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Article abstract

The purpose of this paper is to examine barriers to entry in an insurance market wherein banks are an integral part of the distribution system: Title insurance. Given that the title insurance industry is characterized by two major entry barriers, controlled business arrangements and title plants, we test different industrial organization growth models with barriers to entry to determine which model best describes the title insurance industry. The empirical analysis we present suggests that the theoretical model that explains more accurately the current title insurance industry structure is the Salop circular-city model.

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by Martin Boyer and Charles M. Nyce

ABSTRACT

The purpose of this paper is to examine barriers to entry in an insurance market wherein banks are an integral part of the distribution system: Title insurance. Given that the title insurance industry is characterized by two major entry barriers, controlled business arrangements and title plants, we test different industrial organization growth models with barriers to entry to determine which model best describes the title insurance industry. The empirical analysis we present suggests that the theoretical model that explains more accurately the current title insurance industry structure is the Salop circular-city model.

Keywords: Title insurance, entry barriers, market segmentation, controlled business arrangements.

JEL classification: G22, L85, L13.

RÉSUMÉ

L'objectif de cette recherche est d'étudier les barrières à l'entrée dans un marché de l'assurance où les banques font partie intégrante du système de distribution : le marché de l'assurance-titres. L'industrie de l'assurance-titres étant caractérisée par deux types de barrières à l'entrée, soit les ententes régies entre entreprises et les banques de données géographiques (title plants), nous évaluons différents

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modèles de croissance organisationnelle avec des barrières à l'entrée pour identifier quel modèle représente le mieux l'industrie de l'assurance-titres. L'analyse empirique que nous présentons conclue que le modèle théorique qui reproduit le plus exactement la structure de l'industrie de l'assurance-titres est le modèle de Salop de la route circulaire.

Mots clés: Assurance de titres, barrières à l'entrée, segmentation du marché, ententes régies entre entreprises.

Classification JEL : G22, L85, L13.

1. INTRODUCTION AND MOTIVATION

Growth of the real estate industry in the United States in the last decade has given rise to significant profit opportunities for companies involved in the process. Builders, mortgage lenders, and realtors have all benefited from the increased activity. Title insurance companies (see Arruñada, 2002, for a thorough survey of title insurance systems around the world) are another essential participant in real estate transactions. Banks and other mortgage lenders require borrowers to produce a valid title for the mortgaged property, as the number of real estate transactions increases, so does the business for title insurers. Although title insurance has not generated much academic interest compared to other insurance products, in terms of direct premiums written it is larger than many P&C insurance lines including medical malpractice.

There has been very little recent literature on title insurance. White (1984) advocates the use of controlled business arrangements in the absence of price competition in the industry. He argues that the absence of price competition is a fundamental problem in the title insurance industry and that controlled business arrangements and reverse competition (rebates and kickbacks) are symptoms of that problem. He further argues that as long as price competition remains absent, controlled business arrangements should be encouraged. Since home buyers are perceived to have little knowledge of title insurance and rely heavily on the recommendation of others involved in the real estate transaction (recommenders), title insurers focus their competitive efforts on attracting the recommenders through rebates rather than homeowners through price competition. One could thus argue title insurers are competing through non-price means.

Lately Arruñada (2002) argues that title insurance "complements and enforces the professional liability of professionals involved in real estate transaction." This raises important concerns for the industry who finds itself offering services that are perhaps already

implicitly offered at a lower cost elsewhere, in particular within the financial institution. As large banks are possibly able to self-insure property rights associated with real estate transactions, the need for independent title insurers should dwindle and perhaps eventually disappear. Alliances and business arrangements are therefore essential for the survival of the title insurance business. A similar argument is made in Arruñada (2004) and Palomar (2001).

Because the title insurance premium represents only a small fraction of closing costs, let alone of the purchase price of a real estate property, rate changes and/or increased entry barriers are not likely to be followed by any adverse consumer response. As a result, we may presume that entry barriers and firm concentration should be high in this industry. Nyce and Boyer (1998) show that concentration at the State level is relatively high. The market share of the top 5 decision centers by State is never below 70 percent. As for the market share of the top 3 title insurance decision centers, only once is it below 50 percent. In addition, the title insurance Herfindahl index is significantly greater than larger lines of business of P&C insurers (Nyce and Boyer, 1998), as shown in Table 1.

Title insurance is a unique form of insurance as the premium is paid only once (at the time the property is purchased) and very little of it goes to cover future claims. Title insurance protects buyers and their mortgage lenders against sellers who are selling assets that are not theirs, or not theirs entirely. For example, a title insurance policy protects the buyer against title defect such as lien or unknown property claims that the seller failed to mention, or did not know existed.[1]

By statute title insurers are often restricted to operate in that unique line of business. For example, Jaffee (2004) cites the California Insurance Code section 12360 that states: " An insurer which anywhere in the United States transacts any class of insurance other than title insurance is not eligible for the issuance of a certificate of authority to transact title insurance in this State nor for the renewal thereof."

As is the case in mortgage insurance, title insurance is thus known as a monoline insurance product. According to Jaffee (2004) title insurers are restricted to operate is this unique line because there is almost no residual risk (loss avoidance is easily done) if the title agent has done the title search properly. In fact, only 5% of the premium goes into the insurer's reserves. As a result, to prevent title insurance reserves from subsidizing the reserves of lines where residual risk exists (basically any other insurance line), title insurance companies are restricted to sell no other type of insurance, whether within the State or in any other State.

The title insurance premium represents only a small fraction of closing costs associated with a mortgage. Because most of the premium is used to cover expenses incurred in the title search, very little is reserved to cover future claims. Title searches require the examination of a vast number of legal documents that trace the title of the property through all the previous owners. Although some States have central offices that accumulate all the relevant information on real estate transactions, other States require that each title insurer have its own real estate transaction database; these databases are known as a *title plant*. Where they are mandatory, title plants represent a significant barrier to entry. A potential entrant into a State where a title plant is required needs to gain access to an existing title plant from an incumbent title insurer (either by purchasing the title plant or leasing it) or construct one from scratch.

Although the insurance literature generally agrees that minimum capital standards are entry barriers, regulators are more concerned with solvency issues than with lack of competition issues so that substantial capital becomes necessary. In addition to the usual capital standards, title insurers face two other entry barriers that are arguably more important than the minimum capital standards. These two title insurance market entry barriers are the previously mentioned title plants and controlled business arrangements. As a result any potential entrant into a title insurance market may need not only to own its own title plant, but also to build arrangements with local businesses involved in real estate transactions. To our knowledge the only theoretical approach to title insurance is that of Arruñada and Garoupa (2005) who show the conditions under which registration systems, in place in most civil law countries, are more efficient than recording systems. This is particularly true when the cost of registration is relatively low compared to the cost of eviction.

1.1 Controlled or Affiliated Business Arrangements

In the real estate industry, controlled business arrangement (CBA's), are defined as the ownership of one provider in a real estate transaction by another provider (see Palomar, 1997). Affiliated Business Arrangements (AfBA's) are defined as an arrangement in which a person who is in position to refer business as part of a real estate transaction involving a federally related mortgage loan has either an affiliate relationship or direct ownership interest of more than 1% in the provider of settlement services. Under the Real Estate Settlement Procedures Act of 1974 (RESPA), controlled or affiliated business arrangements are allowed as long as the consumer is informed of the relationship among service providers and no rebates or kickbacks are

exchanged between service providers.[2] Rebates and kickbacks are prohibited to prevent reverse competition, whereby title insurers offer substantial rebates to primary service providers (lenders or realtors) to induce them to use their products. These rebates increase the cost of title insurance because insurers or insurance agents need to recoup the cost of the rebates by increasing the premium charged to the consumers.

Controlled business arrangements, while facilitating one stop shopping for potential homeowners, discourage new entry into the title insurance industry by almost requiring partnerships with established individuals or firms involved with the real estate transaction, including the independent title insurance agent. Some States have limited the amount of revenue that may be generated by controlled or affiliated business arrangements for title insurers or agents.[3]

Although the importance of independent title agents may vary from State to State, the 1997 American Land Title Association Agent Survey (see Bilbrey and McCarthy, 1998) reports that 39% of agents wrote business for only 1 title company and 66% of agents wrote business for 1 or 2 title insurers. Although some of these agents may be independent, they act as if they were exclusive agents. For affiliated agents, less than 2% of surveyed agents reported title insurer ownership interest, but they were the most important agents in the survey with over 1 million dollars in premium written. For these affiliated relationships, the average title insurer ownership in the title agency was 66%. Finally, 7% of agents report some other affiliation with another real estate provider, primarily the mortgage lender.

1.2 Title Plants

Title plants essentially duplicate all the public records for land property in a given locality and are the primary source of data for title searches. The title insurer (or the title agent) maintains these plants, required by statute in some States. In these *title-plant States*, title plants must meet some minimum requirements (Koch, 1993). Title insurers competing in title-plant States may meet title plant requirements by owning, leasing or sharing title plants with other title insurers. While only seven States explicitly require title plants (see Palomar, 1997), based on reported title plant values, there appear to be 34 States in which insurers consider title plants an asset. The other fifteen States (*non-title-plant States*) are Alabama, Arizona, Colorado, Connecticut, Delaware, Florida, Georgia, Maryland, North Carolina, New Jersey, Ohio, Pennsylvania, South Carolina, Utah and Washington.[4] Of the 33 title insurers in the United States that do not list any title plant as an asset in 1996, 17 are either members of a

group where at least one member had a title plant or had no direct premiums written in 1996. For the remaining 16 firms, two rented title plants and 14 only wrote business in *non-title-plant States*. Regardless of statutory requirement, ownership or access to a title plant gives incumbent insurers a competitive advantage over potential market entrants.

It should also be noted that technological advances have aided in the cost effectiveness of title plants. Title insurers are becoming more automated in all aspects of operations, including order taking, title searches and policy issuance (BestWeek, 1996). These advances, along with the computerization of the public record, should enable title insurers to more efficiently maintain the title plants, increase profit margin, and reduce the barrier to entry that title plants present.

Title plants currently remain significant entry barriers as it is shown in Table 2. To construct this table we divided the States into title-plant and non-title-plant States and conducted a simple test on means and medians indicating the impact of title plant requirements on companies operating in a State. The profitability measure[5] is the only measure that is not significant with regards to title plant requirements. We see that title plant requirements have an important impact on the structure of the different State markets for title insurance. In title-plant States, there are fewer companies, fewer independent companies[6] and market concentration is higher than in non-title-plant States.

An interesting finding in Table 2 is that the two types of entry barriers (i.e., title plants and controlled business arrangements) appear to be complementary to each other. Title insurers appear to derive proportionally more income from controlled business arrangements in title-plant States than in non-title-plant States. If this measures the importance of bank referrals, this difference may indicate that consumers search less in title-plant States, thus increasing the profitability of title insurers. Controlled business arrangements entry barriers would then compound the effect of the title plant entry barrier.

2. MODELS

The impact of entry barriers on firm profitability has been well documented in the literature, starting with Stackelberg (1934), Bain (1956) and Stigler (1968). Barriers to entry are a prerequisite for a firm to gain monopoly power in a market. Without entry barriers, no

non natural monopoly would be sustainable. The seminal approach to testing empirically entry barriers has been developed by Orr (1974) using the Canadian manufacturing market as its data source. Recent studies by Burton *et al.* (1999) and Neumann *et al.* (2001) have reexamined the method used by Orr, developed a new measure, or used a different approach to measuring the strength of the entry barriers. For instance, Neumann *et al.* (2001) find that market concentration is significantly smaller in larger markets, given potential entry. This is due to the fact that larger markets can accommodate more entry, which reduces the market power of any individual firm, and thus the relative size of the incumbent firms. The study also finds that concentration declines as a result of market growth. In fact, depending on the type of market growth (a higher willingness to pay by consumers, or a higher number of consumers), the number of firms may increase, thus reducing concentration. When entry is not possible, they find that concentration does not change.

The work by Kang and Lee (2001) resembles more the problem faced in the title insurance industry where a lot of the same players are competing against one another in many different markets, some in which entry barriers are important, and others where entry barriers are less important. Using a model similar to Katz and Tokatlidu (1996) and Baik and Lee (2000), they show that eliminating entry barriers can sometimes reduce welfare for consumers as the resources invested during the entry contest can exceed the gain from lowering entry barriers.

To find what basic type of industrial organization model fits the title insurance industry best, we develop four models used extensively in the industrial organization literature. Although these four models are not the only industrial organization models we could have used, they have the advantage of being simple and offering different testable predictions. We first present the traditional Cournot-Nash game where firms compete in quantities. We then move on to a Bertrand competition in a circular city (the Salop model) because it has often been suggested that insurers compete in prices, not quantities. Given all the different insurers and their reliance on Bests' (and Moody's) solvency ratings, it could be argued that not all insurers offer the same service. This means that insurers compete in prices over differentiated products. The third model supposes that each insurer's product is so differentiated that each firm has a local monopoly power (in which case choosing quantities or prices makes no difference). Finally, we present a Cournot-Nash model where entry and exit are prohibited, so that the number of firms is always the same.

In every model, we assume a linear inverse demand function: $p = a - bQ$, where $Q = \sum_{i=1}^{n} q_i$ is the total market supply. An increase in the willingness to pay for any quantity (what is called a *vertical market growth*) is associated with a higher intercept a (the inverse demand function shifts up), whereas an increase in the number of consumers for a particular good (what is called a *horizontal market growth*) is associated with a lower slope $-b$ (the inverse demand function tilts counterclockwise). All firms are assumed to be the same in the models. This modeling choice follows the observation that the health of the title insurance industry is closely related to that of the real estate market. As this market grows both in the number of transactions and in the value of those transactions, demand for title insurance services increases both horizontally – because there were more transactions – and vertically – because the transactions are becoming larger and larger. The two types of market growth will not have the same impact on market concentration depending on the type of industrial organization model used.

Firms considering operating in the title insurance industry are faced with two types of entry barriers: Title plants and Controlled business arrangements. Let F represent the firm's investment in controlled business arrangements. Investment in F lowers the firm's marginal cost, but at a decreasing rate so that $c'(F) < 0$, $c''(F) > 0$, $c'(\infty) = 0$ and $c''(\infty) = \infty$.

The second barrier corresponds to the cost of setting up a title plant. Whereas F is an endogenous firm decision, we let the cost of the title plant be fixed for all. We let ϕ represent the cost of the title plant.

2.1 Cournot Competition

In our first model, we use the Neumann *et al.* (2001) approach to Cournot Competition with possible entry. The maximization problem for each firm i is then

$$\max_{q_i, F_i} \Pi_i = (a - bQ) q_i - c(F_i) q_i - F_i - \phi. \tag{1}$$

This yields first order conditions

$$\frac{\partial \Pi_i}{\partial q_i} = a - bQ - c(F_i) - bq_i = 0 \tag{2}$$

$$= a - b(n+1) q_i - c(F_i) = 0 \tag{3}$$

and

$$\frac{\partial \Pi_i}{\partial F_i} = -c'\left(F_i\right)q_i - 1 = 0. \tag{4}$$

Only n identical firms will enter the market if

$$\left(a - bnq_i - c\left(F_i\right)\right)q_i - F_i - \phi = 0. \tag{5}$$

We want to find the impact of a change in the market (parameters a, b and ϕ) on the number of firms (n) on the production of each firm (q) and on the amount invested in controlled business arrangements (F). Totally differentiating conditions (3), (4) and (5) yields.

$$\begin{pmatrix} -bq_i & -b(n+1) & -c' \\ 0 & -c' & -c''q_i \\ -bq_i^2 & 0 & 0 \end{pmatrix}\begin{pmatrix} dn \\ dq_i \\ dF \end{pmatrix} = -\begin{pmatrix} 1 & -(n+1)q_i & 0 \\ 0 & 0 & 0 \\ q_i & -nq_i^2 & -1 \end{pmatrix}\begin{pmatrix} da \\ db \\ d\phi \end{pmatrix} \tag{6}$$

Inverting the first matrix, we have

$$\begin{pmatrix} dn \\ dq_i \\ dF \end{pmatrix} = -\begin{pmatrix} -bq_i & -b(n+1) & -c' \\ 0 & -c' & -c''q_i \\ -bq_i^2 & 0 & 0 \end{pmatrix}^{-1}\begin{pmatrix} 1 & -(n+1)q_i & 0 \\ 0 & 0 & 0 \\ q_i & -nq_i^2 & -1 \end{pmatrix}\begin{pmatrix} da \\ db \\ d\phi \end{pmatrix}. \tag{7}$$

Let $\omega = b(n+1)c''q_i - (c')^2 > 0$.[7] The determinant of the matrix is then negative: $= -bq_i^2\omega$. Solving, we have

$$\begin{pmatrix} dn \\ dq_i \\ dF \end{pmatrix} = \begin{pmatrix} 0 & 0 & \frac{1}{bq_i^2} \\ c''\frac{q_i}{\omega} & -\frac{c'}{\omega} & -\frac{c''}{\omega} \\ -\frac{c'}{\omega} & b\frac{n+1}{\omega} & \frac{1}{q_i}\frac{c'}{\omega} \end{pmatrix}\begin{pmatrix} 1 & -(n+1)q_i & 0 \\ 0 & 0 & 0 \\ q_i & -nq_i^2 & -1 \end{pmatrix}\begin{pmatrix} da \\ db \\ d\phi \end{pmatrix}. \tag{8}$$

This gives us

$$\begin{pmatrix} dn \\ dq_i \\ dF \end{pmatrix} = \begin{pmatrix} \frac{1}{bq_i} & -\frac{n}{b}q_i & -\frac{1}{bq_i} \\ 0 & -q_i^2\frac{c''}{\omega} & \frac{c''}{\omega} \\ 0 & q_i\frac{c'}{\omega} & -\frac{1}{q_i}\frac{c'}{\omega} \end{pmatrix} \begin{pmatrix} da \\ db \\ d\phi \end{pmatrix}. \quad (9)$$

Unfortunately, the data does not allow us to look at quantities sold by a firm since quantities are hard to define in an insurance contract. Instead we have to rely on a firm's revenue (or income), which is a product of price and quantity ($R = pq_i$). This value is easily available in insurance under the heading "direct premium written". Firm revenue is given by $R = \left(a - bq_i - b(n-1)q\right)q_i$ which yields $\frac{dR}{da} = q_i + \left(a - b(n+1)q\right)\frac{dq_i}{da} > 0, \frac{dR}{db} = -nq_i^2 + \left(a - b(n+1)q\right)\frac{dq_i}{db} < 0$ and $a - b(n+1)q)\frac{dq_i}{d\phi} > 0$. We therefore have the following prediction matrix from which we are able to draw three testable hypotheses.

$$\begin{array}{lll} \frac{dn}{da} > 0 & \frac{dn}{db} < 0 & \frac{dn}{d\phi} < 0 \\ \frac{dR}{da} > 0 & \frac{dR}{db} < 0 & \frac{dR}{d\phi} > 0 \\ \frac{dF}{da} = 0 & \frac{dF}{db} < 0 & \frac{dF}{d\phi} > 0 \end{array}$$

Hypothesis A.1: A vertical increase in demand (+ Δa) will have no impact on the amount invested in controlled business arrangements, but the number of firms will increase as will a firm's revenue.

Hypothesis A.2: An horizontal increase in demand (+ Δb) will increase the amount invested in controlled business arrangements, a firm's revenue and the number of firms.

Hypothesis A.3: A greater entry barrier (+ $\Delta\phi$) will increase a firm's revenue and the amount invested in controlled business arrangements, but it will reduce the number of firms.

2.2 Bertrand competition with differentiated product: The circular city

Using the Salop (1979) model, we have that each of the n firms face the following demand function

$$q_i = \frac{p_j + \frac{t}{n} - p_i}{t} = \frac{p_j + \frac{t}{n}}{t} - \frac{1}{t} p_i \tag{10}$$

where t is the distance from a consumer to firm i and p_j is the closest other firm's price.

Suppose for now that the travel cost depends on two parameters, a and b, which we will discuss later. The firm's maximization problem is then

$$\max_{p_i, F_i} \Pi_i = \left(p_i - c\left(F_i\right)\right)\left(\frac{p_j + \frac{t(a,b)}{n} - p_i}{t(a,b)}\right) - F_i - \phi. \tag{11}$$

This yields first order conditions

$$\frac{\partial \Pi_i}{\partial p_i} = \left(\frac{p_j + \frac{t(a,b)}{n} - p_i}{t(a,b)}\right) - \left(p_i - c\left(F_i\right)\right)\frac{1}{t(a,b)} = 0 \tag{12}$$

and

$$\frac{\partial \Pi_i}{\partial F_i} = -c'\left(F_i\right)\left(\frac{p_j + \frac{t(a,b)}{n} - p_i}{t(a,b)}\right) - 1 = 0. \tag{13}$$

Only n firm will enter the market if

$$\left(p_i - c\left(F_i\right)\right)\left(\frac{p_j + \frac{t(a,b)}{n} - p_i}{t(a,b)}\right) - F_i - \phi = 0. \tag{14}$$

With all firms alike, we have ($p_i = p_j = p$) so that (12), (13) and (14) become

$$-p+\frac{t(a,b)}{n}+c\left(F_i\right)=0 \tag{15}$$

$$-c'\left(F_i\right)\frac{1}{n}-1=0 \tag{16}$$

$$\left(p_i-c\left(F_i\right)\right)\frac{1}{n}-F_i-\phi=0. \tag{17}$$

To find the impact of a change in the market (parameters a, b and ϕ) requires a functional form for $t(a, b)$.

We know that the circumference of the circular city if all n firms are the same is given by $nt = 2\pi r$. Suppose that r represents the price in the inverse demand function when all quantities are taken into account.[8] In other words, let $r = P = a - bQ$, where $Q = nq_i$ since all n firms are the same and sell the same quantity. This yields $t=2\pi\left(\frac{a}{n}-bq_i\right)$. We then find $\frac{\partial t}{\partial a}=2\pi\frac{1}{n}$ and $\frac{\partial t}{\partial b}=-2\pi q$.

Totally differentiating conditions 15, 16 and 17, and letting $t=2\pi\left(\frac{a}{n}-bq_i\right)$ yields

$$\begin{pmatrix} -\frac{t}{n^2} & -1 & c' \\ c'\frac{1}{n^2} & 0 & -c''\frac{1}{n} \\ -(p-c)\frac{1}{n^2} & 0 & 0 \end{pmatrix}\begin{pmatrix} dn \\ dp \\ dF \end{pmatrix}=-\begin{pmatrix} 2\pi\frac{1}{n^2} & -2\pi q\frac{1}{n} & 0 \\ 0 & 0 & 0 \\ 0 & 0 & -1 \end{pmatrix}\begin{pmatrix} da \\ db \\ d\phi \end{pmatrix}. \tag{18}$$

The determinant of the first matrix is $\Delta=-\frac{p-c}{n^3}c''$ which is clearly negative since $c'' > 0$. Inverting the first matrix, we find

$$\begin{pmatrix} dn \\ dp \\ dF \end{pmatrix} = \begin{pmatrix} 0 & 0 & -\dfrac{n^2}{p-c} \\ -1 & -c'\dfrac{n}{c''} & \dfrac{tc''-(c')^2 n}{(p-c)c''} \\ 0 & -\dfrac{n}{c''} & -c'\dfrac{n}{(p-c)c''} \end{pmatrix} \begin{pmatrix} -2\pi\dfrac{1}{n^2} & 2\pi q\dfrac{1}{n} & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} da \\ db \\ d\phi \end{pmatrix} \quad (19)$$

and

$$\begin{pmatrix} dn \\ dp \\ dF \end{pmatrix} = \begin{pmatrix} 0 & 0 & -\dfrac{n^2}{p-c} \\ 2\pi\dfrac{1}{n^2} & -2\pi q\dfrac{1}{n} & \dfrac{tc''-(c')^2 n}{(p-c)c''} \\ 0 & 0 & -c'\dfrac{n}{(p-c)c''} \end{pmatrix} \begin{pmatrix} da \\ db \\ d\phi \end{pmatrix}. \quad (20)$$

A firm's revenue is again given by the product of price and quantities: $R = p_i\left(\frac{p_j - p_i}{t} + \frac{1}{n}\right) = p_i\frac{1}{n}$.The impact of a variation in the travel cost on revenues is then given by $\frac{dR}{dt} = \left(\frac{dp}{dt}n - p\frac{dn}{dt}\right)\left(\frac{1}{n}\right)^2$. With $\frac{dp}{dt} = \frac{1}{n}$ and $\frac{dn}{dt} = 0$, we have $\frac{dR}{dt} = \left(\frac{1}{n}\right)^2 > 0$, which means that $\frac{dR}{da} = \frac{dR}{dt}\frac{dt}{da} > 0$ and $\frac{dR}{db} = \frac{dR}{dt}\frac{dt}{db} < 0$. As for the impact of an increase in entry barriers, we find $\frac{dR}{d\phi} = \left(\frac{dp}{d}n - p\frac{dn}{d}\right)\left(\frac{1}{n}\right)^2$. Substituting for $\frac{dp}{d\phi} = \frac{tc''-(c')^2 n}{(p-c)c''}$, $\frac{dn}{d\phi} = -\frac{n^2}{p-c}$ and $p = \frac{t}{n} + c$ yields $\frac{dR}{d\phi} = (c')^2\frac{cn^2}{c''t^2} + 1 > 0$. Thus, $\begin{matrix} \frac{dn}{da} = 0 & \frac{dn}{db} = 0 & \frac{dn}{d\phi} < 0 \\ \frac{dR}{da} > 0 & \frac{dR}{db} < 0 & \frac{dR}{d\phi} > 0 \\ \frac{dF}{da} = 0 & \frac{dF}{db} = 0 & \frac{dF}{d\phi} > 0 \end{matrix}$. We are now able to state our testable hypotheses.

Hypothesis B.1: As travel costs increase (following either a vertical increase in demand, + Δa, or an horizontal increase in demand, – Δb) a firm's revenue will increase, but neither the number of firms nor the amount invested in controlled business arrangements will change.

Hypothesis B.2: A greater entry barrier will reduce the number of firms, increase a firm's revenue and increase the amount invested in controlled business arrangements.

2.3 Bertrand competition under monopolistic competition

The third model supposes that each firm faces a demand function over which each exercises monopoly power. The number of firms in the market then reduces the intercept of the demand curve, but has no impact on the slope of the curve. Given that it is a monopoly, there is no loss in generality to suppose that quantities are chosen instead of prices, so that the inverse demand function of firm i is given by $p_i = \frac{a}{n} - bq_i$.

The maximization problem for firm i is then

$$\max_{q_i, F_i} \Pi_i = q_i\left(\frac{a}{n} - bq_i\right) - q_i c\left(F_i\right) - F_i - \phi. \tag{21}$$

This yields first order conditions

$$\frac{\partial \Pi_i}{\partial q_i} = \frac{a}{n} - 2bq_i - c\left(F_i\right) = 0 \tag{22}$$

and

$$\frac{\partial \Pi_i}{\partial F_i} = -c'\left(F_i\right)q_i - 1 = 0. \tag{23}$$

Only n firms will enter the market if

$$q_i\left(\frac{a}{n} - bq_i\right) - q_i c\left(F_i\right) - F_i - \phi = 0. \tag{24}$$

Totally differentiating these conditions yields

$$\begin{pmatrix} -\frac{a}{n^2} & -2b & -c' \\ 0 & -c' & -c''q \\ -q\frac{a}{n^2} & 0 & 0 \end{pmatrix} \begin{pmatrix} dn \\ dq \\ dF \end{pmatrix} = - \begin{pmatrix} \frac{1}{n} & -2q & 0 \\ 0 & 0 & 0 \\ \frac{q}{n} & -q^2 & -1 \end{pmatrix} \begin{pmatrix} da \\ db \\ d\phi \end{pmatrix}. \quad (25)$$

Letting $\omega = 2bc''q - (c')^2 > 0$ (for the same reason as in the Cournot case), the determinant of the first matrix is $\Delta = -q\frac{a}{n^2}\omega < 0$. Solving we find

$$\begin{pmatrix} dn \\ dq \\ dF \end{pmatrix} = \begin{pmatrix} \frac{1}{a}n & -\frac{1}{a}n^2q & -\frac{1}{qa}n^2 \\ 0 & -\frac{c''}{\omega}q^2 & \frac{c''}{\omega} \\ 0 & q\frac{c'}{\omega} & -\frac{c'}{q\omega} \end{pmatrix} \begin{pmatrix} da \\ db \\ d \end{pmatrix}. \quad (26)$$

Looking at total revenues ($R = pq_i = \left(\frac{a}{n} - bq\right)q$), we see that $\frac{dR}{da} = \frac{1}{n}q\left(1 - \frac{a}{n}\frac{dn}{da}\right) + \left(\frac{a}{n} - 2bq\right)\frac{dq_i}{da} = 0$, since $\frac{dq}{da} = 0$ and $\frac{a}{n}\frac{dn}{da} = 1$.

Also, $\frac{dR}{db} = \left(\frac{a}{n} - 2bq\right)\frac{dq_i}{db} < 0$ and $\frac{dR}{d\phi} = \frac{1}{a} + \left(\frac{a}{n} - 2bq\right)\frac{dq_i}{d\phi} > 0$. This

$$\begin{matrix} \frac{dn}{da} > 0 & \frac{dn}{db} < 0 & \frac{dn}{d\phi} < 0 \\ \frac{dR}{da} = 0 & \frac{dR}{db} < 0 & \frac{dR}{d\phi} > 0 \\ \frac{dF}{da} = 0 & \frac{dF}{db} < 0 & \frac{dF}{d\phi} > 0 \end{matrix}$$

gives us .We are now able to state our testable hypotheses.

Hypothesis C.1: A vertical increase in demand (+ Δa) will increase the number of firms, but it will have no impact on a firm's revenue nor on the amount invested in controlled business arrangements.

Hypothesis C.2: An horizontal increase in demand (– Δb) will increase the number of firms, a firm's revenue and the amount invested in controlled business arrangements.

Hypothesis C.3: A greater entry barrier (+ $\Delta\phi$) will reduce the number of firms, but increase a firm's revenue and the amount invested in controlled business arrangements.

2.4 Blockaded entry

The final model is the Cournot competition where entry into the market is blockaded. In that case it is clear that changes in demand will have no impact on the number of firms since the number of firms is fixed at its current level. Using the same approach as in the other three cases we find the following matrix.

$$\begin{array}{lll} \frac{dn}{da} = 0 & \frac{dn}{db} = 0 & \frac{dn}{d\phi} = 0 \\ \frac{dR}{da} > 0 & \frac{dR}{db} < 0 & \frac{dR}{d\phi} = 0 \\ \frac{dF}{da} > 0 & \frac{dF}{db} < 0 & \frac{dF}{d\phi} = 0 \end{array}$$

We are now able to state our testable hypotheses.

Hypothesis D.1: A vertical increase in demand (+ Δa) will increase a firm's revenue and the amount invested in controlled business arrangements, but it will have no impact on the number of firms.

Hypothesis D.2: An horizontal increase in demand (– Δb) will increase a firm's revenue and the amount invested in controlled business arrangements, but it will have no impact on the number of firms

Hypothesis D.3: A greater entry barrier (+ $\Delta\phi$) will have no impact on any of firm's decisions.

2.5 Competing models

The four models offer different predictions as to what impact demand shifts and entry barriers have on the number of insurers, insurer revenue and investment in control business arrangements. We summarize in the following matrix the four competing models we test in this paper.

Cournot Competition

$$\frac{dn}{da} > 0 \quad \frac{dn}{db} < 0 \quad \frac{dn}{d\phi} < 0$$
$$\frac{dR}{da} > 0 \quad \frac{dR}{db} < 0 \quad \frac{dR}{d\phi} > 0$$
$$\frac{dF}{da} = 0 \quad \frac{dF}{db} < 0 \quad \frac{dF}{d\phi} > 0$$

Circular City

$$\frac{dn}{da} = 0 \quad \frac{dn}{db} = 0 \quad \frac{dn}{d\phi} < 0$$
$$\frac{dR}{da} > 0 \quad \frac{dR}{db} < 0 \quad \frac{dR}{d\phi} > 0$$
$$\frac{dF}{da} = 0 \quad \frac{dF}{db} = 0 \quad \frac{dF}{d\phi} > 0$$

Monopolistic Competition

$$\frac{dn}{da} > 0 \quad \frac{dn}{db} < 0 \quad \frac{dn}{d\phi} < 0$$
$$\frac{dR}{da} = 0 \quad \frac{dR}{db} < 0 \quad \frac{dR}{d\phi} > 0$$
$$\frac{dF}{da} = 0 \quad \frac{dF}{db} < 0 \quad \frac{dF}{d\phi} > 0$$

Blockaded Entry

$$\frac{dn}{da} = 0 \quad \frac{dn}{db} = 0 \quad \frac{dn}{d\phi} = 0$$
$$\frac{dR}{da} > 0 \quad \frac{dR}{db} < 0 \quad \frac{dR}{d\phi} = 0$$
$$\frac{dF}{da} > 0 \quad \frac{dF}{db} < 0 \quad \frac{dF}{d\phi} = 0$$

Looking at the four models' nine predictions, we see that one is the same in every model: $\frac{dR}{db}$ is always predicted to be negative. Only eight degrees of freedom are thus left to differentiate the four models. Interestingly, in the circular city model, investment in controlled business arrangements should not be affected by market growth ($\frac{\partial F}{\partial b}$), as opposed to the other three models. Another interesting aspect of the models is that the impact of the title plant requirement is the same for the three models where entry is possible; title plant requirements should decrease the number of firms, increase firm revenue and increase the amount invested in controlled business arrangements.

3. DATA AND METHODOLOGY

3.1 Data

The title insurance data was obtained from the National Association of Insurance Commissioners. It spans all 50 States and the District of Columbia from 1996 through 2000 inclusively.[9] Iowa and

the District of Columbia were removed from the dataset.[10] The NAIC database provides direct premium written (from affiliated as well as non-affiliated operations), other income, and direct losses (paid and incurred) by State. This database was supplemented with mortgage information and median home prices by State from the Federal Housing Finance Board Monthly Interest Rate Survey (MIRS). In addition, single-family building permits and population by State from the U. S. Bureau of the Census and the Real Estate Center at Texas A&M University were utilized. Table 3 contains the descriptive statistics for the variables used in the analysis.

As apparent from the theoretical models presented in the previous section, three dependent variables are needed for analysis. These variables are the number of insurers operating in a State, the average revenue by insurer and the amount invested by insurers in controlled business arrangements.

We obtained the number of companies operating per State from the NAIC database. Similar to other insurance markets, however, there are groups of title insurers under common ownership. This significantly reduces the number of completely independent decision centers. Companies that were members of the same group were considered one company. For average revenues, we divided total premiums written by the number of firms in the State. Finally, we approximated the percentage of business derived from controlled business arrangements by the ratio of direct premiums written originating from affiliated operations over total direct premiums written.[11] We use the proportion of business derived from CBAs as a proxy for the amount invested in them because the data on investment is not available.

To test for the impact of horizontal market growth and vertical market growth, we use the number of new building permits by State by year, and the average value of each permit. These are good proxies for the total number of real estate transactions in a State and for the total value of such transactions. For the State of Texas, where building permit and total real estate transaction measures are available, the average correlation since 1989 between the average value of housing starts and the average value of housing sales is 98%, whereas the correlation between the number of real estate transactions and the number of new building permits is 96%.

Given the linear demand curve, variations in the number of new building permits represents a horizontal market growth, whereas variations in the average value of new houses represents a vertical market growth (change in the intercept). Using the number of new

building contracts to represent the slope of our linear demand curve is logical as more people need to purchase title insurance (change in the slope of the demand curve). An increase in the number of new homes is therefore represented by a flatter demand curve ($-b$ decreases). As for vertical market growth, we use the average value of each new dwelling constructed following the emission of new building permits because consumers who are willing to purchase a more expensive home may not have the same price-elasticity as those who want to purchase a less expensive home.

Finally, in terms of entry barriers, a prominent one in title insurance is the title plant. Some States maintain a public title plant so that every title insurer has open access to it. Most States, however, require that each insurer maintain its own title plants. We thus let the entry barrier cost in our model be represented by a dummy variable for this title plant requirement.

3.2 Methodology

The empirical testing of the theoretical models is done in two stages. First we estimate an ordered probit model (equation M1) using the number of title insurers in the State as the dependent variable. Depending on the theoretical model we examine, horizontal (*hgrowth*) and vertical (*vgrowth*) market growth may have an impact on the number of companies operating in a State. In addition, the requirement to maintain a title plant (*plant*) also influences the number of firms operating in a State. The testable equation is thus

$$\#\text{ of companies} = f_1(\text{hgrowth, vgrowth, plant, CBAlimits, population}) \quad \text{(M1)}$$

As evident in equation (M1), we control for State population and legal limits imposed on the proportion of income originating from controlled business arrangements. We want to control for population because larger States are more likely to be able to sustain a large number of companies.Moreover, larger States may also face larger entry barriers as more information needs to be collected to build each insurer's title plant. To account for regulatory limitations on the development of controlled business arrangements, a control variable (*CBAlimits*) identifying the States that impose limits on the proportion of business originating from CBA is included. The variable takes on the value of the limit percentage in place in that State (as noted in footnote 8). This variable affects results in two opposite ways. On the one hand, limits on CBA income should reduce the relative importance of affiliated business. On the other hand, only States that felt the CBA income was too high would institute limitations. Univariate analysis of

percentage of income from CBA's (see Table 4) provides evidence that the second hypothesis is more likely to be true.

For the other two testable equations, we use a simultaneous equations model (equation M2) to explain the average firm revenue by State and the proportion of business generated by controlled business arrangements. The instruments included in the simultaneous equations model are similar to the ordered probit model's where the theoretical model predicts the effects of horizontal and vertical growth as well as title plant requirements. The testable equation then becomes

$$\text{average revenues} = f_2\left(\begin{array}{c}\%\text{income from CBAs, hgrowth, vgrowth,}\\ \text{plant, interestrates, population, \#of companies}\end{array}\right). \quad \text{(M2)}$$

$$\%\text{ income from CBAs} = f_3(\text{revenues, hgrowth, vgrowth, plant, CBAlimits, \# of companies})$$

Again we control for State level variables that affect real estate transactions and thus the demand for title insurance. Control variables[12] include the previously mentioned CBA limits, State population, and State level interest rates.[13]

A interesting specificity of the title industry is that premiums are not necessarily reported in the same way in every State. There are two ways that States require their title insurers to report premiums: Gross all-inclusive rate and Gross risk rate. Although regulation varies from State to State, all title insurer within the State are required to report in the same way. For example, the State of Texas is reporting on a All-inclusive rate basis except for one company. 15 States require companies to report on an All-inclusive rate basis whereas the other 35 States require companies to report on a gross risk rate basis. In Gross-risk rate States, the title agents retain about 60% of the premium whereas agents retain 90% of the premium in All-inclusive States. This difference in reporting may affect the results when we look at the firm's average revenues. We measure whether the State requires an all-inclusive rate report as a dummy variable that equals one for All-inclusive States and zero otherwise.

4. RESULTS

Tables 6A and 6B contain the empirical results of equations M1 and M2; the number of companies, an insurer's revenue, and the pro-

portion of revenues due to Controlled Business Arrangements. The three independent variables that are most interesting to us are the number of new building permits per person (horizontal growth), the average value of new construction (vertical growth), and whether a State is a title plant State. We present two sets of results in Table 5 and in Table 6 depending on whether we control for the type of premium reported by insurers. The results are sensibly the same, however.

The following matrix summarizes our main empirical results presented in Table 5

$$\begin{array}{lll} \frac{dn}{da} < 0 & \frac{dn}{db} = 0 & \frac{dn}{d\phi} < 0 \\ \frac{dR}{da} > 0 & \frac{dR}{db} < 0 & \frac{dR}{d\phi} = 0 \\ \frac{dF}{da} = 0 & \frac{dF}{db} = 0 & \frac{dF}{d\phi} > 0 \end{array}$$

Compared with the summary of the theoretical results, we can already rule out the blockaded entry model because five of the model's nine predictions are not supported by the data. It is therefore reasonably safe to conclude that the blockaded entry model does not apply to the title insurance industry. For the three other models (Cournot, Salop and Monopolistic), the only predictions that vary from one model to the next is $\frac{dn}{da}$, $\frac{dn}{db}$, $\frac{dR}{da}$ and $\frac{dF}{db}$. Interestingly, these three models yield the same predictions regarding the impact of entry barriers. Let us compare these three models two-by-two.

The differences between the Cournot and the Salop models rest on the impact of horizontal growth on the number of companies ($\frac{dn}{db}$) and on the amount invested in controlled business arrangements ($\frac{dF}{db}$), and on the impact of a vertical market growth on the number of companies ($\frac{dn}{da}$). The Salop model predicts that none should have an impact whereas the Cournot model predicts $\frac{dn}{da}$ to be positive and the other two to be negative. With respect to $\frac{dn}{db}$ and $\frac{dF}{db}$ the empirical results seems to support the Salop model since neither $\frac{dn}{db}$ not $\frac{dF}{db}$ are not statistically different from zero; even a joint test cannot reject

the fact that they are both zero. We can then surely say that the Salop model is better than the Cournot model in explaining the industrial organization of the title insurance industry.

When we compare the Monopolistic competition model with the Salop circular city model, we note that the two models differ with respect to all four cells $\frac{dn}{da}$, $\frac{dn}{db}$, $\frac{dR}{da}$ and $\frac{dF}{db}$. Note that none of the Monopolistic model's predictions are supported in the data. It is therefore easy to conclude that the Salop model is better than the Monopolistic model in explaining the industrial organization of the title insurance industry.

The empirical results presented in Table 6, where we control for the type of premium reporting required in each State (All-inclusive versus Gross risk), are sensibly the same as the empirical results presented in Table 5. The All-inclusive dummy variable has a significant impact on the firm's average revenue (positive) and on the investment in controlled business arrangements (negative). Although the All-inclusive dummy variable has significant explanatory power, it does not come to the detriment of the nine cells around which we build our argument.

Table 7 summarizes our findings. As we can see, the Blockaded and the Monopolistic models fit the worst the empirical results since they only correctly predict four of the nine cells. The Cournot model does not fare much better as it correctly only five cells. The Salop model represents best the title insurance industry as seven of the nine cells[14] are correctly predicted, including the three cells regarding CBA's. The only two cells that are not correctly predicted are either not supported by any or the four models, or only supported by the Blockaded entry model, which otherwise is not supported by the data.

5. DISCUSSION AND CONCLUSION

The goal of this paper was to present an analysis of the industrial organization of the title insurance industry by exposing different competing industrial organization models to see which one fits the title insurance industry best. The four traditionnal models we focus on are the Cournot, Salop's circular city, the Monopolistic competition and the Blockaded entry models. We tested these four models using title insurance industry data from 1996-2000. Our empirical results suggest that the model that best explains the indus-

trial organization of the title insurance industry is the Salop circular city model were the diameter of the circle is determined by the inverse demand function.

The distinctive feature of the Salop model is that, although firms compete in prices, their product appears differentiated from the consumer's point of view. In the model, the difference in the product is modelled as the distance between the location of two firms located on the circumference of a circle.

An interesting inference of our results in terms of public policy, was to infer from the title insurance industry structure what the property and casualty structure would look like if banks were allowed to become insurance referral agents, insurance agents or direct providers of insurance. The growth of the banking sector in the insurance industry does not come necessarily from the banks' better underwriting or pricing technology. Rather banks can become insurance agents that could refer clients to their insurer when negotiating mortgages or car loans. While bank sales of property/casualty products is still relatively small (approximately 3% of total sales), the growth in bank sales is about ten times that of growth in the overall market. As banks are expanding significantly into the insurance arena, it is only a matter of time before they become important players in the American insurance industry. As insurance regulators put more and more capital requirements on insurers, thus increasing implicitly the entry barriers, the conglomeration of banks and insurance companies should occur at a faster pace. In the title insurance industry, we observe more business originating from controlled business arrangements in States where the entry barrier (the title plant requirement). Interestingly, market size and market wealth do not have any impact on theses arrangements; only the entry barrier. According to the Salop circular city model, we should also observe higher company revenues in States where the capital requirements are more stringent. This raises an interesting dilemma for State insurance regulators.

By increasing capital requirements, the number of insurance companies is reduced and more are pushed toward alliances with banks. As a result, each insurance company collects more revenues on average, presumably through higher premiums. Seeing that the market is less competitive and consumers are worse off – albeit because of their own doing – regulators must intervene on the insurance market directly to limit the insurance premium increases.[15] By limiting insurer revenues regulator increase the risk of insolvency so that, in the name of the public good, capital requirements increases are mandated because the worse thing that could happen is having an insurer fail. And we are back where we started.

Society's end question regarding banks selling insurance products in their branches will be whether such partnerships increase or decrease competition. While research has shown that bank entry into other financial services fields (see Gande, Puri and Saunders, 1999) increases competition, Saunders (1999) raises the point that the competitive effects differs based on the type of entry method used (de novo vs. acquisition). Where de novo entry increases competition, acquisition decreases the number of competitors in the marketplace. Therefore, the form of entry needs to be closely monitored to determine the overall benefits of consolidation. The method chosen by banks to enter the P&C insurance industry will thus have an important impact of the competitive nature of the industry (see Carow, 2001b): Competition could decrease if banks restrict their insurance operations to offering contracts of existing insurance companies (in effect becoming insurance agents). Our paper sheds light on that debate by observing what happens in an insurance line whose operations is closely intertwined with that of banks; that is Title insurance.

The type of regulatory framework that government bodies will ultimately opt for will depend on the relative efficiency of each type of approach; a priori, there is no clear reason why regulation by one principal over multi-task agents should be or should not be more efficient than regulation of one agent by many principals. We anticipate interesting avenues of research to open up regarding the regulation of financial institutions.

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Notes

1. See Rush (2000) for more details about the use of title insurance for lenders.

2. The only benefit that the person referring the business is allowed to gain is their normal ownership income from the service provider, they may not directly receive income based on their referrals.

3. As of 1997, Kansas limited income from CBA's or AfBA's to 20%, California to 50%, Michigan to 15%, Colorado and Utah to 33 1/3%, Wyoming to 25% and Nebraska to 20% (see Palomar 1997).

4. Although the State of New York requires title insurers to have access to a title plant, it does not allow title insurers to list the title plant as an admitted asset.

5. Profitability is measured as one minus the loss ratio $\left(1-\frac{\text{direct losses incurred}}{\text{direct premiums earned}}\right)$. Although widely used to assess the profitability of different insurance lines, it is not a very good measure for title insurance since a majority of premiums collected are for the expenses incurred during the title search rather than losses. Unfortunately the NAIC annual statement (schedule T) does not provide expenses by State as it does for premiums and losses.

6. The number of companies operating per State was taken from the NAIC database. Similar to other insurance markets, however, there are groups of title insurers under common ownership. This significantly reduces the number of decision centers. Companies that were members of the same group were considered one decision center for the purpose of our analysis.

7, With F sufficiently large, ω is indeed positive since $c''(\infty) = \infty$ by assumption and $c'(\infty) = 0$. Another way to see it, as is graphically presented in Neumann *et al* (2001), is by noting that slope $\frac{b(n+1)}{-c'} > 0$ is greater than slope $\frac{-c'}{qc''} > 0$. These two slopes are obtained by finding $\frac{dF}{dq}$ for the two first order conditions of the maximization problem. This implies that $\omega > 0$.

8. Assuming that the size of the city (as measured by its circumference) is related to the price is logical. Indeed as a city becomes larger, the number of consumers or the travel time will increase, thus increasing the price of the good for which the circular city is a good model.

9. The NAIC began compiling the title insurance database in 1996.

10. According to Burke (2000), lawyers were able to successfully lobby the Iowa legislation to prohibit the sale of title insurance in Iowa. The District of Columbia is missing data necessary for the analysis.

11. As noted in section 3.2, RESPA requires that consumers are notified of CBA's but places no requirement of reporting income from these arrangements. The NAIC annual statements however do provide at least a proxy for revenue generated by CBA's by reporting direct premiums written from a subsidiary, controlled or affiliated company or agency.

12. Given that our panel dataset, a fixed effects model would have been optimal. Unfortunately, the title plant requirements and limitations on income from CBA's vary by State but not over time. Thus using State dummies in a fixed effects model would capture any impact title plant requirements and limitations on CBA income. Our solution is to include time and regional dummies in the analysis for fixed effects and keep the title plant and limits on income from CBA variables in our analysis. One alternative model the authors attempted was to include the Herfindahl index in lieu of the title plant dummy and use a fixed effects model with State dummies rather than regional dummies. We felt this was a viable alternative given the significant differences in concentration between States with different title plant requirements (see Table 2). The results did not vary much with those reported in Table 6.

13. Title searches also originate when the owner of the real estate property refinances his mortgage. We controlled for changes in interest rates and the proportion of mortgage contracts that have a variable rate. These two measure may be proxies for the likelihood that refinancing will occur. The new specifications do not change our results.

14. Although the Salop circular city model is the best fit of the four model tested here, it does not fit perfectly as two of its nine predictions are not empirically supported. The two cells that are off for the Salop model are the impact of a vertical market growth on the number of firms ($\frac{dn}{da}$) and the impact of the title plant requirement on firm revenue ($\frac{dR}{d\phi}$). In the first case, $\frac{dn}{da} < 0$ is not consistent with any of the models presented: two models, Cournot and Monopolistic, predicted that the number of companies should increase as the vertical demand increases, whereas the other two, Salop and Blockaded, predicted no impact on the number of firms. In the second case, $\frac{dR}{d\phi} = 0$ is consistent only with Blockaded entry model, a model that we can otherwise discard with confidence as only four of the nine cells are correctly predicted.

15. Another possible impact is that the insurance regulator may be captured by the insurance industry.

Appendix

TABLE 1
1996 HERFINDAHL INDICES FROM SELECTED LINES

	Title	Home-owners	Private Passenger Auto Liability	Private Auto Physical Damage
Herfindahl	0.1286	0.0740	0.0644	0.0600

Source: NAIC P&C Insurers database, NAIC 1996 Title Insurers database.

TABLE 2– DIFFERENCES IN MEANS AND IN MEDIANS TITLE PLANT STATES VERSUS NON-TITLE PLANT STATES

	Non-Title Plant States (15 States)		Title Plant States (34 States)	
	Mean[a]	Median[b]	Mean	Median
Number of Companies	11.83 (2.64)	11	8.41 (1.97)	8
Number of Independent Companies	3.74 (2.29)	3	1.33 (1.19)	1
Herfindahl Index	0.189 (0.04)	0.189	0.240 (0.067)	0.230
Top-3 Market Share	0.667 (0.087)	0.670	0.740 (0.104)	0.746
Top-5 Market Share	0.860 (0.075)	0.867	0.921 (0.066)	0.928
Independent Companies Market Share	0.083 (0.090)	0.062	0.045 (0.058)	0.016
Profitability	0.946 (0.030)	0.956	0.947 (0.045)	0.954
Proportion of Income from CBAs	0.076 (0.089)	0.038	0.146 (0.180)	0.075

Note: Standard error in parentheses.

a: All t-tests for statistical differences in means were significant at the 1% level except for Profitability. All variances are statistically different between the two samples except for Top-3 Market Share and Top-5 Market Share.

b: Two-sided Median Two-Sample tests are significant at the 1% level for all except Independent Companies Market Share (5% level) and Profitability (not significant).

TABLE 3 – DESCRIPTIVE STATISTICS PER STATE

Variable	Mean	Median	Standard deviation	Min	Max
Number of Companies	9.31	9	2.64	5	18
Price ($ '000)	160.17	152.10	38.88	82.6	300.2
Building Permits ('000)	23.35	16.29	24.00	1.26	108.61
State Population ('000 000)	5.47	3.90	5.96	0.48	33.87
State Revenues ($ '000 000)	135.11	59.93	227.44	2.30	1470.60
Proportion* of Income from CBAs	0.1273	0.0604	0.1639	0	0.7950
Interest Rates %	7.47	7.49	0.3785	6.65	8.31

Source: Authors' calculations based on NAIC database

* For comparison, bank sales of property and casualty insurance averaged around 3% in 2000.

TABLE 4 – DIFFERENCES IN MEANS AND IN MEDIANS STATES WITH CBA LIMITS VERSUS STATES WITHOUT CBA LIMITS

	States with CBA limits		States without any limits	
	Mean[a]	Median[b]	Mean	Median
Proportion of Income from CBAs	0.233 (0.233)	0.1322	0.104 (0.134)	0.047

Note: Standard errors in parentheses.

a: The t-test statistical difference in mean is significant at the 1% level.

b: Two-sided Median Two-Sample test is significant at the 1% level.

TABLE 5 – REGRESSION RESULTS
THE DETERMINANTS OF THE NUMBER OF COMPANIES, AVERAGE REVENUE AND THE IMPORTANCE OF CONTROLLED BUSINESS ARRANGEMENTS

Not controlling for type of premium reporting			
Variable	**Number of companies**	**Average company revenue**	**Proportion of income from CBA**
Constant		-70.19** (33.13)	-20.70*** (11.80)
Vertical Growth (Median Price)	-0.015*** (0.002)	0.078*** (0.023)	0.008 (0.040)
Horizontal Growth (Building Permits)	-0.029 (0.033)	-2.491*** (0.451)	0.140 (0.825)
Title Plant	-2.662*** (0.240)	-3.566 (2.193)	12.58*** (2.84)
Proportion of income from CBA		0.081 (0.186)	
Average Company Revenue			0.836*** (0.298)
Number of Companies		0.100 (0.376)	0.845 (0.592)
State Population	0.168*** (0.016)	0.572** (0.185)	
State Limits on CBA Income	-0.010*** (0.003)		0.109*** (0.032)
Interest Rates		7.053* (3.830)	
All Inclusive Premium			
Number of Observations	245	245	245
Log-likelihood Value	-388.20		
Adjusted R^2		0.692	0.541

Note: The number of companies is found using an ordered probit regression. The regressions for the average company revenue and the precentage of affiliated business in total revenues uses a simultanous equation approach. Value of coefficient, standard error in parentheses.

*** significant at the 1% level, ** at the 5% level and * at the 10% level.

TABLE 6 – REGRESSION RESULTS.
THE DETERMINANTS OF THE NUMBER OF COMPANIES, AVERAGE REVENUE AND THE IMPORTANCE OF CONTROLLED BUSINESS ARRANGEMENTS

Controlling for type of premium reporting			
Variable	**Number of companies**	**Average company revenue**	**Proportion of income from CBA**
Constant		-47.39 (31.26)	-25.59** (11.37)
Vertical Growth (Median Price)	-0.015*** (0.002)	0.075*** (0.022)	-0.001 (0.047)
Horizontal Growth (Building Permits)	-0.024 (0.034)	-2.741*** (0.432)	0.653 (1.118)
Title Plant	-2.686*** (0.244)	-2.944 (2.076)	16.29*** (3.594)
Proportion of income from CBA		-0.254 (0.189)	
Average Company Revenue			1.206** (0.505)
Number of Companies		0.106 (0.355)	1.032* (0.596)
State Population	0.166*** (0.016)	0.558*** (0.174)	
State Limits on CBA Income	-0.011*** (0.003)		0.143*** (0.036)
Interest Rates		4.332 (3.627)	
All Inclusive Premium	0.121 (0.222)	13.13*** (1.724)	-13.43** (7.488)
Number of Observations	245	245	245
Log-likelihood Value	-388.05		
Adjusted R^2		0.736	0.492

Note: The number of companies is found using an ordered probit regression. The regressions for the average company revenue and the precentage of affiliated business in total revenues uses a simultanous equation approach. Value of coefficient, standard error in parentheses.

*** significant at the 1% level, ** at the 5% level and * at the 10% level.

TABLE 7 – COMPARISON OF EMPIRICAL RESULTS WITH MODEL HYPOTHESES

Explained / Explanatory	Number of companies	Average company revenue	Percentage of affiliated business to total revenues
Vertical Growth (Median Price)	– + Ø + Ø	+ + + Ø +	Ø Ø Ø Ø +
Horizontal Growth (Building Permits)	Ø – Ø – Ø	– – – – –	Ø – Ø – –
Title Plant	– – – – Ø	Ø + + + Ø	+ + + + Ø

Note: The first sign (+, – or Ø) in each box is the empirical finding presented in Table 6. The second sign is the hypothesized sign for the Cournot model. The third, fourth and fifth sign are the hypothesized signs for the Circular city, the Monopolistic competition and the Blockaded entry models. The explantory variable in the far left column is assumed to have no impact (Ø) on the dependent variables if its sign is not significant at the 5% level or better. The symbols + and – mean that the variable has a significant positive or negative impact (i.e., 5% level or better) on the dependent variable.