Entry Liberalization and Market Conduct in Insurance*

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Abstract

The effects of rate regulation on insurance have been profusely investigated in the empirical literature but less is known about the effects of entry liberalization.

We investigate the effects of an entry liberalization process on conduct of insurance firms, under a rate regulation system. An explicit model of oligopolistic interaction is proposed and an application is reported.

The results show that coordination between insurance firms was only temporary upset by a gradual liberalization on entry conditions, with firms resuming almost immediately a coordinated equilibrium.

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1 Introduction

Regulation is a feature of many insurance insurance markets and usually incides on rates or/and entry conditions. The effects of rate regulation have been profusely investigated in the empirical literature. The resulting evidence on whether regulated markets have higher or lower rates has not been uniform. The studies for the United States typically use regression analysis across states.

Earlier evidence suggested that a no significant or negative effect of regulation was present.[1] However, more recent work has found that states with prior approval regimes of rate regulation were associated with lower prices.[2]

On European countries, the study by Finsinger and Schimd (1991) reveals that countries with strict regulation tend to have higher rates.

An important difference in the background of studies applied to the U.S. and to Europe is the existence of significant entry barriers into the market. Those are much lower in the U.S. than across European countries. Although EC Directives move towards an integrated European market, reality is still far from it.

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[1]See, for example, Ippolito (1979) and D'Arcy (1982), and Harrington (1984b) for a survey.

[2]See Cummins and Harrington (1985), Grabowski, Viscusi and Evans (1989), Harrington (1984a,1987) and Pauly, Kunreuther and Kleindorfer (1986) among others.

On the effects of entry regulation, less is known. The analysis of this kind of regulation requires a different methodology than the one employed to investigate rate regulation effects. Conduct of firms has a more important role in understanding the outcome of entry regulated markets. Under rate regulation and freedom of entry, entry can discipline the behavior of firms. Thus, under this hypothesis, an entry liberalization process should lead to a more competitive behavior of firms if some collusion prevailed before.

In the present work, entry liberalization effects on conduct of firms are analyzed. In order to identify conduct of firms, an explicit model of oligopolistic interaction under rate regulation is proposed. This is the only institutional framework considered since entry regulation is usually accompanyed by rate regulation.

An application to the Portuguese auto-insurance market is reported. This particular market has some characteristics that make it a natural experiment to investigate the issue. It had strict regulation in the period 1982-88 and experienced gradual entry liberalization during the period. Also regulation of contractual dispositions makes auto-insurance a relatively homogeneous product across firms.

In the aftermath of the Portuguese April 25th 1974 Revolution, entry in insurance markets was legally blockaded to private firms in 1977. Only in 1984, with the approval of a new constitution, the market was again officially open to private firms. Still, several constraints on the start-up of new firms remained active. Another step of liberalization occurred in 1986 with Portugal's accession to the EEC. Adjustments of national law to ECC Directives were readily made. This has constituted a further and definitive move towards free entry. In 1987 it is possible to say that free entry was in place. Only minimum capital requirements and some other minor administrative barriers (mostly due to prudential safeguards) remained. During this period, rate regulation has been effective and was dismantled only in the beginning of 1989.[3]

The first measure of the effect of entry liberalization is the rate of start-up of new firms in the market. Entry has been quite small in the following of the 1984 measures. The 1986 adjustments were more important and the number of firms has increased almost 20 % from 1985 to 1988.

These are the visible effects but adjustments internal to the market, in the behavior of incumbent firms, may have preempted entry in some extent. Also, the possibility of entry may have disciplined collusive agreements between firms. A more competitive behavior by incumbents could have, then, made unprofitable entry of new firms.

The question addressed in this paper is thus how has conduct evolved in response to the gradual path from blockaded entry (prior to 1984) to almost complete freedom of entry (after 1986/87).

The paper is organized in the following way. Section 2 briefly presents the theoretical model underlying the analysis. Section 3 discusses the data and the econometric procedure. Section 4 reports the results. Finally, section 5 concludes.

2 The Model

The analysis of reaction of incumbents to the undertaken measures implies a characterization of firms' behavior over time. This requires a full-fledged model of oligopolistic interaction

[3]The effects of price liberalization are analyzed in Barros (1993).

under rate regulation. The rate regulation regime, either prior approval or direct price-setting by the regulatory agency, implies that rates change slowly.[4]

Insurance firms have also to set reinsurance variables and capacity (to be defined below). Reinsurance is usually made by treaties between direct insurers and reinsurance firms. Reinsurance treaties define the set of relevant variables (price, commission and coverage) for a time period (in general, no shorter than a year). This suggests a two-stage to model insurance firms decisions. In the first stage, companies choose reinsurance policies. Capacities are chosen in the second stage. Price setting is left out of the explicit model as it is set in a prior stage.

The empirical analysis will imply the estimation of the equation describing firms' behavior in the choice of capacities in the proposed theoretical model. The reinsurance block of the model is thus treated in a summary way.

The existence of reinsurance by direct insurers is justified by insufficient risk diversification and risk aversion (Borch 1962). Excess-of-loss reinsurance treaties are considered. Excess-of-loss means that reinsurers cover anly losses, per contract, in excess of a pre-defined limit, chosen by direct insurers.[5] The treaty defines how prices and commissions of reinsurance are set given the limit chosen and what that limit is. Making explicit reinsurance and why it is used has two consequences for the empirical analysis: marginal costs include a (unobservable) risk premium of adding an extra contract to the firm's portfolio, and provides a rationale to the use of net of reinsurance variables.

Capacity is defined as the total number of potential consumers a firm expects to contact. Ir subsumes decisions on brokers, agents and the like. An important point to stress is that branches account for a very small fraction of the contracts made. This allows the modelling of capacity decisions after reinsurance decisions.

Under rate regulation, consumers pay the price whatever with which they underwrite the contract. They choose randomly between all the firms that contact him. The total expected number of contracts per firm is its share of total capacity times market demand at the fixed price.

The second stage profit of an insurance firm is

$$\begin{aligned}\Pi_{it} &= \frac{k_{it}}{\sum_j k_{jt}} Q(\bar{p}_t)\,(\bar{p}_t Ex_i(1-\rho_i-\alpha_i+z_i+r_i(1-\rho_i)Ex_i - Ex_i + \\ &+ \int_{D_i}^{\infty}(x_i - D_i)f(x_i)dx_i - c_i\Big) - C_\omega(k_{it}) - F_{it}\end{aligned}$$

where the notation is defined in Table 1.

The real resources cost function of the insurance firm is of the Gorman type and it includes a "risk" cost of adding an extra contract to the firm's portfolio.[6]

The first-order condition for profit maximization (assuming constant returns to scale in the capacity cost function) is given by:

$$\frac{\partial \Pi_{it}}{\partial k_{it}} = \frac{Q_t}{K_t}\,(1 - s_{it}\theta_{it})\,(p_{it} - h_{it} - c_i) - \omega = 0 \tag{1}$$

[4]For example, Ippolito (1979, p.83) reports that, under prior approval, rates changed on average every 22 months, while in deregulated regimes, the time elapsed between two changes of rates was about half of it, 11 months.

[5]The model can be readily adapted to other types of reinsurance.

[6]See, again, Barros (1993).

Table 1: Notation

k_{it}	—	capacity of firm i in period t;
$Q(\bar{p}_t)$	—	total market demand at the fixed price in period t;
$\bar{p}_t$	—	administratively fixed price in period t;
Ex_i	—	expected claims per contract for firm i;
ρ_i	—	reinsurance premium proportion;
α_i	—	commissions and acquisitions expenses;
z_i	—	reinsurance commission;
r_i	—	expected return of investment from expected claims;
D_i	—	reinsurance level per contract of firm i (chosen previously, in the first stage);
c_i	—	real resources marginal cost of a contract made;
C_ω	—	capacity cost function;
F_{it}	—	all other fixed variables of the firm.

where θ_i summarizes the firm's conduct and $p_{it} = \bar{p}_t Ex_i(1 - \rho_i + z_i - \alpha_i), h_{it} = -r_i(1 - \rho_i)Ex_i - Ex_i + \int_{D_i}^{\infty}(x_i - D_i)f(x_i)dx_i$, and $s_{it} = k_{it}/K_t$.

The parameter θ_{it} nests in a useful way different oligopoly models. No theoretical claim is made upon it. For different values of θ_i, first-order conditions of distinct oligopoly models are replicated.[7] The empirical analysis will concentrate on the value taken by the conduct parameter and on coordination among firms.

Coordination must be viewed as an agreement between firms to reduce individual capacities. The more natural agreement of this kind would be equiproportional reductions in capacity, therefore keeping market shares constant. Coordinated outcomes can be described by $\theta_{it} = 1 + \nu_i(1 - s_{it})/s_{it}$. Values for ν_i in the interval [0,1] indicate a more collusive behavior than the Nash-Cournot equilibrium ($\nu_i = 0$) but less than full collusion ($\nu_i = 1$).

Total coordination means that firms agree on some total capacity reduction, dK, which must be fully distributed among all firms. By definition of θ_{it}, is straightforward to establish that $\sum_i(1/\theta_i) = 1$. Thus, total coordination yields a testable restriction on estimated conduct parameters.[8]

The test described can be motivated in the following way. The profit of firm i can be written as

$$\Pi_i = Q\pi_i \frac{k_i}{K} - \omega k_i, \pi_i > \omega \tag{2}$$

where $\pi_i = p_{it} - h_{it} - c_i$ is used as short notation (see equation 1). In a coordinated outcome, firms agree on a set of parameters γ_i such that $k_i = \gamma_i K$, and $\sum_i \gamma_i = 1$. Total differentiation gives

$$d\Pi_i = (Q\pi_i \frac{1}{K} - \omega)dk_i - \frac{k_i}{K^2}Q\pi_i dK \tag{3}$$

Using the rule of distribution of capacity between firms, the change in profit for firm i is then

$$d\Pi_i = \left((\gamma_i - s_i)\frac{\pi_i Q}{K} - \gamma_i\omega\right)dK \tag{4}$$

[7]For example, $\theta_i = 0$ for perfect competition (firms take total capacity in the market as fixed); $\theta_i = 1$ for Nash-Cournot behavior (firms take capacity of others as given) and $\theta_i = 1/s_i$ corresponds to perfect coordination.

[8]Equiproportional capacity reductions are a particular case of this condition in the sense that $\nu_i = 1$ implies $\theta_i = 1/s_i$ and the sum of all market shares equals one.

A firm is willing to participate in some agreement to reduce total capacity ($dK < 0$) if the term in brackets is negative. When γ_i is established as $\gamma_i = s_i$ (equiproportional scheme), then the agreement is profitable to all firms. Even for some values $\gamma_i > s_i$, for some i, it is possible that firm i has some advantage from the agreement.

A profitable deviation to the agreement is implied by $\tilde{\gamma}_i < \gamma_i$, where $\tilde{\gamma}_i$ denotes the actual percentual capacity reduction by firm i. A firm deviates by setting a reduction lower than the one established by the agreement. The gain in the market share is the driving force. When $\gamma_i = 0$, the firm benefits from the agreement because it increases its market at the expense of other firms, without additional capacity cost. A break in the collusive/coordinated outcome is detected if $\sum_i \gamma = \sum_i (1/\theta_i) < 1$ holds.

3 The Data and Econometric Procedures

3.1 Data Set

Estimation of the first-order condition of capacity choice on a two (contiguous) years basis will reveal the evolution of market conduct over the sample period. Due to the small number of firms in the market, single year estimates would be statistically very poor and are not reported. Two-year estimates allow us to retain the panel data structure of the data , even if at minimum level.

The data are obtained from published accounts and statistics of the Instituto de Seguros de Portugal, the Portuguese regulatory agency. It covers a period of seven years (1982-88) of panel data on twenty-seven firms. The variables p_{it} and h_{it} are obtained from published data as follows. The variable p_{it} is constructed with premiums of direct insurance minus premiums of ceded reinsurance plus reinsurance commissions minus direct insurance commissions. The variable h_{it} is obtained as direct insurance claims minus reinsurance claims received minus revenues of investments corresponding to technical reserves. All the necessary values can be found in Estatísticas da Actividade Seguradora - Elementos Estatísticos I. The number of policies and accidents of each firm can be found in Estatísticas da Actividade Seguradoras - Elementos Estatísticos II. Both publications are from Instituto de Seguros de Portugal.

Variables defined in averaged values or in current values of claims do not yield qualitatively different results. Only results based on average values for claims are reported, since giving some preference to this procedure is natural (Doherty 1981).

As is well known, premiums and claims published in the same annual reports do not correspond to the same economic period.[9] All variables are calculated with reference to premiums charged in a given year.

The data set used has excluded new firms that have entered the market during each observation period. Firms that have exited the market were also eliminated from the sample. The sample of firms always covers more than 99 % of the auto-insurance market, measured either by contracts or by premiums.

Published accounts also include costs for each type of insurance. Criteria for allocating common costs between different lines of insurance it is not well defined and firms can easily manipulate results per line of business through cost allocation. For example, some of them use premiums to allocate common costs; others use claims and still others make an average of both indicators. There is no guarantee that allocations are made consistently either in

[9] See Harrington (1988) for discussion of the issue.

a cross-section dimension or in a time-series dimension. Given this, we took the view that allocated costs do not reflect the true marginal costs, and proceeded to estimate marginal cost in the course of action. Moreover, before 1984 not even such cost allocation was published.

3.2 Econometric Procedures

To allow for differences in behavior across firms, three strategic groups of firms are defined according to market shares. The same pattern of market shares distribution has prevailed through the years and a clear identification of groups of firms is possible, although ir remains arbitrary in nature.

A first group of firms has market shares higher than 8 %. A second group has market shares between 3 % and 1 %. At this value, anither threshold can be identified. The third strategic group of firms includes all firms with market shares lower than 1 %. So, three strategic classes of firms can be formed in a natural way: big, medium and small companies.

Data limitations prevent treating both θ_i and c_i as fixed effects to the firm. As a compromise, we will consider fixed effects to the strategic groups and individual effects assumed random across observational units. Group coefficients are defined by

$$\theta_i = \begin{cases} \theta_1 & \text{if } i \notin (D6 \cup D7) \\ \theta_1 + \theta_2 & \text{if } i \in D7 \\ \theta_1 + \theta_3 & \text{if } i \in D6 \end{cases} \qquad c_i = \begin{cases} c_1 & \text{if } i \notin (D6 \cup D7) \\ c_1 + c_2 & \text{if } i \in D7 \\ c_1 + c_3 & \text{if } i \in D6 \end{cases}$$

with sets $D6$ for *big* firms, and $D7$ for *medium* firms, defined as $D6 = \{i : s_i \geq 5\,\%\}$ and $D7 = \{i : 1\,\% < s_i < 5\,\%\}$.

An error term u_{it} is included in the first-order condition of each firm. It is composed of a pure random component across time *and* firms, ε_{it}, and of a random effect specific to each firm, η_i. That is, $u_{it} = \eta_i + \varepsilon_{it}$. The presence of the firm-specific effect η_i introduces correlation between residuals of the same firm in different periods. Residuals from different firms are independent. The random term η_i is assumed to have zero mean and finite variance σ_η^2, to be independently distributed across firms and uncorrelated with ε_{it} or with any explanatory variable (X_{kit}). On the other hand, ε_{it} is a white noise term, with zero expected value, finite variance σ_ε^2 and it is uncorrelated through time and with any explanatory variable.[10]

The random effect η_i captures other influences that are specific to each firm and not explicitly incorporated in the model.

The error structure assumed implies a variance-covariance matrix typical of error components models. Additionally the model is non-linear. Those characteristics justify estimation by maximum likelihood methods. The simultaneous solution of the first-order conditions is, in general, complicated. The log likelihood function can be simplified, for estimation purposes. A matrix P can be constructed such that transformed residuals are homocedastic and normally distributed.[11]

The procedure of "cleaning" the residuals by application of a transformation matrix, a usual trick in error-components models, makes sense despite the non-linear structure of the model. The crucial point to note here is that u_{it} can be expressed as linear in some redefinition of the original variables and parameters, and maximum likelihood estimation of the implicit

[10] See Hsiao (1986).

[11] See Fuller and Battese (1973: 627) or Judge et al. (1985: 524).

Table 2: Estimates - General model

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
θ_1	182.666	175.750	190.786	180.611	182.081	187.467
	(6.51)	(7.13)	(7.83)	(13.29)	(9.83)	(12.70)
θ_2	-132.572	-132.800	-145.387	-132.015	-153.804	-158.522
	(5.08)	(5.59)	(-5.49)	(8.94)	(8.11)	(10.93)
θ_3	-172.810	-169.328	-184.748	-171.047	-175.033	-179.840
	(-6.25)	(-6.86)	(-7.67)	(-12.60)	(-9.39)	(-12.70)
c_1	2.961	3.649	3.630	3.598	3.150	2.464
	(3.42)	(4.68)	(4.92)	(5.95)	(5.31)	(5.16)
c_2	-1.020	-1.595	-1.470	-1.596	-0.617	-0.811
	(-0.94)	(-2.30)	(-2.26)	(-2.45)	(-0.74)	(-1.16)
c_3	-0.992	-3.001	-3.116	-1.498	-1.328	-2.054
	(0.78)	(-3.04)	(-2.91)	(-1,84)	(-1.25)	(-1.84)
b_1	0.388	0.174	0.324	0.250	0.161	0.029
	(1.28)	(1.15)	(1.22)	(1.24)	(0.96)	(0.21)
b_2	-0.078	0.085	-0.028	-0.218	-0.282	0.083
	(-0.87)	(0.50)	(-0.19)	(-1.61)	(-1.97)	(0.78)
σ_η^2	0.756	0.750	0.915	0.563	0.340	0.217
	(2.89)	(2.53)	(2.40)	(1.88)	(1.77)	(2.14)

Note: t-ratios based on White (1982) consistent estimator in brackets.

form of the model can then be carried out.[12]

The test statistic used for selection between competing nested models is the adjusted Wald test proposed by White (1982).

White (1982) shows that under appropriate assumptions, the adjusted Wald test converges in distribution to a central chi-square distribution with J degrees of freedom, where J is the number of restrictions to be tested, when the null hypothesis is true.

In the presence of misspecification of the probability model, the likelihood ratio test is not asymptotically equivalent to the adjusted Wald test, and it is not even distributed as a $\chi^2_{(J)}$. All t-statistics presented below are computed based on the White's (1982) robust variance-covariance matrix.

4 Conduct Evolution

Maximum likelihood estimates for each consecutive pair of years are presented in Table 2. The results of the model are very similar whether it is estimated with constraints suggested by statistical significance of coefficients or without them. Since the results are robust for those variants only the more general specification will be discussed in detail. Unrestricted estimates and further tests can be found in appendix.

The first feature of the results is that the same pattern is present in each pair of years. *Big* firms have the smallest value for the basic conduct parameter, θ_i, followed by *medium* firms, and, finally, with a much higher value, by *small* firms. Before proceeding to a more detailed

[12]The ML procedure in the econometric package TSP (version 4.2) for Macintosh is used to compute maximum likelihood estimates.

Table 3: Conduct Parameters (General Model)

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
ν_{big}	1.293	0.783	0.720	1.200	0.847	0.919
ν_{medium}	1.281	1.136	1.233	1.365	0.804	0.849
ν_{small}	0.811	0.816	0.890	0.800	0.878	0.904

Table 4: Wald Tests for Coordination (General Model)

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
$\nu_{big} = 1$	2.18	0.01	1.97	2.67	2.83	0.80
$\nu_{medium} = 1$	1.95	0.01	1.31	4.57	3.08	3.43
$\nu_{small} = 1$	2.29	3.40	0.93	10.86	1.86	1.95
$\nu_i = 1, \forall i$	7.27	3.42	2.41	15.62	6.47	7.80
Coordinated outcome	2.66	0.29	1.08	4.06	3.12	2.64

Note: The Wald test follows a χ^2 distribution with degrees of freedom equal to the number of restrictions. The critical values are $\chi^2_{(1)} = 3.84$ and $\chi^2_{(3)} = 7.81$

analysis, note that the values are quite far and above the unitary threshold of Nash-Cournot behavior.

Although the focus of the paper is on conduct is nevertheless worth mention the insignificance of time effects and changes across years in marginal costs. Differences across strategic groups of firms in marginal costs are only significant in the middle of the sample years. The general line of results is for bigger firms to have smaller marginal costs. A more detailed analysis of the cost structure of insurance firms and its determinants across strategic groups of firms and time is thus warranted in future research. Time-specific variables are never significant, which is in accordance to the equilibrium properties of the model.

Table 3 presents the values of the group conduct parameters for collusion and Table 4 the Wald tests for a coordinated outcome.[13]

The first three rows of the Table 4 present the test for participation in a totally coordinated outcome with equiproportional capacity reductions. The forth line reports the test that all three strategic groups of firms have engaged in that type of equilibrium. Finally, the fifth line presents the test for a coordinated outcome, without requiring equiproportional capacity changes.

The observed pattern of estimated conduct parameters is compatible with coordination across firms. In general, the Wald tests show that for all but one year, the coordinated equiproportional individual capacity reductions equilibrium is not rejected by the data.[14]

The coordinated outcome was not perturbed by the first entry liberalizing measures. In only one case, 1985/86, was the null hypothesis of the test rejected in favor of a more competitive outcome. The value of the test os also high in 1986/87, although the null hypothesis is not rejected. This indicates that the liberalizing legislation of 1986 has had some effect upon the conduct of incumbent insurance firms. More precisely, the strategic group of *small* firms

[13]The parameter ν_i is computed as the estimated conduct parameter, θ, (minus one) divided by $(1 - \bar{s}_i)/\bar{s}_i$ for each strategic group, where $\bar{s}_i$ is the average market share within the strategic group across firms and time. Inferences on the estimated parameters are conditional on the vector of market shares.

[14]The same pattern can be observed in the other variants of the model, with the results being stronger in their support of the coordinated equilibrium. See appendix.

Table 5: Conduct Parameters (Fixed Marginal Cost)

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
ν_{big}	1.209	0.830	0.767	1.176	0.862	0.983
ν_{medium}	1.084	0.870	1.030	1.263	0.861	0.845
ν_{small}	0.793	0.843	0.900	0.803	0.887	0.882

Table 6: Wald Tests for Coordination (Fixed Marginal Cost)

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
$\nu_{big} = 1$	0.95	0.22	0.29	2.51	2.03	0.04
$\nu_{medium} = 1$	0.29	0.27	0.02	3.38	1.32	4.34
$\nu_{small} = 1$	4.93	1.59	0.77	10.90	1.60	2.61
$\nu_i = 1, \forall i$	6.76	2.12	0.93	14.99	5.20	7.20
Coordinated outcome	0.98	0.23	0.20	3.25	2.09	0.90

Note: The Wald test follows a χ^2 distribution with degrees of freedom equal to the number of restrictions. The critical values are $\chi^2_{(1)} = 3.84$ and $\chi^2_{(3)} = 7.81$

had, in this pair of years, a more aggressive behavior.

Only for 1985/86 is rejected the hypothesis of a coordinated outcome achieved by equiproportional capacity reductions. The deviation to what seems to have been the implicitly coordinated outcome has been partially offset by a more than proportional reduction of capacity by *medium* firms. No reaction of *big* firms is measured.

The visible effects of entry liberalization on conduct are very small. Evolution of marginal costs, on the other hand, are more in accordance to the timing of liberalizing measures. This hints that adjustments, if any is present, were made on the cost side, without an identifiable effect on conduct.

Of course, it is possible to argue that cost structures are much less able to be adjusted than conduct and the econometric results are the espurious consequence of allowing too much freedom to adapt in insurance firms. To see if this is the case, the marginal cost parameter estimates for the whole period are imposed as constant across time for each pair of years. Table 5 and Table 6 present the values for the conduct parameter ν_i and the corresponding Wald tests.[15]

The results are remarkably similar to previous ones. In all but one case, 1985/86, the coordinated equilibrium with equiproportional reductions in individual capacities is not rejected. Moreover, the more general test for a coordinated outcome is not rejected. The imposition of an equal cost structure across years (but different across strategic groups) does not change the main piece of evidence: entry liberalization has had a marginal effect on firms conduct. Coordination has been slightly upset around the time of introduction of entry liberalizing measures but has quickly resumed its previous level.

[15] Estimates are reported in appendix.

5 Final Remarks

Entry liberallization is usually seen as a way of improving competition in a market, even if entry is not observed in a large scale.[16] That hypothesis was investigated through analysis of the effects of a gradual liberalization process on the behavior of insurance firms under a rate regulated system.

The use of a structural model of the industry to measure the evolution of firms' conduct has revealed that, on the one hand, a coordinated outcome has prevailed through the whole period, and, on the other hand, entry liberalizing measures had only upset marginally and in a non-lasting way the coordinated outcome.

Barros (1993) has found that price liberalization in the same market was associated with a change from a coordinated outcome in the period 1982-88 to a competitive equilibrium in the year 1989-90. The present work complements that study showing that the entry liberalization process did not imply a gradual change of conduct towards a competitive stand by firms.

Entry regulation seems, at least for the Portuguese auto-insurance market, to be not enough to introduce competition among firms. It also reveals that coordination can be achieved by a relatively large number of firms (twenty-seven in this case).

A final comment on performance is justified. In the particular institutional framework of the industry studied, the market outcome, although a collusive one, corresponds to a reasonable performance. In a non-coordinated outcome insurance firms would have excess capacity, which has no social value.

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Table 7: Estimates - Restricted Model

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
θ_1	172.242	169.002	185.615	177.872	191.069	188.111
	(6.23)	(6.87)	(6.51)	(14.49)	(9.41)	(13.15)
θ_2	-164.686	-161.097	-177.646	-169.909	-182.750	179.761
	(-5.95)	(-6.55)	(-6.25)	(-13.82)	(-9.00)	(-12.56)
θ_3	-135.230	-130.019	-141.909	-136.884	-159.540	-159.710
	(-4.98)	(-5.26)	(-4.98)	(-10.63)	(-7.75)	(-10.97)
c_1	3.021	3.884	3.856	3.761	3.142	2.5067
	(3.42)	(4.38)	(4.13)	(5.42)	(5.27)	(4.83)
c_2		-2.300	-2.187	-2.492	-1.314	-1.194
		(-2.66)	(-2.44)	(-3.88)	(-2.10)	(-2.13)
c_3		-2.091	-2.152	-1.688	-0.720	-0.752
		(-2.21)	(-2.25)	(-2.42)	(-0.82)	(-1.23)
σ^2_η 0.851	0.748	0.952	0.562	0.330	0.219	
	(2.93)	(2.53)	(2.32)	(1.83)	(1.72)	(2.14)

Note: t-ratios based on White (1982) consistent estimator in brackets.

Table 8: Conduct Parameters (Restricted model)

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
ν_{big}	0.957	1.004	1.067	1.026	1.025	1.019
ν_{medium}	0.940	0.994	1.163	1.147	0.901	0.833
ν_{small}	0.764	0.786	0.866	0.788	0.921	0.907

6 Further Results and tests

Table 9: Wald Tests for Coordination (Restricted Model)

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
$\nu_{big} = 1$	0.32	0.01	23.16	2.12	3.66	2.11
$\nu_{medium} = 1$	0.61	0.01	1.54	1.64	0.83	4.68
$\nu_{small} = 1$	3.66	3.40	1.00	15.00	0.64	1.80
$\nu_i = 1, \forall i$	4.29	3.42	25.91	18.85	5.11	8.68
Coordinated outcome	1.24	0.29	5.43	1.36	0.34	2.65

Note: The Wald test follows a χ^2 distribution with degrees of freedom equal to the number of restrictions. The critical values are $\chi^2_{(1)} = 3.84$ and $\chi^2_{(3)} = 7.81$

Table 10: Estimates (Fixed Marginal Cost)

	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88
θ_1	178.623	181.429	192.954	181.273	184.062	183.058
	(8.53)	(6.79)	(7.96)	(13.56)	(10.02)	(12.20)
θ_2	-136.079	-148.306	-154.891	-136.243	-153.860	-154.261
	(-6.31)	(-5.02)	(-6.19)	(-12.91)	(-7.88)	(-10.44)
θ_3	-169.341	-174.686	-185.589	-171.948	-176.904	-174.968
	(-8.15)	(-6.48)	(-7.82)	(-9.62)	(-9.53)	(-11.78)
b_1	0.296	0.228	0.300	0.223	0.213	-0.029
	(1.42)	(1.33)	(1.16)	(1.23)	(1.20)	(-0.20)
b_2 -0.075	0.069	-0.026	-0.203	-0.250	0.075	
	(-0.82)	(0.39)	(-0.17)	(-1.63)	(-1.72)	(0.69)
σ_η^2	0.773	0.788	0.982	0.630	0.348	0.262
	(2.74)	(2.29)	(2.15)	(1.73)	(1.89)	(2.48)

Note: t-ratios based on White (1982) consistent estimator in brackets.