Information sharing, market competition and Antitrust intervention: a lesson from the Italian insurance sector

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ABSTRACT

By means of an application of the Rosse-Panzar methodology, we assess the degree of competition in the Italian car insurance market in order to evaluate the considerable fine that in 2000 the Antitrust Authority imposed on 39 companies for their supposed anti-competitive behaviour due to a long-standing information exchange through a third independent company. Our results show that this group of firms has earned revenues as if under monopoly or collusive oligopoly conditions, therefore endorsing the Antitrust decision.

KEYWORDS: Collusion; Information sharing; Insurance; Market structure

JEL CLASSIFICATION: G22, L13, L41

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I. Introduction

In the economic literature, many contributions show that asymmetric information between agents in a market causes losses in the efficient allocation of resources. This is particularly true in the insurance industry, where companies are often unable to observe the characteristics and riskiness of customers, thus incurring in adverse selection problems. Moreover, insurance companies are often unable to monitor the actions that insured people take after signing a contract: a customer may lessen his effort to prevent accidents, and this moral hazard problem usually drives to higher premiums.

Probably the only way through which insurance firms can overcome these problems is to produce information about their customers by way of screening and monitoring. However, another way is the exchange of information with other companies about one's own customers. On one side, information sharing among firms would allow welfare improvements through efficiency gains; on the other side, there is fear of welfare losses due to the coordination that companies could establish.

In this paper we study the intervention of the Italian Antitrust Authority in the automobile insurance market, which led to remarkable fines on several companies accused of anti-competitive conduct originating from the exchange of sensitive information. For the purpose, we estimate the Rosse-Panzar *H*-statistic, which has been extensively employed in other industries as a test for assessing the type and the level of market competition.

Section II surveys the role of information sharing as a coordination device, and analyses the decision of the Italian Antitrust Authority regarding the car insurance market as well as the companies' defence. Section III outlines the Rosse-Panzar approach, and Section IV exposes the results of our estimations. Finally, Section V offers some concluding remarks.

II. Information sharing in the Italian automobile insurance industry

In 2003, the Italian automobile liability insurance industry represented more than 50% of the total damage liability insurance sector and about 20% of the whole insurance market. In addition, the top ten insurance groups owned 49 companies operating in the car segment, thus covering more than 85% of the market share (AGCM, 2003, pp. 34-36), in spite of the fact that the industry structure appears to be characterized by negligible scale economies, so that the minimum efficient scale should not represent an entry barrier (ISVAP, 2000).

Car liability insurance in Italy became compulsory in 1969. In the years 1969-1994 prices and contract conditions were determined by the State. Afterwards, the market was deregulated with respect to premiums and contract clauses, but the main consequence was that in the period 1994-2000 the average premium for the automobile insurance almost doubled, an odd peculiarity of the Italian market when compared to other EC countries (AGCM, 2003, p. 116).

On September 1999, the Italian Antitrust Authority started a profound and complex investigation into the motor vehicle insurance market (completed in July 2000), finding 39 companies[1] guilty for anti-competitive behaviour. Particularly, the Authority ascertained that 15 of the chief motor vehicle insurers in Italy used to apply identical terms and conditions of insurance towards customers, also declining to provide fire and theft insurance separately from third-party liability insurance. Besides, the Authority accused all the investigated companies of having adopted a concerted practice of information sharing of both aggregate and individual data. The exchange of sensitive information had taken place thank to an independent company (Rc Log), whose activity was based on the principle of reciprocity: each company transmitted its own data and received those of the other competitors. The Authority judged both the exchange of information and the consequent parallel behavior as a violation of competition legislation, also taking into account that the involved companies held about 80% of

[1] They are: Allianz Subalpina, Allstate, Assimoco, Assitalia, Augusta, AXA, Azuritalia, Bayerische, BNC, Commercial Union, Duomo, Fata, Fondiaria, Gan, Generali, Helvetia, Italiana, ITAS, Lloyd Adriatico, Lloyd Italico, Maeci, Mediolanum, Meie, Milano, Nationale, Nuova MAA, Nuova Tirrena, Piemontese, RAS, Reale Mutua, Royal Insurance, Royal & Sun Alliance, Sai, Sara, Toro, Unipol, Vittoria, Winterthur, Zurigo.

global motor vehicle insurance market share. Overall, the imposed fines amounted to about 360 million euro. The insurance companies challenged this verdict and appealed both to the Regional Administrative Court of Lazio (2001) and the Council of State (2002), but without success.

An important consequence of this dispute, however, was a Protocol Agreement on motor liability insurance between the Italian government, ANIA (the association of the Italian insurance companies) and the greater part of the consumer associations, which was signed in 2003 and where they agreed to collaborate on the crisis factors (prices, prevention of risks, costs).

There are two different viewpoints about the reasons why competitors share information (Kuhn and Vives, 1995). One presumes that the access to competitors' information in presence of demand or cost uncertainty can help firms to better shape their output or prices to the current market situation. Novshek and Sonnenschein (1982) also show that information sharing among competitors can enhance social welfare. This can be particularly important in markets like banking or insurance, which are characterized by significant information asymmetries[2], so that the availability of information for the screening and monitoring of customers is unquestionably beneficial for the firms' decision about prices and output.

The opposite view holds that the exchange of information can easily drive to collusion. As Green and Porter (1984) demonstrate, information about rivals' past moves can keep them away from indiscriminate price wars, which would occur if firms are not able to recognize whether a price fall is the result of an exogenous demand fluctuations or a deviating behavior of a rival from the collusive output. As a result, it is less likely that firms make autonomous decisions, and market transparency is artificially increased.

With reference to the insurance companies, it is rather difficult to acquire information on individual characteristics and behaviours, so problems of adverse selection (hidden information) or moral hazard (hidden action) may arise. They can be softened if insurance firms are able to obtain further information about customers, and the information exchange between firms can be a viable and rather inexpensive solution. On the other side, the possibility for companies of sharing sensitive data could

[2] For further details on the problem of imperfect information in banking and insurance markets, see Pagano and Jappelli (1993) and Rotschild and Stiglitz (1976), respectively.

increase their market power, causing a rise of premiums at expense of the insured individuals. In short, there is a tension between the need for information exchange, in order to reduce especially the problems of moral hazard, and the market power deriving from this exchange.

The Italian Authority presumed that the exchange of sensitive data among the investigated insurance companies (regarding revenues, accidents, terms of communication between the insurer and the insured, current prices disaggregated by type of risk) allowed them to predict the conduct of competitors (Grillo, 2002, p. 162). ANIA objected that the Authority's decision was based on a 'supposed' information exchange rather than on an empirical economic analysis of the facts (ANIA, 2002, p. 40-42), while the Italian institute for the supervision of the insurance companies (ISVAP) ascribed the increase in prices mainly to the rise of costs for car damages and physical injures compensation[3]. Particularly, ISVAP held that the information exchange between insurance companies was a helpful solution for the correct setting of premiums (Porrini, 2004 , p. 231).

The above defences were not enough to avoid the guilty verdict: the Italian Antitrust Authority judged the insurance companies' conduct to be a severe violation, because it involved many firms and consequently facilitated the reduction of market competition.

In an industry, the effects of information exchange are crucially linked to its structure (number of firms, technology, degree of substitutability of goods, etc.). According to the structure-conduct-performance (SCP) paradigm, performance and concentration are positively related: a higher market concentration could ease collusion among firms, allowing monopoly rents and at the same time justifying antitrust policies (Mason, 1939; Bain, 1951; Stigler, 1964). However, as the efficient-structure (ES) paradigm maintains, the structure of a market can be driven by the degree of efficiency of firms: more efficient producers are usually characterised by higher profits, because they are able to charge lower prices and thus capture larger market shares and economic rents (rather than monopoly rents), at the same time favouring consumers in the form of reduced prices (Demsetz, 1973, 1974; Peltzman, 1977; Brozen, 1982).

[3] This is the result of a study by British Market Fact and Business Information (MFBI), where it is shown that between 1992 and 1997 the increase of the car repair costs in Italy has been much larger than in other European countries.

The new empirical industrial organization (NEIO) approach has criticized the SCP and ES models because of their hypothesis of a one-way causality going from market structure to market performance. It aims at testing explicit models of firms' behaviour in specific industries so as to discover the presence of market power. Within this framework, a way of measuring competition is the estimation of the Panzar-Rosse *H*-statistic (Rosse and Panzar, 1977; Panzar and Rosse, 1987): the conjecture is that, if factor prices change, firms will use different pricing strategies in relation to the market structure in which they operate: therefore, market power can be measured by the extent to which revenues reflect changes in costs[4].

Empirical studies regarding the insurance industry are those by Carroll (1993) and Bajtelsmit and Bouzouita (1998). Both test the impact of concentration and efficiency on performance for the United States, but with different results: while the first analysis is not able to fully support either the SCP or ES hypotheses, the second observes a positive and significant relationship between concentration and profits for liability, physical damage, and the combined lines, but again no association between profitability and efficiency. Choi and Weiss (2005) examine the relationships between market structure and performance in U.S. property-liability insurers for the period 1992-1998, and are able to support the ES hypothesis. Regarding the NEIO studies, Murat et al. (2002) apply the Panzar-Rosse technique to the Australian insurance market: their evidence suggests that the industry is characterised by a monopolistic competition environment. Souma and Tsutsui (2005) investigate the Japanese life insurance industry by means of a simultaneous equation model, finding that competition increased in the period under study (1996-2002). Finally, Bikker and van Leuvensteijn (2008) analyse the Dutch life insurance sector and use the Boone indicator to measure its level of competition, finding a limited degree of competitiveness compared to other Dutch industries.

[4] Thorough surveys on the tests allowing to assess the degree of competition in an industry are those by Gilbert (1984) and Bresnahan (1989).

III. The Rosse-Panzar *H*-test

In order to give a judgement on the decision of the Italian Antitrust Authority to fine 39 companies for their supposed anti-competitive behaviour, we need to assess the degree of competition that characterised the Italian insurance market in the same years. For the purpose, we estimate the Rosse-Panzar *H*-statistic. Its main advantage consists in being less data-demanding than other tests, because it requires the estimation of a reduced form revenue equation and does not explicitly need proxies for price and quantity (figures that are often difficult to be clearly identified), while total revenues are easily observable.

At time *t*, for the *i*-th firm the revenue equation to be estimated is the following:

$$R_{it} = f(w_{it}, Z_{it}, Y_t, \varepsilon_t), \tag{1}$$

where w_{it} represents the vector of factor prices, Z_{it} the variables affecting the cost function, Y_t the variables shifting the demand function, and ε_t is the error term.

If firm *i* employs *m* inputs, the Rosse and Panzar *H*-statistic can be written as

$$H = \sum_{k=1}^{m} \frac{\dfrac{\partial R_{it}}{R_{it}}}{\dfrac{\partial w_{itk}}{w_{itk}}} = \sum_{k=1}^{m} \frac{\partial \ln R_{it}}{\partial \ln w_{itk}}. \tag{2}$$

Thus, *H* corresponds to the sum of the elasticities of the reduced form revenue with respect to all the factor prices. No further information on costs are needed, even if the insertion of every variable possibly shifting demand or cost is required.

It has been demonstrated that for a monopoly, a perfectly colluding oligopoly and a homogeneous conjectural variations oligopoly, the value of the *H*-statistic is less than zero, while in a symmetric perfectly competitive market in long-run equilibrium it is equal to one. Shaffer (1982) has shown that *H* also equals unity for a natural monopolist operating in a perfectly contestable market and for a sales-maximising firm that is subject to break-even constraints. Finally, in case of a symmetric monopolistic competition (Chamberlinian) market, the *H*-value is less than or equal to one[5].

[5] For further details, see Panzar and Rosse (1987), pp. 444-455.

To apply this technique, some assumptions need to be made. First, higher input prices must not be associated with better quality services, otherwise an increased revenue would merely reflect the higher value of the product. Under this point of view, the insurance service can be regarded as rather homogeneous, so our *H*-statistic should not be biased. Second, insurance companies must be considered as single product firms; we believe this condition is also satisfied, as these firms can be regarded as producing insurance services using earned premiums, labour and physical capital as inputs[6]. Third, observed perfect and Chamberlinian equilibria necessitate that firms are observed in long-run equilibrium. To test this hypothesis, it is usually supposed that competitive markets equalise the rates of return across firms, so that they should not be significantly correlated with input prices. As a result, one can calculate the Rosse-Panzar *H*-statistic using the return on assets as the dependent variable: a value of $H = 0$ would prove equilibrium (Shaffer, 1982).

A great deal of applications of this test have concerned the banking industry, so as to assess the effects of the increasing consolidation on the degree of market competition[7]. With reference to the insurance industry, less attention has been devoted in applying this technique. So far, the paper by Murat et al. (2002) appears to be the only attempt to apply the Rosse-Panzar test to an insurance industry, specifically the Australian one.

In what follows, we carry out a panel estimation with fixed effects and calculate the *H*-statistic for the Italian non-life insurance industry from 1998 (the year for which our accounting data are first available) to 2003 (the year when the Protocol Agreement between the Italian government, ANIA and the consumer associations was subscribed). By interacting the input price variables with dummy variables that takes the value of 1 for non-fined and fined companies, respectively, we try to ascertain whether in this time period an anticompetitive behaviour from the second group of firms really occurred. Because of lack of disaggregated data on the specific market segment, we are forced to consider in our sample both non-life and composite insurance companies, i.e. those being able to offer the car insurance.

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[6] Gelos and Roldos (2004) observe that this assumption does not rule out product differentiation, which is allowed for in the monopolistic competitive model.

[7] Latest studies employing this methodology are those by Claessens and Laeven (2004), Coccorese (2004), Gunalp and Celik (2006), Staikouras and Koutsomanoli-Fillipaki (2006), and Hauner and Peiris (2008).

IV. Methodology and estimation results

We employ balance sheet data coming from ISIS, a comprehensive database on international public and private insurance companies that is managed by Fitch Ratings. They refer to 39 Italian insurance firms for the period 1998-2003, classified as non-life and composite companies (24 and 15, respectively) and including 24 of the 39 fined companies[8]. The panel is unbalanced due to lacking data for some years and/or companies.

The revenue equation we estimate is the following:

$$\begin{aligned} \ln REV_{it} = {} & \alpha + \beta_1 \ln\omega_{1it}*NONFINED + \beta_2 \ln\omega_{2it}*NONFINED + \beta_3 \ln\omega_{3it}*NONFINED + \\ & + \gamma_1 \ln\omega_{1it}*FINED + \gamma_2 \ln\omega_{2it}*FINED + \gamma_3 \ln\omega_{3it}*FINED + \\ & + \delta_1 \ln ASSETS_{it} + \delta_2 \ln INV_{it} + \delta_3 GDPGROWTH_t , \end{aligned} \qquad (3)$$

where:

REV = total revenue;

ω_1 = price of claims (net claims/net technical reserves);

ω_2 = price of labour (net commission expenses/number of employees);

ω_3 = price of other inputs (net management expenses/fixed assets);

ASSETS = total assets;

INV = total investments;

GDPGROWTH = real annual GDP growth rate;

NONFINED = dummy variable (1 for the non-fined companies, 0 elsewhere);

FINED = dummy variable (1 for the fined companies, 0 elsewhere).

The dependent variable is the sum of premium revenue and investment income, as insurance companies earn revenue both through the underwriting of insurance risks and from investing their assets. The proxy of the unit price of claims is calculated as the ratio of net claims to net technical

[8] They are: Allianz Subalpina, Assimoco, Assitalia, AXA, BNC, Commercial Union, Duomo, Fata, Gan, Generali, Helvetia, ITAS, Lloyd Adriatico, Lloyd Italico, Meie, Milano, Nuova MAA, RAS, Royal & Sun Alliance, Sai, Sara, Toro, Unipol, Zurigo. The list of all the included companies is available from the author upon request.

reserves. Given that data did not allow to calculate the average expense per claim (or per insured risk), we suppose that technical reserves nonetheless reflect the size of current risks, so the average claim expense for each euro put aside as a reserve seems a good proxy as well. The unit price of labour is computed as the net commission expenses for each employee, and the unit price of all the other inputs necessary for producing the various insurance services is calculated as the value of the net management expenses (a good proxy for the general and administrative costs) divided by the value of fixed assets[9].

With the aim of assessing the conduct of the Italian insurance companies and testing for differences in the behaviour between those fined and the others, we have divided them in two sub-groups, and have interacted the input prices with two dummy variables (*NONFINED* and *FINED*) taking the value of 1 for the non-fined and the fined firms, respectively. If the input prices interacted with the dummy variable *FINED* yield significantly different estimates compared to those associated to the non-fined firms, we are able to infer a structural difference in the relationship between factor prices and revenues and, by establishing if and how the sum of elasticities changes, give a judgement on the Italian Antitrust Authority decision to impose the fine[10]. Particularly, if there exists an oligopoly power associated with the belonging to the group of fined firms, the value $\gamma_1+\gamma_2+\gamma_3$ should be significantly lower than the value $\beta_1+\beta_2+\beta_3$, and even non-positive.

Some additional variables are inserted in the estimation to account for other characteristics. Total assets (*ASSETS*) are typically used as a proxy for the size of firms, and should yield a positive coefficient if larger firms enjoy economies of scale in their activity. The amount of financial investments (*INV*) is expected to positively influence revenues, since they can represent a significant flow of income for the insurance companies that increases with their volume. Finally, *GDPGROWTH* aims to account for the demand side of the market, and tries to assess whether a growing economy can increase the business of insurance companies and therefore positively affect firms' revenues.

Summary statistics of the variables are shown in Table 1.

PLEASE INSERT TABLE 1 ABOUT HERE

[9] Murat et al. (2002) compute the input prices always dividing each category of expenses by the total assets.
[10] Similar interaction terms are introduced by Gelos and Roldos (2004).

Our panel estimation with time dummies and fixed effects allows the coefficients of input prices to change over time and ensures the control for unobserved heterogeneity, hence reducing the omitted variable problems. We estimate three different specifications of the model with the interaction terms so as to assess the robustness of results (Table 2). We also estimate the same specifications for both the sub-groups of non-fined and fined firms (Table 3).

When estimating *H* for the whole sample with interactive dummies (Table 2), the sign of the coefficients for ω_1 are always positive and statistically significant at least at the 5% level for both groups of firms and in all specifications. The variable ω_2 is significant (at the 1% level) only for the non-fined firms, while ω_3 is never significant.

PLEASE INSERT TABLE 2 ABOUT HERE

Regarding the estimated *H*-values, we discover a sharp difference between the two sub-groups. For the non-fined firms, it ranges between 0.75 and 0.82; besides, in all specifications it is always significantly different from zero and indistinguishable from unity. Considering the fined companies, *H* is notably lower, varying between 0.17 and 0.22; most importantly, its value is never significantly different from zero. Hence, we can not reject the hypothesis that a monopolistic or collusive behaviour has characterised the companies prosecuted by the Italian Antitrust Authority. There is evidence of a structural break between the two groups, given that in contrast the conduct of non-fined firms is compatible with a perfectly competitive environment (except in Model 3). Even without recalling a continuous interpretation of the *H*-index, it is undeniable that the strong difference between the degree of competition of the sub-groups strongly points towards a collusive agreement among the fined firms, unlike the other companies.

This indication is supported by the estimation results for each sub-sample (see Table 3). Actually, while the *H*-statistic for the non-fined companies turns out to be always statistically indistinguishable from 1 (and equal to about 0.75 on average), for the set of fined firms it is quite lower than the former (ranging between 0.24 and 0.31), even if statistically different from 0 in two of the three estimations. Again, a sharp difference characterises the behaviour of the selected groups of insurance companies; it almost seems that we face two different markets, each with its own degree of competition. As a whole,

the above results prove the ability of the *H*-test to capture the more cooperative behaviour of some firms in the market, and clearly corroborate the choice of the Antitrust Authority of fining them.

PLEASE INSERT TABLE 3 ABOUT HERE

Concerning the estimated values of the other coefficients for the whole sample (Table 2), the variable *ASSETS* has the expected positive sign only in one regression, proving that the size can have an important role in generating higher revenues. The variable *INV* has a significant value in Model 1 (10% level) and Model 3 (1% level): the coefficients are both positive, confirming our conjecture that for the whole set of firms there is a positive relation between the amount of investment and the revenues. The last variable, *GDPGROWTH*, is never significant, so that we can exclude that companies' income is linked to the economic trend.

We lastly need to verify that insurance companies have been observed in long-run equilibrium, especially the non-fined firms (as they are generally characterised by a perfect competition equilibrium). So we estimate *H* using *ROA* (measured as the ratio between net profits after tax and total assets) as the dependent variable; particularly, in order to adjust return on assets for possible small negative values due to banks' losses in any year, we compute it as 1+*ROA* (Claessens and Laeven, 2004). As Table 4 shows, in all regressions we reject the hypothesis that $H_{ROA} = 0$ at the 5% level for the non-fined firms[11]: hence, there is evidence of disequilibrium. However, the lack of long-run equilibrium could be also a signal of the structural and regulatory changes that have characterised the insurance industry during the sample period. In addition, Shaffer (1982) has demonstrated that, if the sample is not in long-run equilibrium, it can negatively skew the Panzar-Rosse *H*-statistic, and this may indicate that the rejection of $H = 1$ (as happens in Model 3) might be spurious for these companies.

PLEASE INSERT TABLE 4 ABOUT HERE

[11] However, this does not happen when estimating H_{ROA} for the sub-sample of non-fined firms. These results are not reported here.

V. Conclusions

In Italy, after the liberalisation of the contract clauses in the car liability insurance market in 1994, there was a notable increase in the prices to be paid by the customers. The Italian Antitrust Authority judged this upward trend as a proof of a collusive agreement among some companies, which had taken place by means of a huge information exchange, and decided to impose a considerable fine on them. Insurance companies maintained that the higher premiums were due only to the increasing costs of repairing cars, and that the information sharing, far from being a facilitating practice, helped to set a fair price for the insurance services.

By way of the Rosse-Panzar *H*-statistic, this paper has shown that in the period 1998-2003 it is not possible to reject the hypothesis of monopolisation of the market by the fined companies, and that their behaviour was quite different from that characterising the non-fined firms and compatible with a collusive conduct. Our evidence is therefore that, although information exchange could in principle help to achieve efficiency improvements, especially in presence of asymmetric information, in the Italian car insurance market the information sharing has led to a cooperative behaviour, therefore giving reason for the Antitrust intervention.

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Table 1 – Descriptive statistics and list of variables

Variable	**Mean**	**S. D.**	**Min**	**Max**
ASSETS	11129.0	34281.3	13.87	203030
INV	9975.0	31295.3	10.25	185360.6
NTR	9270.4	29437.5	10.01	177742.7
FIXASS	667.2	1920.0	0.68	10670
REV	2930.3	8007.3	6.35	44578.1
NC	1566.6	4401.2	2.91	25260.6
NCE	325.4	872.6	0.09	5075.4
NME	131.2	360.3	0.42	2207.1
EMP (*)	3339.6	10720.6	11	60638
ω_1 *(**)*	0.31	0.13	0.09	0.82
ω_2 *(***)*	112.6	44.83	5.71	196.7
ω_3 *(**)*	0.55	0.67	0.10	4.88

All variables are expressed in millions of 1995 euro, except:
(*) Number of units
(**) Ratios
(***) Thousands of 1995 euro

Variable		**Description**
ASSETS	=	total assets
INV	=	liquid assets + other investments
NTR	=	net technical reserves (net unpaid losses + net unearned premium insurance funds + other technical reserves)
FIXASS	=	fixed assets (real estate and property + non-investment fixed assets)
REV	=	total revenue (net premium earned + net investment income)
NC	=	net claims
NCE	=	net commission expenses
NME	=	net management expenses
EMP	=	number of employees
ω_1	=	price of claims (net claims / net technical reserves)
ω_2	=	price of labour (net commission expenses / number of employees)
ω_3	=	price of other inputs (net management expenses / fixed assets)

TABLE 2 – *Panzar-Rosse H-statistic for the whole sample: estimation results*

	Model 1			**Model 2**			**Model 3**		
	Coeff.	*t-value*		*Coeff.*	*t-value*		*Coeff.*	*t-value*	
$\ln\omega_{1i}$**NONFINED*	0.2782	2.64	***	0.3174	3.01	***	0.2595	2.52	**
$\ln\omega_{2i}$**NONFINED*	0.4250	6.20	***	0.4286	6.13	***	0.4231	6.18	***
$\ln\omega_{3i}$**NONFINED*	0.0470	0.81		0.0725	1.25		0.0376	0.66	
$\ln\omega_{1i}$**FINED*	0.0377	0.31		0.0510	0.41		0.0275	0.23	
$\ln\omega_{2i}$**FINED*	0.1738	2.35	**	0.1720	2.28	**	0.1761	2.38	**
$\ln\omega_{3i}$**FINED*	-0.0242	-0.49		0.0008	0.02		-0.0361	-0.77	
ln*ASSETS*$_i$	0.2775	0.88		0.8886	17.36	***	-	-	
ln*INV*$_i$	0.5911	1.96	*	-	-		0.8528	17.81	***
GDPGROWTH	0.0069	0.53		-	-		-	-	
Non-fined H	*0.7503*			*0.8184*			*0.7202*		
H_0: $H = 0$ (F test)		34.55	***		42.74	***		34.42	***
H_0: $H = 1$ (F test)		3.83	*		2.10			5.20	**
Fined H	*0.1873*			*0.2239*			*0.1675*		
H_0: $H = 0$ (F test)		1.53			2.13	*		1.25	
H_0: $H = 1$ (F test)		28.75	***		25.63	***		30.96	***
R^2 within	0.9300			0.9263			0.9293		
Observations	124			124			124		
Companies	39			39			39		

Dependent variable: ln*REV*$_i$.
All regressions include company and year intercepts (coefficient estimates are not reported).
Significance for the parameter estimates: *** = 1% level; ** = 5% level; * = 10% level.

TABLE 3 – *Panzar-Rosse H-statistic for the two sub-samples: estimation results*

a) Non-fined firms

	Model 1			Model 2			Model 3		
	Coeff.	*t-value*		*Coeff.*	*t-value*		*Coeff.*	*t-value*	
$\ln\omega_{1i}$	0.2268	1.35		0.3473	2.20	**	0.2673	1.82	*
$\ln\omega_{2i}$	0.3931	3.85	***	0.4157	3.94	***	0.4005	4.03	***
$\ln\omega_{3i}$	0.0495	0.52		0.0926	0.97		0.0604	0.66	
$\ln ASSETS_i$	-0.4268	-0.53		0.8904	7.74	***	-	-	
$\ln INV_i$	1.1974	1.65		-	-		0.8167	8.37	***
GDPGROWTH	-0.0049	-0.14		-	-		-	-	
Non-fined H	*0.6694*			*0.8556*			*0.7282*		
H_0: $H = 0$ (F test)		9.85	***		20.55	***		16.56	***
H_0: $H = 1$ (F test)		2.40			0.59			2.31	
R^2 within	0.9287			0.9185			0.99277		
Observations	44			44			44		
Companies	15			15			15		

Dependent variable: $\ln REV_i$.
All regressions include company and year intercepts (coefficient estimates are not reported).
Significance for the parameter estimates: *** = 1% level; ** = 5% level; * = 10% level.

b) Fined firms

	Model 1			Model 2			Model 3		
	Coeff.	*t-value*		*Coeff.*	*t-value*		*Coeff.*	*t-value*	
$\ln\omega_{1i}$	0.1383	1.31		0.1364	1.33	**	0.0875	0.81	
$\ln\omega_{2i}$	0.1755	2.99	***	0.1757	3.03	**	0.1822	2.96	***
$\ln\omega_{3i}$	-0.0038	-0.10		-0.0050	-0.13		-0.0324	-0.83	
$\ln ASSETS_i$	0.9183	2.42	**	0.8784	16.31	*	-	-	
$\ln INV_i$	-0.0414	-0.11		-	-		0.8908	15.19	***
GDPGROWTH	0.0016	0.12		-	-		-	-	
Fined H	*0.3100*			*0.3071*			*0.2373*		
H_0: $H = 0$ (F test)		6.09	**		6.40	**		3.43	*
H_0: $H = 1$ (F test)		30.15	***		32.60	***		35.42	***
R^2 within	0.9453			0.9452			0.9383		
Observations	80			80			80		
Companies	24			24			24		

Dependent variable: $\ln REV_i$.
All regressions include company and year intercepts (coefficient estimates are not reported).
Significance for the parameter estimates: *** = 1% level; ** = 5% level; * = 10% level.

TABLE 4 – *Panzar-Rosse H-statistic for the whole sample: equilibrium test*

	Model 1			**Model 2**			**Model 3**		
	Coeff.	*t-value*		*Coeff.*	*t-value*		*Coeff.*	*t-value*	
$\ln\omega_{1i}$**NONFINED*	0.2292	4.93	***	0.2583	5.31	***	0.2558	5.37	***
$\ln\omega_{2i}$**NONFINED*	-0.0936	-3.10	***	-0.0910	-2.83	***	-0.0908	-2.87	***
$\ln\omega_{3i}$**NONFINED*	0.0904	3.51	***	0.1093	4.09	***	0.1038	3.92	***
$\ln\omega_{1i}$**FINED*	0.0275	0.51		0.0374	0.65		0.0421	0.75	
$\ln\omega_{2i}$**FINED*	0.0072	0.22		0.0059	0.17		0.0040	0.12	
$\ln\omega_{3i}$**FINED*	-0.0211	-0.98		-0.0025	-0.11		-0.0042	-0.19	
$\ln ASSETS_i$	-0.3950	-2.83	***	0.0592	2.51	**	-	-	
$\ln INV_i$	0.4394	3.30	***	-	-		0.0669	3.02	***
GDPGROWTH	0.0045	0.78		-	-		-	-	
Non-fined H	*0.2260*			*0.2766*			*0.2688*		
H_0: $H = 0$ (F test)		16.13	***		23.00	***		22.44	**
Fined H	*0.0136*			*0.0408*			*0.0419*		
H_0: $H = 0$ (F test)		0.04			0.33			0.37	
R^2 within	0.5346			0.4642			0.4827		
Observations	124			124			124		
Companies	39			39			39		

Dependent variable: $\ln(1+ROA_i)$.
All regressions include company and year intercepts (coefficient estimates are not reported).
Significance for the parameter estimates: *** = 1% level; ** = 5% level; * = 10% level.