	(9.36)	(8.42)	(6.55)
Touristic	0.266	0.533	-0.311
(1/0)	(1.02)	(1.98)	(-0.94)
Income	0.085	0.024	0.184
(000 €)	(2.13)	(0.60)	(3.54)
Density	0.465	0.477	0.018
(000h/km^2)	(1.37)	(1.38)	(1.12)
Island	-0.238	-0.469	0.834
(1/0)	(-0.36)	(-0.70)	(1.08)
Regulation:			
Decomposition of Matea and Mora index*:			
2nd licence (2007)	-1.798	-1.565	-1.859
	(-4.49)	(-3.93)	(-3.94)
Opening hours: workdays	-1.189	-1.513	0.392
	(-2.21)	(-2.74)	(0.56)
Opening hours: Sundays & bank holidays	-2.059	0.482	-6.292
	(-0.95)	(0.22)	(-2.44)
Observations	202	202	202
Dep.Var.Levels	10	8	5
Log Likelihood	-249.6346	-301.8417	-116.9063
LR index	0.29	0.26	0.33

*see text for details.

Table 4. Observed and predicted number of supermarkets per municipality

Observed supermarkets	Predicted supermarkets (model 1)											Municipalities:
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
0	52	22	3	0	0	0	0	0	0	0	0	77
1	18	17	3	1	0	0	0	0	0	0	0	39
2	2	15	14	6	2	0	0	0	0	0	0	39
3	2	4	7	3	2	0	0	0	0	0	0	18
4	0	1	4	4	1	0	1	1	0	0	0	12
5	0	0	1	1	0	1	1	0	0	0	0	4
6	0	0	2	0	1	0	0	1	0	0	0	4
7	0	0	0	1	1	0	0	0	1	0	0	3
8	0	0	0	0	0	0	1	1	1	0	1	4
9	0	0	0	0	0	0	0	0	1	0	0	1
10	0	0	0	0	0	0	0	0	0	0	1	1
Municipalities:	74	59	34	16	7	1	3	3	3	0	2	**202**

Table 5. Estimation results. Ordered probit model. Subsamples with interaction effects

Dependent variable: number of supermarkets at each municipality.

Model	2b	2c	3b	3c	9b	9c	10b	10c
Supermarket size:	$1,000\ m^2$ $-2,499\ m^2$	$1,000\ m^2$ $-2,499\ m^2$	$>2,500\ m^2$	$>2,500\ m^2$	$1,000\ m^2$ $-2,499\ m^2$	$1,000\ m^2$ $-2,499\ m^2$	$>2,500\ m^2$	$>2,500\ m^2$
Population	0.080	0.071	0.051	0.069	0.071	0.067	0.042	0.048
(000 hab)	(7.47)	(3.58)	(4.30)	(3.14)	(6.81)	(3.44)	(3.56)	(2.22)
Touristic	0.606	0.613	-0.179	-0.233	0.580	0.584	-0.393	-0.413
(1/0)	(2.26)	(2.27)	(-0.56)	(-0.71)	(2.14)	(2.15)	(-1.19)	(-1.22)
Income	0.061	0.056	0.177	0.193	0.009	0.007	0.192	0.196
(000 €)	(1.56)	(1.36)	(3.64)	(3.73)	(0.22)	(0.17)	(3.62)	(3.57)
Density	0.569	0.565	0.195	0.209	0.459	0.456	-0.064	-0.059
($000h/km^2$)	(1.68)	(1.67)	(0.56)	(0.59)	(1.33)	(1.32)	(-0.18)	(-0.16)
Island	-1.036	-1.019	0.367	0.382	-0.533	-0.529	0.912	0.926
(1/0)	(-1.60)	(-1.57)	(0.49)	(0.52)	(-0.80)	(-0.79)	(1.17)	(1.18)
Hypermarkets	0.238	0.224			0.229	0.224		
($>$2,500 m^2)	(1.82)	(1.68)			(1.71)	(1.63)		
Supermarkets			0.289	0.294			0.312	0.312
(1,000-2,500 m^2)			(2.68)	(2.71)			(2.71)	(2.72)
Small retailers'		0.004		-0.006		0.002		-0.002
index		(0.51)		(-0.99)		(0.23)		(-0.33)
Matea&Mora	-0.339	-0.340	-0.520	-0.536				
(2007)	(-2.68)	(-2.69)	(-3.65)	(-3.72)				
2nd licence					-1.381	-1.378	-1.536	-1.548
(2007)					(-3.34)	(-3.33)	(-3.12)	(-3.13)
Opening hrs.					-1.519	-1.505	0.922	0.895
workdays					(-2.75)	(-2.70)	(1.23)	(1.19)
Opening hrs.					1.074	1.015	-6.682	-6.608
Sundays					(0.48)	(0.46)	(-2.58)	(-2.54)
Dep.Var.Levels	8	8	5	5	8	8	5	5
Log Likelihood	-224.3813	-224.2450	-120.6763	-120.1830	-220.9829	-220.9558	-113.1866	-113.1298
LR index	0.26	0.26	0.31	0.31	0.27	0.27	0.35	0.35

202 observations in all cases. t-statistics in parentheses.

**Table 6. Predicted number of supermarkets per municipality
due to regulation changes**

Predicted supermarkets	Predicted supermarkets (2011 regulation)											
(2007 regulation)	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Municipalities:**
0	1	59	14	0	0	0	0	0	0	0	0	74
1	0	16	43	0	0	0	0	0	0	0	0	59
2	0	0	21	10	3	0	0	0	0	0	0	34
3	0	0	0	9	7	0	0	0	0	0	0	16
4	0	0	0	0	2	0	4	1	0	0	0	3
5	0	0	0	0	0	0	0	1	0	0	0	1
6	0	0	0	0	0	0	0	3	0	0	0	3
7	0	0	0	0	0	0	0	1	2	0	0	3
8	0	0	0	0	0	0	0	0	3	0	0	3
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	2	2
Municipalities:	1	75	78	19	12	0	4	6	5	0	2	**202**