REGIONAL REGULATION ANALYSIS OF PERFORMANCE IN SPANISH RETAILING[1]

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Abstract:

The objective of this work is to analyze the impact on Spanish retail firms' efficiency of the regulatory process experienced in the period 1994-2002. In particular, we study the influence of the Retail Trade Act of 1996, by means of which the Spanish state transferred authority to concede licenses for opening commercial establishments to the regions. First, we analyze retail-sector firms' technical efficiency in periods before and after the regulatory process, using static and dynamic nonparametric methodologies. Second, we are interested in determining if there are any differences in efficiency when considering the region in which the firms operate, hence taking into account the differences in regulation in each region. Our results confirm a decrease in firms' technical efficiency in the post-regulatory period between 1996 and 2002. The different patterns of convergence/divergence in the distribution of technical efficiency depend on firm size. Small firms experience a process of divergence to lower efficiency levels from 1994 to 2002. For medium and large firms, the density functions have shifted towards higher efficiency levels. Finally, regions with either a strong or a weak regulation have gained in efficiency between the year the Retail Trade Act came into force (1996) and 2002.

Keywords: Efficiency, firm size, kernel density, process of convergence, regulation, retail sector.

JEL Classification: C61, L51, L81, F10

1. Introduction

The retailing industry in Spain has experienced a rapid transformation in recent decades. At the same time, this subject is becoming of more interest to the general public[2]. As Cruz Roche et al. (1999) point out, the retail sector could be considered a monopolistic market. In the US, there are small entry barriers, and entrants differ in terms of their sizes (Bresnahan and Reiss, 1991). For the United Kingdom, Dobson and Waterson (1996) estimate a large number of retail markets exist with an oligopoly structure. Market power and profits are both important. For the Spanish case, recent information[3] shows a strong market concentration in favor of supermarket firms, with 65.3% market share in 2004 compared to 42.5% in 1994.

With this environment, in this current work we analyze the impact that the Retail Trade Act of 1996[4] may have had on firms' efficiency in the Spanish retail distribution sector in the period 1994-2002. The regulator's motivation, as is reflected in this act, was to optimize distribution, by means of the efficient allocation of resources through the operation of free competition. The efficiency of individual retail stores is a key issue in retailers' competitiveness, since the global profitability of any chain enterprise depends on the profitability of its constituent parts (Barros and Alves, 2003). As Thomas et al. (1998) note, there is a paucity of research into this aspect of chain store management. Recent exceptions are Athanassopoulos (1995, 2003), Barros and Alves (2003), Thomas et al. (1998), and Donthu and Yoo (1998).

As we mentioned before, we study the distortions to industrial organization caused by entry regulation. We take advantage of heterogeneity across countries/regions to examine whether some regions are differentially affected by high/low levels of entry regulation. Economists have offered two contrasting views of government regulation of

economic activity. Under the Public Choice view (Stigler, 1971), regulation is assumed by industries, and is designed and operated for their benefit, through the increased market power that regulation allows. By contrast, the Public Interest perspective, as initially suggested by Pigou (1938), holds that industry will be fraught with inefficiencies stemming from market failures of all kinds if left to its own devices (Fisman & Sarria-Allende, 2002). In this respect, authors such as Joskow and Rose (1989) indicate that the regulator's intervention could provoke inefficiencies in the allocation of resources, leading even to delays in technical change in some activities. Some of the reasons for these inefficiencies could be related to the idea that the regulators do not always have the objective of maximizing social welfare, and at the same time have probably not had sufficient information to carry out the process. On the other hand, as Hoj, Kato and Pilat (1995) suggest, the widely-accepted idea that the traditional forms of regulation can generate important efficiency losses has encouraged a change of approach in regulation policy towards favoring competition.

Boylaud and Nicoletti (2001), in a study of the retail sector in OECD member countries, indicate that the consequences of regulation can be seen in the restricted access to the markets and in the operation of the firms within the markets. With respect to market access, the distribution sector has a large number of entries and exits, and there are, in most cases, few regulations on entry. The main restrictions are to do with requirements for setting up and opening businesses, which include entry formalities (trade register), regulations on the establishment, extension and location of commercial premises, regulations on specific operations and products, the existence of local monopolies for some products and legal impediments to the establishment of large outlets. Carree and Nijkamp (1999) investigate the effects of the 1993 deregulation for the Dutch retail sector. They find an increase in the equilibrium number of firms per local market (for

both food and non-food store types). Bosma and Zwinkels (1999) provide data for 1996, showing that for the retail sector as a whole entries decline from 1995 to 1996, while exits grow to a certain extent. Finally, Bertrand and Kramarz (2002) look in a much more focused way at the effects of entry regulation on employment in the French retail sector, taking advantage of regional and temporal variations in the stringency with which entry regulation is applied. They find that entry regulation decreases retail employment, partly due to the increase in concentration and the ensuing price upturns.

The remaining parts of this study are organized as follows. In Section 2, we describe the contextual setting, characterize the Spanish retail sector and present our hypotheses. Section 3 is concerned with measurement and estimation issues. It describes the data for the study and presents the empirical model to be estimated. The methods followed for the different analyses make use of the nonparametric approach and graphical tools. Section 4 concludes with the implications of our results.

2. The retail industry in Spain and hypotheses

The Retail Trade Act of 1996 coexists with the regional governments' exclusive responsibilities in the area. The regions define in each case what in their judgment is a large retail outlet. In 1996 the regions were authorized to award licenses essential for opening any major retail outlets, after evaluating the real needs of each locality. This does not affect the license that the local councils continue to require.

What has occurred since 1996? In Figure 1a we can see some relevant data. The total number of premises has fallen (by 29 percent), and this decline is most marked among traditional stores (42 percent). On the other hand, the size of the stores has increased. The number of hypermarkets has increased (by 27.9 percent), as has the number of

supermarkets and self-service stores (by 14.9 percent), and the discount stores have made a strong appearance (42 percent).

Take in Figure 1a and 1b

In Figure 1b we report the evolution in market shares of the different types of store. Traditional stores have lost 4.5 percent market share in pre-packed food, hypermarkets meanwhile have lost 6.6 percent. In contrast, supermarkets of between 400 and 2,499 m^2 have gained ground. This growth trend in Spanish retailing, at the same time as the concentration effects, has been mirrored by similar behavior in Europe (Aalto-Setälä, 2002).

In order to determine the impact of the Retail Trade Act of 1996 we suggest the following hypotheses:

Hypothesis 1: The Retail Trade Act of 1996 affects the technical efficiency of retail-industry firms over time. This law may not have the same influence on firms of different sizes.

Hypothesis 2: Firms' efficiency will differ significantly over time depending on the region's legislation in the area of retail regulation.

3. Measurement and estimation issues

3.1 Data

The data set considered in this study uses the SABI database[5] for its analysis. This database collects data on more than 180,000 firms inscribed in the Mercantile Register (BORME), covering all sectors of business activity in Spain. It is highly representative

of firms from the 18 Spanish autonomous "communities" (i.e., regions). The sectors of commercial distribution are distinguished according to their two-digit CNAE-93[6] codes (52: retail trade). We are interested in capturing the impact of the regulation of 1996, so we need to examine before and after this year. The principal restriction with this is the missing values in the employee variable, especially before 1996. To mitigate this problem we work with two samples. The first, for the years 1994-1996-1998-2002, to control for the temporal influence of the regulation. The second sample, for the years 1996 and 2002, to control for the regulatory effect at the spatial level (regional). In this case more observations are needed. Table 1a and 1b show descriptive statistics for the main variables.

Take in Table I

For the efficiency analysis that we shall shortly outline it would have been desirable for both consumption of materials and flow of services to be expressed in physical units. However, limitations in the available information have obliged us to use accounting variables directly, expressed in constant monetary units. We use the deflator index of national accounting. The choice of output and input type follow the recommendations by Donthu and Yoo (1998).

There are some differences between the databases of the two samples. In sample 1, two years were added: 1994 and 1998. As we mentioned before, including the year 1994 is necessary to control for efficiency before the retail trade act of 1996, and as can be seen later, including 1998, two years after the law, will clarify the analysis. The other important difference is the high averages in all variables in sample 1 compared to sample 2. The reason is that some firms have more than 20,000 employees.

3.2 Measurement of firm efficiency

In this study a nonparametric approach has been adopted, partly because we are primarily interested in all features possibly hidden by the data, and linear programming techniques tend to envelope data more closely. We consider the DEA (Data Envelopment Analysis) approach to efficiency[7].

Efficiency is a key issue in retailing because it is a component of total productivity. Early studies on retailing efficiency focused on partial aspects of productivity, such as labor productivity (Ratchford and Brown, 1985). As Barros and Alves (2003) mention, other works analyze aspects under the control of retail management that affect store retailing efficiency, such as merchandise assortment (Mahajan et al., 1988), promotion (Weitzel et al., 1989), and aspects beyond the control of retail management, such as employment patterns, business cycles and trading area factors (Doutt, 1984; Lusch and Moon, 1984). In recent work, Athanassopoulos (2003) uses DEA and the concept of efficient benchmarking to form strategic groups within sectors.

The mathematical process consists of solving, for each observation, a linear program that determines – when we adopt a factor orientation – the minimum quantity of factors required to achieve the quantity of production observed. In this paper, our choice of input-oriented DEA is based on the DMUs' market conditions. As a general rule of thumb, in competitive markets the DMUs are input oriented, and we assume that the Spanish retail market is close to the monopolistic/oligopolistic structure. From this referent a radial efficiency index is established, which establishes that a firm's inefficiency allows us to determine the proportional reduction (θ^*) that can occur in all the inputs simultaneously without reducing the production.

$$\text{Min } \theta$$

$$\text{s.t.:}$$

$$\sum_{j=1}^{N} y_{sj}\lambda_j \geq y_{si}, \quad s = 1,...,S$$

$$\sum_{j=1}^{N} x_{mj}\lambda_j \leq \theta x_{mi}, \quad m = 1,...,M$$

$$\lambda_j \geq 0. \quad j = 1,...,N \qquad (1)$$

$$\sum_{j=1}^{n} \lambda_j = 1 \qquad (2)$$

where firm s uses an input vector $x = (x_1,\ldots,x_j,\ldots x_n) \in R_+^n$ in order to produce $y = (y_1,\ldots,y_j,\ldots y_n) \in R_+^n$ outputs. Program (1) and (2) must be solved for each firm in each period, since we are interested in an intertemporal analysis. The results of these programs are shown later. The efficiency score for each firm s is bounded between 0 and 1. Unity corresponds to the efficient (or "best-practice") firms that make up the efficient frontier.

Table 2 shows the methodology proposed in this work. Our analysis was divided into static and dynamic parts. In the static part we are interested in controlling for the effect of the retail trade act of 1996 in relation with scale and year for all observations (without splitting the sample). We use sample 1 (241 firms). As we mentioned before, introducing the year 1994 supposes a considerable number of lost observations. With kernel density analysis we observed the convergence/divergence in the distribution of efficiency. As we discuss later, the results of the first analysis demonstrated some scale problems, so we split the sample into four percentiles in relation to fixed assets and we investigate about different sizes. Authors such as Athanassoupoulos (2003) use the same variable to control for the size.

Take in Table II

Finally in the static part we analyze the impact of the retail trade act after 1996 across the Spanish regions. In this analysis we use sample 2 (1040 firms) because more observations are needed. On the other hand, dynamic analysis is very interesting because it is possible to analyze firms' transitions from any technical efficiency level in the initial year to another in the final year.

3.2.1 Static analysis

The DEA index can be calculated in several ways. In this study, we analyze the technical efficiency by constant returns to scale (CRS) and variable returns to scale (VRS). As Barros and Alves (2003) mention, the VRS hypothesis is justified because scale size is controllable by the retail chain's central management. We want to examine the impact of scale efficiencies (ratio of technical efficiency under CRS to technical efficiency under VRS). The relative efficiency scores of the retail firms analyzed are presented in Table III.

Take in Table III

The average efficiency scores under CRS, VRS and scale efficiency are similar in 1994 and 1996, but decrease in 2002. The average efficiency scores under CRS are 0.82 and 0.59 in 1994 and 2002 respectively. Including all sources of inefficiency, retail outlets could operate, on average, at the same production level with a reduction in inputs of 18% and 41% in 1994 and 2002, respectively. However, the efficiency scores assuming VRS are equal to 0.85 and 0.72 in 1994 and 2002, respectively. Given the scale

operation and comparing between years, a majority of retail outlets are inefficient in managing their resources.

3.2.1.1 Testing statistical dominance

In this section we develop a procedure for comparing the efficiency distributions of different firms, in an intertemporal analysis (1994-1996-2002) in the retail sector. Most studies examine the means, but this is only one moment in the statistical distribution (and then, the heterogeneity of the data is not considered). As suggested by Delgado *et al*. (2002), applying the Kolmogorov-Smirnov test permits us to test for stochastic dominance among the empirical distributions of the groups of firms being compared.

Let F and G denote the cumulative distribution functions associated with the efficiency corresponding to two groups of firms that are to be compared. Stochastic dominance of G over F implies that $F(x) \geq G(x) \ \forall \ x \in \Re$ with strict inequality for some x.

The Kolmogorov-Smirnov (KS) test is suitable in this case, given that it does not require any specific distribution family. The KS test of stochastic dominance of G over F can be formulated as:

- H_o: $F(x) - G(x) \geq 0 \ \forall x \in \Re$ versus
- H_1: $F(x) - G(x) < 0 \ \exists x \in \Re$

There are statistical differences between the efficiency distributions in the retail firm sector between 1994, 1996 and 2002. The hypothesized result (retail firms in 2002 are less efficient than retail firms in 1996 and 1994) implies the acceptance of Ho: $F^{RETAIL\_1994}(x) - G^{RETAIL\_2002}(x) \geq 0$.

Take in Table IV

A complement of the KS test is the distribution function graph. This tool permits us to compare a target distribution, for example distribution G, to a reference distribution F. It is an alternative that can be used to depict the two compared distributions directly, as is shown in Figure 2.

Take in Figure 2

The top left-hand graph in Figure 2 shows the distribution in the TE for both 1994 and 1996. The two distributions are clearly very similar. In contrast, the TE distributions in 1994 and 2002 are more distant. So before the retail trade act of 1996 the TE distribution is similar in 1994 and 1996, but the situation worsens after this regulatory period (the differences two years before and seven years after 1996 are relevant as well). The bottom right-hand graph of Figure 2, the quantile-quantile graph, demonstrates the predominance of the functions below the diagonal. But in the bottom left-hand graph, both distributions are very similar, so the relative distribution is the uniform distribution on [0,1].

The results achieved at this point partially confirm Hypothesis 1. The technical efficiency in the sample of retail firms is similar in two years before the Retail Trade Act of 1996, but decreases dramatically after the law.

3.2.1.2 Kernel density

In this section we analyze the distribution of the efficiency using density functions, carrying out a nonparametric approximation – by applying the kernel method, and in particular estimating a Gaussian kernel with optimal bandwidth[8]. The purpose of the

estimations of density is to determine if a process of convergence or divergence has occurred in the period of analysis. In the first case, this would be reflected by the probability mass tending to concentrate around certain values. For example, if the concentration value was 0.5, this would indicate a process of convergence towards the mean. In contrast, a process of divergence would be occurring if the probability mass became spread out over the range of the distribution.

Figure 3 shows the kernel density functions of efficiency for 1994, 1996, 1998 and 2002. As we have mentioned, the analysis has been carried out to analyze the scale of the firms. In section 3.2.1 we began to analyze this subject. Now we split the sample into four groups (percentiles) of differently-sized firms, with sizes measured by fixed assets. We estimate the TE under CRS in each size range and we determine the efficient firms in this analysis in comparison with the first analysis, which used the complete sample. We find that the efficient firms in both analyses are practically the same, but the inefficient firms differ. Perhaps size is important in the retail sector, particularly after the 1996 act. The graphs at the top of Figure 3, show the density functions for the small retail-sector firms (first percentile), while the other rows correspond to different size percentiles for the firms.

Take in Figure 3

The results obtained reveal the changes that have taken place in the external form of the distribution – changes that confirm that both convergence and divergence processes have taken place. We can interpret these processes as follows. With regards the first and second percentiles in the top half of the figure and towards the year 2002 (top right-hand graph), a process of divergence has occurred, since the ratio of extreme values of

the density function has fallen over the efficiency range, and moreover there is a decreasing concentration of the probability mass around the mean.

However, for firms in the third and fourth percentiles (50-75; 75-100) the distribution patterns are not the same as for the smaller firms. There has been a shift of the density functions (the level of concentration of the firms shifts towards higher efficiency levels), with the same pattern holding in the fourth percentile, but a different one in the third (two modes, one around the middle-high efficiency level and another less intense mode in the high efficiency zone)

With regards the graph and comparing by size (percentiles) and years in a vertical sense the patterns are very clear. For 1994 and 1996 the efficiency distribution functions are at high efficiency levels and are multi-modal in form. However, for 1998 and 2002 (after the regulation) there has been a shift of the density functions across the size (the level of concentration of the firms shifts towards higher efficiency levels by percentiles). So we can finally confirm Hypothesis 1. The efficiency distribution patterns are quite different over time before and after the 1996 law. There are clear differences across firm sizes.

3.2.1.3 Regional efficiency analysis

In view of the results achieved in section 3.2.1.1 about the gap in efficiency distributions between 1994 and 1996 compared to 2002 we were interested in determining if these differences in efficiency are maintained when we consider the region – i.e., the Autonomous Community – within which the firms operate, and hence taking into account the differences in regulatory processes in each region, we use the same methodology for 16 of the 18 communities[9]. We recall that the central government transferred the authority for conceding licenses for opening stores and promulgating

other laws regulating their activity to the Autonomous Communities. Table 5 offers a panorama of the legislative complexity in the different regions[10].

Take in Table V

In order to be able to analyze the effect of the regulation we segment the Spanish territory by Autonomous Communities, grouping them in function of their regulatory intensity. This classification is made in two ways: on the one hand, considering the number of norms and regulations from Table 5. These are divided by percentiles, such that the lower percentiles reflect lower levels of regulation compared to the higher percentiles[11]. The second form of classification is the region's major retail outlet criterion. Autonomous communities require a second license (the first refers to the municipal license) for store premises above a particular number of square meters of surface area. In some cases the number of inhabitants, the potential demand or other factors are considered as well as this threshold. Conceivably, as this criterion for a store to qualify as a major retail outlet, and hence to require the second license, drops, so the regulatory effect becomes more severe, since there are higher entry barriers for large firms. This could be reflected in a larger number of small firms in the Autonomous Communities with more restrictive criteria. In Table 6 we report the classifications carried out.

Take in Table VI

Some considerations deserve particular attention. For example, regions such as Catalonia or Canary Islands, with 15.4 percent and 4.42 percent of the population respectively, have similar criteria for requiring the second license (800 and 750 m^2),

compared to Andalusia or Cantabria (17.9 percent and 1.30 percent, respectively), where the threshold for a major retail outlet rises to 2500 m^2.

The results of the KS tests on the different groups classified in function of regulatory intensity between 1996 and 2002 appear in Table 7.

Take in Table VII

Considering as variable the store premise's surface area in square meters, the regions in groups 1 and 3 improve their efficiency over the period. That is, higher and lower levels of regulation favor improvements in efficiency, while the group with an intermediate level of regulation shows no statistically significant gains in efficiency. The results are the same when we proxy regulatory effect by the number of regulations[12] (in this case the regions are divided into four groups). Hence Hypothesis 2 is supported.

3.2.2 Dynamic evolution of efficiency

Some relevant characteristics of the efficiency distributions were illustrated in section 3.2.1.2. In this respect, and despite the information obtained about the external form of the distribution of efficiency and its variation in time, this does not say anything about the changes that may have occurred within the distribution itself. Moreover, it is important to bear in mind that the firms analyzed are located in 16 of the 18 Autonomous Communities, these do not say anything about changes occurring within the distribution. But as Villaverde (2004) indicates, on such occasions, and very particularly from the perspective of the economic policy to be adopted, these intra-distributional movements can be as relevant as, or even more so, than the changes observed in the external form of the distribution. In our case it is not possible to determine the changes and hence the mobility in terms of the relative position of the

firms between 1994, 1996 and 2002. In order to capture this dynamism we use stochastic kernel estimations that inform about the probability of moving between any two levels in the range of values. A stochastic kernel is therefore conceptually equivalent to a transition matrix with the number of intervals tending to infinity (Quah 1996a, 1997). The stochastic kernel can be approximated by estimating the density function of the distribution in a particular period $t + k$, conditioned on the values corresponding to a previous period t. For this we carry out a nonparametric estimation of the joint density function of the distribution at times t and $t + k$. Figure 4 shows the stochastic kernels estimated from the efficiency for two periods, of nine years (t = 1994 and t + k = 2002) and seven years (t = 1996 and t + k = 2002) for the firms analyzed, before the 1996 law (1994 to 1996) at the top of the figure, and after the law (1996 to 2002) below.

Take in Figure 4

In the 3D part of this graph the X-axis represents the efficiency values in 1994, the Y-axis represents the efficiency values three and nine years later, 1996 and 2002 respectively, while the Z-axis represents the density (or conditioned probability) of each point in the X-Y plane. Lines parallel to the years 1996 and 2002 show the probability of moving from the point considered on the X-axis to any other point on the Y-axis. Given that the probability mass for the two periods analyzed concentrates around the positive diagonal we can conclude that the distribution is characterized by a high degree of persistence, the results are shown in Figure 4 (left-hand graphs). An easier way of analyzing this phenomenon is shown on the right-hand side of Figure 4, which shows the contour plots, representing cuts parallel to the base of the kernel (X-Y plane) at equidistant heights. Thus, the points are at an equal height and density.

According to the contour plots in Figure 4 the probability mass largely concentrates around the main diagonal, so we can confirm the conclusion that the firms' degree of mobility in terms of efficiency within the distribution is limited. However, the dynamic behavior observed for the two periods are different for at least two reasons. On the one hand, in the 1994 to 1996 transition (top left-hand part of the figure) there are three peaks, which show strong levels of concentration of firms with different probabilities. Logically the highest peak is the most probable. This can be seen more easily in the contour plot (top right-hand part of the figure), where three differentiated nuclei can be seen. Meanwhile, in the 1994 to 2002 transition (lower part of figure) there are two peaks of high probabilities, and this is confirmed in the contour plot to the right of the figure.

Second, comparing the contour plots of both time periods there is one nucleus at a high efficiency level in both transition periods, but in the transition 1994 to 2002 (bottom figure) the second nucleus at a low efficiency level is below the diagonal, so firms' efficiency levels fall after the 1996 low. Finally, we can see a greater concentration in the 1994 to 2002 transition, while the dispersion is greater for the 1994 to 1996 transition.

Figure 5 shows the 1996 to 2002 transition. In this case we use sample 2 because the 16 autonomous communities are represented in the sample.

Take in Figure 5

The probability mass largely concentrates around the main diagonal with two peaks and a relative dispersion towards the high efficiency level. The contour plot indicates two

nuclei at low and high efficiency levels. Finally, the dynamic analysis in this section again confirms Hypothesis 1.

4. Summary and conclusions

This research has analyzed the impact that the Spanish Retail Trade Act 1996 may have had on the efficiency of firms in the sector between 1994 and 2002. The main results obtained are as follows: firms' level of technical efficiency is similar before the 1996 law and decreases in the post-regulatory period. The efficiency distribution patterns are quite different over time before and after the 1996 law. In particular, we have investigated if there has been a convergence (divergence) or concentration (dispersion) of the sample of retail-sector firms in relation to the efficiency levels of the sector. With this aim, we have used nonparametric analytical techniques such as stochastic kernel analysis and the Kolmogorov-Smirnov test, along with graphical tools, to examine the dominance of the cumulative distributions of efficiency in an intertemporal analysis.

Analyzing the firms by size, and hence approximating them to the different types of competition (i.e., firms in first percentile of fixed assets: traditional stores; firms in second percentile: small supermarkets; firms in third percentile: medium-sized or large supermarkets; firms in fourth percentile: very large supermarkets and hypermarkets), the behavior of the technical efficiency distribution differs considerably between the groups in the period of analysis. The firms in the first and second percentiles have experienced a process of divergence to lower efficiency levels from 1994 to 2002. However, for firms in the third and fourth percentiles, the distribution patterns are not the same as for the smaller firms. There has been a shift of the density functions (the level of concentration of the firms shifts towards higher efficiency levels), with the same pattern holding in the fourth percentile and different in the third (two modes, one

around the middle-high efficiency level and another less intense mode in the high efficiency zone).

With regards the graph and comparing by size (percentiles) and years the patterns are very clear. For 1994 and 1996 the efficiency distribution functions are at high efficiency levels and are multi-modal in form. However, for 1998 and 2002 (after the regulation) there has been a shift of the density functions across the sizes (the level of concentration of the firms shifts towards higher efficiency levels by percentiles).

The difference in the efficiency of the firms between 1994 and 2002 demonstrates a greater predominance of the cumulative distribution for the first year. This implies that the firms have not improved their efficiency in the whole range of the distribution.

On the other hand, the dynamic analysis (analyzing the mobility and transitions of the firms from any efficiency level in 1994 to a different level in 1996 before the 1996 law, or 1996 to 2002 after the law, has demonstrated a high level of persistence between the sample firms. But the transition in efficiency from 1994 to 2002 shows that most firms shift to lower efficiency levels.

In the analysis by Autonomous Communities (i.e., regions), which aimed to determine if there were efficiency differences between the firms depending on the varying legislations applied in the area of retail regulation by the regions, the results indicate that regions with either a strong or a weak regulation have gained in efficiency between the year the Retail Trade Act came into force (1996) and 2002. In contrast, the Autonomous Communities with an intermediate level of regulation show no statistically significant differences, probably due to their intermediate situation.

From the point of view of regulation policy, and in particular with regards the retail trade sector in Spain, this law has favored medium and large firms. On the other hand, there has been a decline in efficiency for small firms, perhaps because of their disadvantages in terms of economies of scale and scope. It might be of interest in future research to analyze the behavior of firms managed by freelance workers, and thereby add this significant group of workers to the analysis. The main problem in this case would be to obtain the necessary data. On the other hand, more regional analysis is also needed. In this sense it would be interesting to consider the region within which the firms operate, and hence take into account the differences in regulatory processes in each region by size or more precisely by outlet type.

Notes

1. The author would like to thank the Editor and reviewers for their constructive comments on the previous version. We also appraise the support received by Milagros Huertas in the data processing.
2. For example, a recent article published in one of the most popular newspapers in Spain, EL PAÍS, on 9 June 2005, talks about the retail trade act of 1996 in relation to the evolution of supermarkets versus hypermarkets and small retailers.
3. Data from the Report on Commercial Distribution in Spain 2004, elaborated by the Ministry of Industry and Trade, shows that in the past year large supermarkets registered the largest quota increase, arriving at 26.2% for packed food. With this, they overtook hypermarkets, responsible for 23.9%. The company Mercadona, which only works in the supermarket format, has 862 stores distributed in 14 autonomous communities, and concentrates 10.1% of the total commercial surface area. Carrefour is the one with most surface area, at 18.1%, although distributed in hypermarkets, supermarkets, etc.
4. The Retail Trade Act (*Lay de Commerce Minority*) 7/1996 has the objective of finding a balance between the different forms of competition. It transfers responsibility in the regulation of commercial establishment opening times to the regions, which award the licenses they consider appropriate.
5. SABI (Analysis System of Iberian Balances), elaborated by Bureau Van Dijk. SABI is a database of accounting and financial information. It was created in 1992 by the company CESCE and the French group OR.
6. Spanish equivalent of the European NACE classification of economic activities.
7. One of the advantages of using this technique is that it is not necessary to assume a functional form, thus avoiding any specification errors that may influence in the measurement of efficiency (Gong and Sickles 1992).
8. The value of the smoothing parameter was determined following Silverman's (1986) approach.
9. Considering its installation in the 52 provinces making up the Spanish territory, this firm has the largest market share of between 18 and 30 percent in 16 provinces, the second largest share of between 11 and 27 percent in 18 provinces, and the third largest share of between 10 and 18 percent in 6 provinces. In total, considering the top three places in the ranking, it has an important presence in 77 percent of the country as a whole.
10. Data on the Autonomous Communities La Rioja and Ceuta and Melilla were unavailable.
11. The data shown in the table refer to the processes of regulation in the sector by Autonomous Communities, either directly or indirectly affecting firms' activity, in terms of the laws, decrees, etc. Considering only the current legislation, and so ignoring laws or decrees that are no longer in force, and only regulation with a direct effect, the number of processes reduces considerably, passing to a total of

237. In order to carry out our analysis we opted to include the previous legislation, because of the influence that this may have had in the sector's configuration.
12. This classification has been considered solely in order to compare the results.

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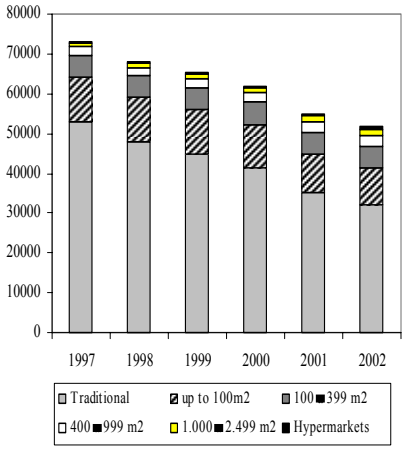
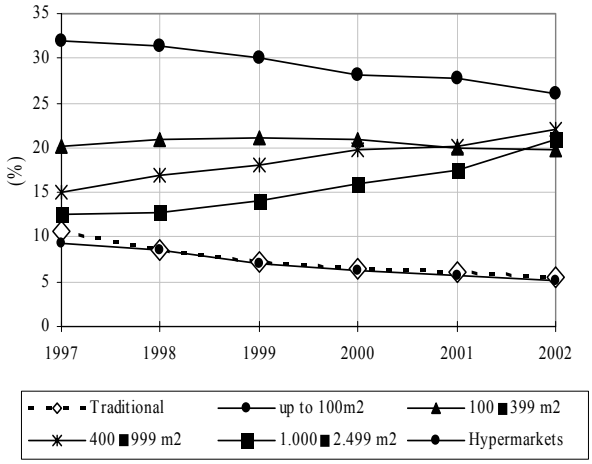
Figure 1





Source: AC Nielsen, Alimarket 1996-2004

Figure 1a: No. stores by type

Figure 1b: % market shares by store type

Retail Sector

Table Ia: *Sample 1*	Descriptive statistics of variables							
	1994		1996		1998		2002	
Variable	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Sales*	90374	641794	92606	660865	115467	772995	164671	1140939
Spending*	69964	489927	70589	495169	87372	575402	126499	866243
Fixed assets*	23373	167421	33689	254178	41903	296178	57072	448314
No. empl.	642	4921	615	4884	733	5150	1030	7315
No. observ.	241							

*In thousands 1996 euros

Table Ib: *Sample 2*	Descriptive statistics of variables			
	1996		2002	
Variable	Mean	S.D	Mean	S.D
Sales*	9012	124286	22813	323360
Spending*	7526	104808	18726	265223
Fixed assets*	2717	44754	5494	90143
No. empl.	58	685	138	1928
No. observ.	1040			

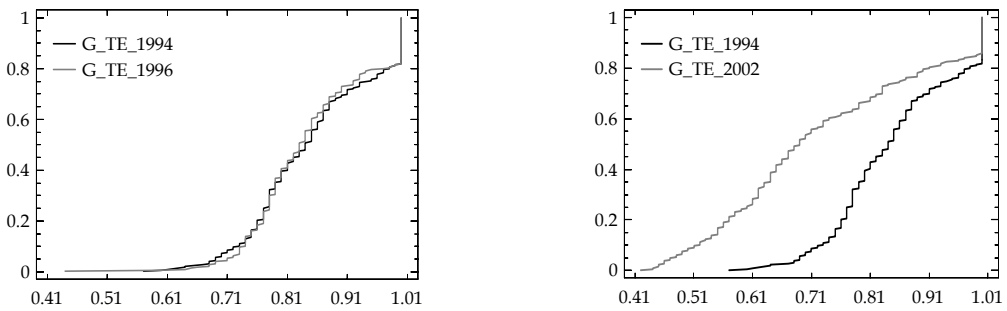
*In thousands 1996 euros

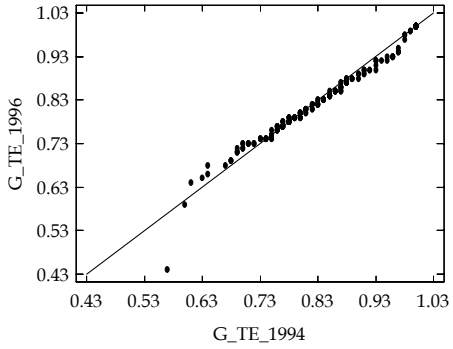
Table II	Methodology		
	Sample characteristics	Technical issues	Aims
Static analysis: - Cross-section: 1994-1996-2002	Sample 1(241 firms)	DEA (CRS-VRS) Statistical dominance (by year)	Comparing differences in distributions and scale issues before and after retail trade act 1996
- Cross-section: 1994 – 1996 – 1998 - 2002	Sample 1(241 firms) In function fixed assets size (by percentile)	Kernel density	Convergence/Divergence efficiency distribution by size before and after retail trade act 1996
- Cross-section: 1996-2002	Sample 2(1041 firms)	DEA(VRS) Statistical dominance (by communities and year)	Effect retail trade act after 1996 across regions in Spain
Dynamic analysis: 1994 → 1996 1994 → 2002	Sample 1(241 firms)	Stochastic Kernel	Transition analysis before/after retail trade act 1996
1996 → 2002	Sample 2(1041 firms)	Stochastic Kernel	Transition analysis after retail trade act 1996 by regions

Table III	DEA technical efficiency scores for retail outlets								
	1994			1996			2002		
Variable	TE_CRS	TE_VRS	TE_Scale	TE_CRS	TE_VRS	TE_Scale	TE_CRS	TE_VRS	TE_Scale
Mean	0.82	0.85	0.96	0.80	0.84	0.95	0.59	0.72	0.82
S.D	0.09	0.10	0.06	0.09	0.09	0.01	0.16	0.17	0.16
Mean(inefficient)	0.80	0.81	0.96	0.79	0.81	0.95	0.56	0.67	0.83

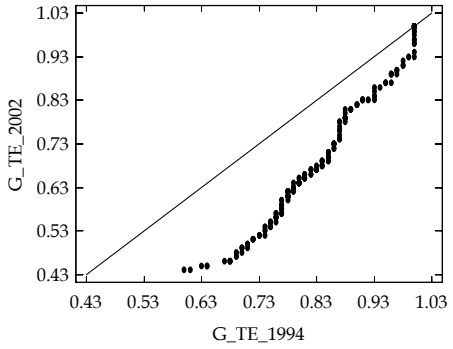
Table IV KS tests on Statistical dominance of efficiency	
$G\_TE^{-initial}$ *vs* G_TE^{-final}	$KS^{initial\ vs\ final}$ (P-value)
G_TE_1994 > G_TE_1996	2.0041** (0.0006)
G_TE_1994 > G_TE_2002	5.4203** (0.0000)

Figure 2





Distribution functions of efficiency of retail firms in 1994 and 1996



Distribution functions of efficiency of retail firms in 1994 and 2002

Figure 2 Distribution functions retail sector

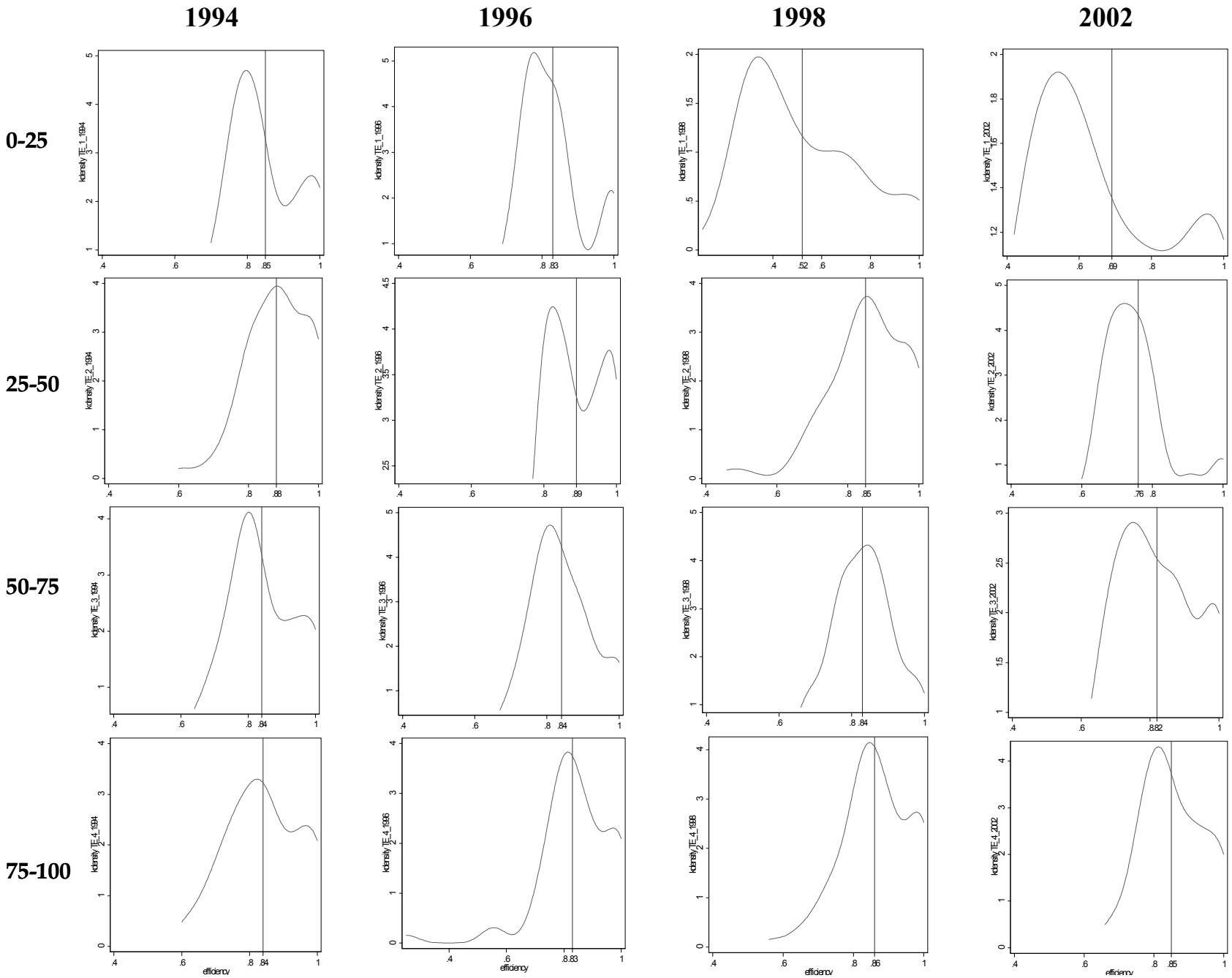


Figure 3. Kernel efficiency density by size (fixed assets) and years

Table V: Retail trade legislation in Autonomous Communities (direct and indirect)

Autonomous Community	**LAWS**	**DECREES**	**ORDERS**	**OTHERS**	**TOTAL**
Andalusia	13	115	103	37	268
Aragon	34	94	60	14	202
Asturias	11	66	0	53	130
Balearic I.	20	116	96	96	328
Canary I.	12	93	67	28	200
Cantabria	18	64	26	45	153
Castile-La Mancha	15	45	60	9	129
Castile-Leon	25	101	131	19	276
Catalonia	47	197	192	171	607
Extremadura	26	127	104	27	284
Galicia	17	112	123	53	305
La Rioja	29	57	91	68	245
Madrid	22	71	91	28	212
Murcia	53	188	79	53	373
Navarre	20	196	85	82	383
Basque Country	12	70	102	72	256
Valencia	19	128	112	84	343
	393	1840	1522	939	4694

Source: Instituto de Empresa, Instituto de Análisis Económico, IDELCO, Marcial Pons (2001)

Table VI Characteristics and formation of groups of Autonomous Communities in function of regulation intensity

Autonomous Community	Population[a] (31.12.2002)	Surface area threshold 2nd license	Group in function of major retail outlet criterion "In function of regulation intensity by surface area"	Group by percentiles (no. regulations) "In function of regulation intensity by number of regulations, direct and indirect"
	In %	In m^2	1= High regulation (to 1000 m^2) 2= Medium regulation (+1000 –2500 m^2) 3= Low regulation (+2500 m^2)	1= High regulation (+328) 2= Medium regulation (269-328) 3= Low regulation (203-268) 4= Very low regulation (0-202)
Catalonia	15.5 %	800-2500	**Group 1** Catalonia Murcia Valencia Castile-Leon Basque Country Aragon Canary I.	**Group 1** Catalonia Navarre
Aragon	2.91 %	600-2500[b]		
Valencia	10.34 %	600-1000[b]		
Murcia	2.94%	600-2500[b]		
Andalusia	17.9 %	+2500		
Castile-La Mancha	4.24 %	+2500		
Extremadura	2.57 %	+2500		
Castile-Leon	5.88 %	1000-2500[b]	**Group 2** Navarre Madrid	**Group 2** Valencia Murcia Balearic I. Galicia Extremadura Castile-Leon
Madrid	13.22 %	1500-2500[b]		
Galicia	6.54 %	+2500		
Asturias	2.57 %	+2500		
Cantabria	1.30 %	+2500		
Basque Country	5.04 %	+400[b]		
Navarre	1.37 %	1500-2500[b]		**Group 3** Andalusia Basque Country Madrid
Balearic I.	2.20 %	+2500		
Canary I.	4.42 %	750-2500[b]		

			Group 3 Balearic I. Galicia Extremadura Andalusia Cantabria Asturias Castile-La Mancha	**Group 4** Aragon Canary I. Asturias Castile-La Mancha

[a] Population share calculated over total census figure 41,837,894 inhabitants. Regions excluded represent 1.01% of census.
[b] In function of number of inhabitants.
** indicates acceptance of null hypothesis at 95% significance level.

Table VII KS tests on statistical dominance of normalized efficiency by regulatory strength

Groups by percentiles (no. regulations) "In function of regulation intensity by number direct/indirect regulations"	Normalized efficiency (MES) MES_2002 >MES_1996 Test (KS) P-Value	Groups in function of major retail outlet criterion "In function of regulation intensity by surface area"	Normalized efficiency (MES) MES_2002 >MES_1996 Test (KS) P-Value
Group 1 (High regulation)	0.0000**	Group 1 (High regulation)	0.0000**
Group 2 (Medium regulation)	0.0000**	Group 2 (Medium regulation)	0.2508
Group 3 (Low regulation)	0.0687		
Group 4 (Very low regulation)	0.0234**	Group 3 (Low regulation)	0.0022**

** indicates acceptance of null hypothesis at 95% significance level

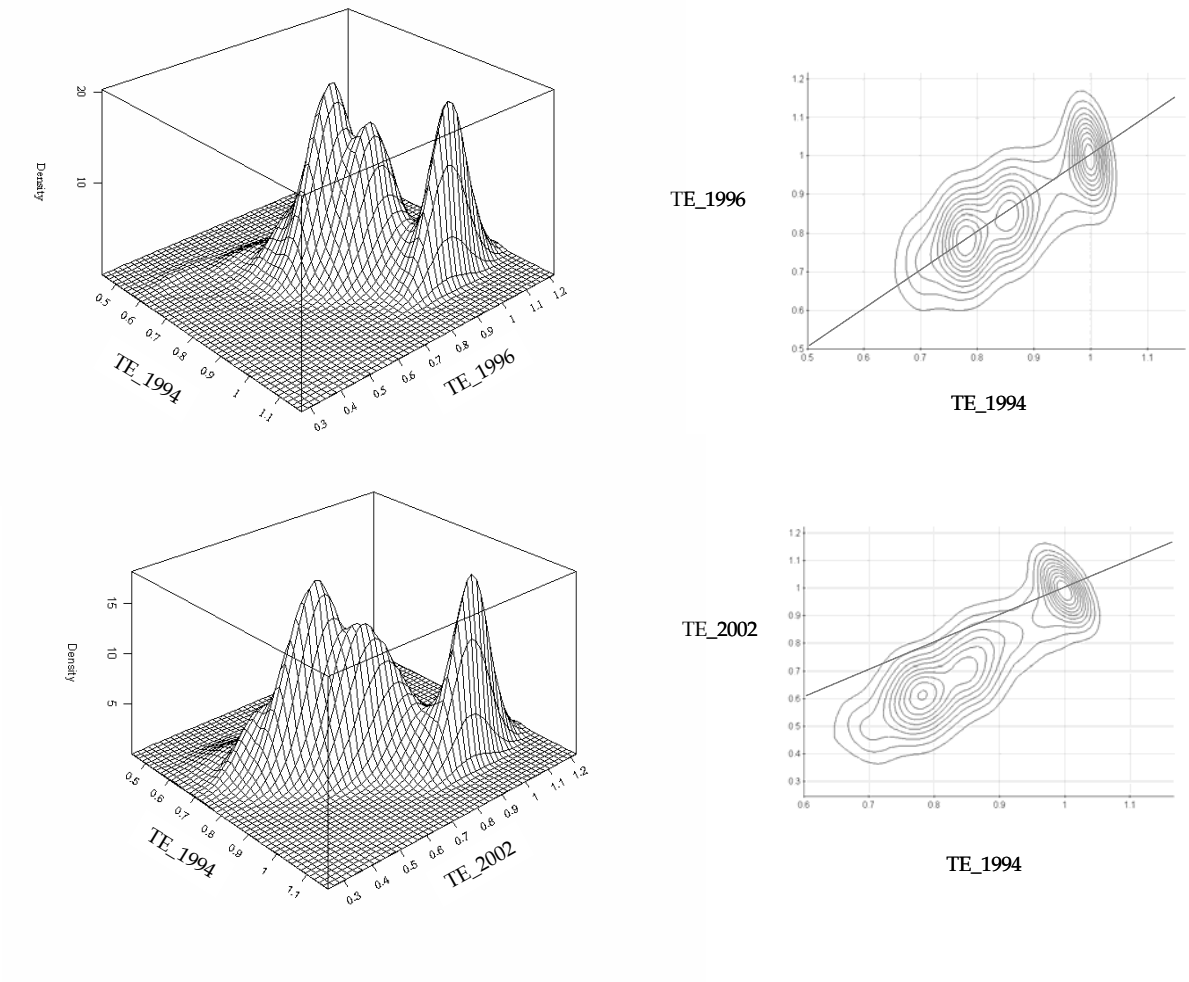


Figure 4 Stochastic kernels, efficiency by years

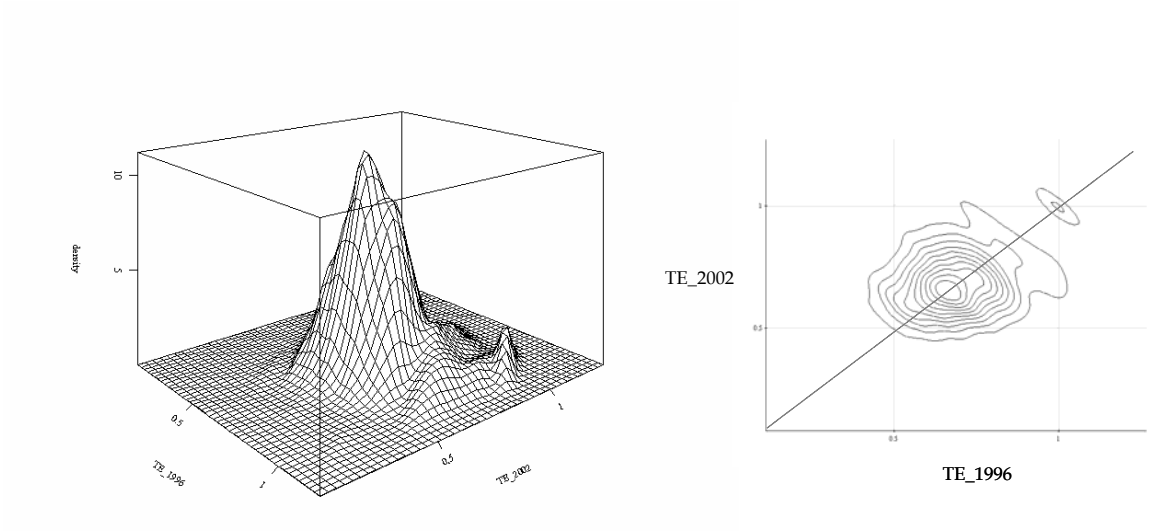


Figure 5 Stochastic kernels efficiency