

**The Demand for Homeowners Insurance
with Bundled Catastrophe Coverages***

Wharton Project on Managing Catastrophic Risks

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In this paper, we estimate the demand for homeowner insurance in Florida. Since we are interested in a number of factors influencing demand, we approach the problem from two directions. We first estimate two hedonic equations representing the premium per contract and the price mark-up. We analyze how the contracts are bundled and how contract provisions, insurer characteristics and insured risk characteristics and demographics influence the premium per contract and the price mark-up. Second, we estimate the demand for homeowners insurance using two-state least squares regression. We employ ISO's indicated loss costs as our proxy for real insurance services demanded. We assume that the demand for coverage is essentially a joint demand and thus we can estimate the demand for catastrophe coverage separately from the demand for non-catastrophe coverage. We estimate various models and determine that price elasticities are more elastic for catastrophic coverage than for non-catastrophic coverage. Further income elasticities are greater for catastrophic cover than for non-catastrophic coverage. Finally, we conclude based on the results of a selection model that our sample of ISO Reporting Companies well represents the demand for insurance in the Florida market as a whole.

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I. Introduction

A. The Problem of Catastrophic Risk

The risk of natural disasters in the U.S. has significantly increased in recent years, straining private insurance markets and creating troublesome problems for disaster-prone areas. The threat of mega-catastrophes resulting from intense hurricanes or earthquakes striking major population centers has dramatically altered the insurance environment. Estimates of probable maximum losses (PMLs) to insurers from a mega-catastrophe range from \$50-\$115 billion depending on the location and intensity of the event (RMS/ISO, 1995).¹ Under current conditions, many insurers could become insolvent or financially impaired if a mega-catastrophe occurred, with rippling effects throughout insurance markets and the economy (ISO, 1996a).²

Increased catastrophe risk poses difficult challenges for insurers, reinsurers, property owners and public officials (Kleindorfer and Kunreuther, 1999). The fundamental dilemma concerns insurers' ability to finance low-probability, high-consequence (LPHC) events, which generates a host of interrelated issues with respect to how the risk of such events are managed, financed and priced at various levels (Russell and Jaffe, 1997). Insurers have sought to raise their

¹ These maximum probable loss (PML) estimates are based on a 500-year "return" period. In other words, the probability that a loss would occur in any given year that would exceed the PML is one in 500.

² An Insurance Services Office (1996a) study estimated the impact of severe catastrophes on the financial condition of 80 insurer groups that report detailed statistical data to ISO. Utilizing catastrophe models, ISO estimated that a mega-catastrophe causing \$50 billion or more in insured losses could result in 36 percent of insurers becoming insolvent and many more becoming financially impaired, depending on their location. The ISO analysis included estimates of the impact of insurers' reinsurance arrangements based on information available from Best's Reports. The companies in the ISO sample represented approximately 28 percent of total industry property insurance premiums. For a model and further estimates of industry capacity to cover catastrophe losses, see also Cummins, Doherty and Lo (1999).

prices and decrease their exposure to catastrophe losses, while looking for efficient ways to diversify their exposure through reinsurance and securitization.

However, state legislators and insurance regulators have resisted insurers' efforts to raise prices and terminate policies in an attempt to preserve the availability and affordability of insurance coverage (Klein, 1998). Regulatory restrictions have been complemented by state residual insurance mechanisms with significant flaws (Marlett and Eastman, 1997). Government policies have imposed significant cross-subsides from low-risk to high-risk areas as well as cross subsidies from non-catastrophe lines of insurance to the catastrophe lines. These policies distort incentives and undermine the ability of market forces to make necessary adjustments and operate effectively in managing catastrophe risk (Grace, Klein and Kleindorfer, 1999).

B. Overview of Study

As concerns about natural disasters have assumed center stage, researchers have begun to explore the special problems disasters pose as well as their implications for insurance markets. Understandably, recent research on catastrophe risk has focused on the topics of industry capacity, reinsurance, securitization, and mitigation. Yet, much less is known about the microeconomics of catastrophe insurance markets at the primary level (i.e., transactions between primary insurers and individual consumers). Analyzing the supply of and demand for catastrophe insurance and integrating this analysis with research on risk diversification and mitigation is essential to formulating a more complete picture of the catastrophe risk problem and evaluating viable solutions.

This paper constitutes the first significant attempt to examine the nature of the demand for insurance against natural disasters at a detailed, micro-economic level.³ Our examination has been made possible with the unprecedented assembly of an extensive, detailed database on residential insurance transactions affected by catastrophe risk.⁴ These data are supplemented by information on insurer financial and organizational characteristics and the demographics of residential households at a Zip code level.

We explore several significant aspects of residential insurance markets threatened by natural disasters. Our initial work encompasses the key determinants of the demand for residential/catastrophe insurance and their effects on the quantity, quality and price of insurance purchased. Among the phenomena we seek to illuminate are the sensitivity of demand to prices, policy features and the bundling/unbundling of perils and coverages.

In this paper, we focus our analysis on demand side of homeowners insurance transactions in Florida. Further we hope to build a complementary supply model for both states and also integrate transactions for dwelling fire and extended coverage.⁵

C. Summary of Initial Findings

At least two interesting observations arise from this analysis. First, we find that

³ A "master monograph" (Grace, Klein and Kleindorfer, 2000) is available that presents additional information about this research, including discussion of the institutional context for catastrophe insurance markets and detailed descriptions of the data used.

⁴ These data were provided to the authors on a confidential basis by the Insurance Services Office (ISO). The insurers included in this database granted explicit permission for the authors to use these data under a confidentiality agreement.

⁵ A small but significant proportion of homes (roughly 10 percent) are insured by dwelling fire policies that also may include extended coverage. These transactions are of interest as they represent a different approach to covering property risks than the more common homeowners multiperil package policies. The less bundled nature of these contracts may be more attractive to some insurers and homeowners when high catastrophe risk causes high prices for homeowners multiperil policies.

catastrophe coverage is more price sensitive than non-catastrophe coverage. Second, catastrophe coverage is a normal good whose income elasticity is considerably lower than non-catastrophe coverage, which appears to be a superior.

The paper proceeds as follows: Section II provides background on the demand for insurance that we will use in our methodology; Section III contains a description of the methodology and the results; Section IV summarizes the results of our analysis and briefly describes future research directions.

II. The Demand for Homeowners Insurance in Florida

A. Introduction to the Demand Analysis

To obtain estimates of the demand for homeowners insurance products, significant amounts of micro-level data are required. With the assistance of the Insurance Services Office (ISO), we obtained information from a group of primary insurers writing business in Florida and New York that report detailed premium and exposure data to ISO. We use the data for the four-year period 1995-1998 for the analyses that are reported here.⁶

The database contains full homeowners premium and exposure data for 60 companies, comprising some 20 groups, taken as a snapshot in the first quarter of each of the four years, 1995-1998. Each exposure record contains slightly aggregated information on similar groups of policies in every Zip code in which reporting companies did business. The information contains relevant data regarding the characteristics of the policies actually purchased by homeowners for

⁶ The sample of insurers was drawn from the top 50 insurer groups in New York and Florida in terms of market share. It should be noted that our database contains only a subset of insurers that report statistical data to ISO. While a cross-section of companies is represented in terms of size, organizational forms, and distribution systems, large direct writers that do not report to ISO are not included in this analysis. In subsequent analyses, we hope to include data from large insurers who do not report data to ISO. Further, we have not yet compared our sample companies with all companies writing homeowners insurance in New York and Florida to see how accurately or sample reflects the total markets in these states.

each such company, including premiums, structural information on the nature of the insured property, and coverages purchased. Additionally, we have compiled financial and organizational data on the insurers in our sample, as well as household economic and demographic data (from the 1990 Census) by Zip code.

By analyzing locational information (Zip code, standard ISO reporting territory and community characteristics), information on the company selling the policy, and Census information on the socio-demographic characteristics of each Zip code, a very rich picture of the nature of demand for homeowners insurance coverage can be deduced using standard econometric techniques. It should be noted that the database constructed has exposure records for Florida and New York for both homeowners multiperil coverages as well as dwelling fire and extended coverage policies that offer less bundled coverages for non-catastrophe and catastrophe perils. This paper will focus only on homeowner multiperil coverage policies in Florida, leaving to a later paper the joint analysis of multiperil and dwelling fire policies as well as an analysis of the supply and demand for homeowners insurance in both Florida and New York. The peril of interest in this vein of research is windstorm, particularly hurricanes.⁷ We first provide a brief introduction to the foundations of the modeling used in this process.

B. Modeling the Demand for Insurance Products

Introduction to the Structure of Demand for Homeowners Insurance

There are several features of this market that serve to constrain and structure the analysis of demand. First, we assume that homeowners insurance, including coverage against windstorm

⁷ In later work we may attempt to model the supply and demand for earthquake insurance in states such as California and Missouri. However, the data for such an analysis is more limited and the role of the California Earthquake Authority presents some special challenges.

damage, is essentially mandatory, although some homeowners may elect a "no coverage" policy, i.e., they have no property insurance.⁸ (Consider this "no coverage" option as purchasing an insurance product with "infinite deductibles" at a price of zero.) Also, insureds may elect to exclude wind coverage from their policy. Second, as a number of previous analyses have shown (e.g., Joskow, 1973; Cummins and Weiss, 1991; and Grace, Klein and Kleindorfer, 1999), the market for homeowners insurance products is workably competitive.⁹

The basic demand problem for the homeowner is to select a single optimal policy from among the menu of policies offered in the market. This involves a complex tradeoff among the various attributes of the coverage and options purchased, the characteristics and needs of the homeowner, and the perceived quality of the companies from which coverage can be purchased. Demand in this market arises from the optimal consumer choice of a bundle of product and company attributes, given the personal characteristics of each homeowner and the economic and demographic characteristics of the neighborhood (i.e., Zip code) where he resides. The feasible set of such "bundled products" is the set of insurance policies, coverage options, and company attributes that can be sustained in a competitive equilibrium under certain regulatory constraints.¹⁰

The theoretical foundation for this demand analysis, and the interacting market equilibrium, are based on a model of price-quality competition (e.g., Gal-or, 1983). In a competitive market,

⁸ Lenders typically require hazard insurance for homes with mortgages. It is possible that some homeowners without a mortgage have opted not to purchase insurance. We shall control for this in the models below using census data (as of 1990) on the percent of homeowners having mortgages in each ZIP code represented in our sample. However, insurers typically require homeowner to insure 80 percent (or more) of the value of real estate (as the land is not insurable). It is quite possible that people might still have mortgage payments to make, but opt out of insuring because the mortgage is less than 20 percent of the property's value.

⁹ Indeed, the standard structural and performance benchmarks, such as concentration ratios and various financial indicators of profitability and excess profits, would underscore this statement.

¹⁰ In this paper, we do not explicitly model or estimate the effects of regulatory constraints. We have conducted

the differences in what homeowners are willing to pay for various features will be reflected in the price at which various bundled products with these features sell. Thus, what we model is essentially a regression of observed price in the market against various features of the products sold and the companies that sell them. We are interested in the factors that appear to influence demand and whether these factors appear reasonable on the basis of theory. Since there is considerable evidence that many homeowners do not search thoroughly for “best offers”, we are also interested in aspects of the market that appear to arise from behavioral considerations (e.g., Kunreuther, 1998b), including the price dispersion of similar policies offered in the same territory.¹¹

At the outset, we rely on the following features of the homeowners insurance market in our modeling. While the structure of this market may be workably competitive, it is nonetheless a regulated market (Klein, 1998). On the demand side, this does not occasion any theoretical difficulties as the model we develop attempts only to explain, for policies actually offered in the market, how various features are valued, within the feature (e.g., various deductible levels) and across features (e.g., deductible levels versus type of coverage). It is important to bear in mind that, because of regulation, the set of policies offered in the market, and their prices in particular, are not necessarily the result of a perfectly competitive market.

We assume that the set of policies offered by companies, together with their underwriting and marketing strategies, are expected profit maximizing, subject to imposed regulatory constraints. This suggests that companies find the regulatory policies imposed not so onerous as

some preliminary analysis in this area and will incorporate a regulatory component in future papers.

¹¹ We should note that one source of price dispersion is the fact that insurance companies differentiate themselves in term of underwriting stringency. Insurers with more stringent underwriting standards, labeled “preferred insurers”, tend to have the lowest prices. “Standard” and “non-standard” companies tend to have higher prices. Some insureds may pay higher than necessary prices if they would qualify for coverage from a preferred insurer, but intentionally or inadvertently purchase coverage from a standard or non-standard insurer.

to cause them to leave the state. Nonetheless, because of such policies, catastrophe coverages in some areas might require “underbracing” or cross subsidies from other lines of business, non-catastrophe coverages and catastrophe coverages in other areas. These cross subsidies may be sustainable in equilibrium if they allow insurance companies to earn a reasonable rate of return on all lines of business and if they are supported by consumer preferences for certain feature bundles and cross-marketing. The continuation of these cross subsidies over time implies some further inertia that may, at least in part, be due to regulatory restrictions on terminating policies and other insurer and consumer considerations.¹² Beyond the obvious implications for understanding rate adequacy and precision, this suggests the importance of detecting cross-marketing synergies in the demand and supply analysis, as well as detecting trends in the aggregate supply of particular insurers in terms of increasing the diversification of their portfolios of insurance policies.

Defining Price and Modeling Demand for Homeowner Policies

Assume that a particular homeowner, with characteristics Z (income, family status, type of structure, etc.), faces a choice among different policy options for insuring his home, where the set H gives the available policy options in the homeowners market. A typical such option “ h ” in the set H would be one offered by firm i (with characteristics X_i) with certain policy features such as deductible levels, loss settlement provisions (i.e., actual cash value or replacement cost), and premium $P(h)$. The homeowner must choose one of the options in H and does so by maximizing his expected utility over the risks or gambles implied by each choice h . Let us

¹² See Bartlett, Klein and Russell (1999) for a discussion of how regulation-imposed insurance price subsidies may be sustained for a period of time.

represent this expected utility $U(h, P(h))$ in quasi-linear form¹³ as:

$$U(h, P(h), Z) = V(F(h), Z) - P(F(h), Z) \quad (1)$$

where V represents, for a consumer of type Z , the consumer's willingness to pay for various coverages or "features" of an insurance policy and $F(h)$ represents the vector of such features, including the characteristics of the company offering the policy that may make a difference to consumers. Note that both V and P are shown to depend on only the vector of features F and the characteristics of the homeowner (possibly only the type of structure, but perhaps also such locational characteristics as community rating or location of nearest fire department). This is without loss of generality since one of these features could itself be the premium level $P(h)$. The homeowner then maximizes the function $U(h, P(h), Z)$ over the set H . Assuming that the features can be more or less continuously varied (that is, there is a rich menu of policies available in the market), we can represent the choice problem as choosing an insurance policy by choosing optimal features of the policy. This leads to a solution to the homeowner's maximization problem characterized by $\partial V / \partial F_i = \partial P / \partial F_i$, which of course varies with consumer characteristics Z . From this logic, one can understand the structure of demand in this market by examining the structure of how premiums vary with policy features.¹⁴ This leads to estimation problems of the following general type, neglecting for the moment the details here of functional form:

$$P(F, X, Z) = aF + bX + cZ + \varepsilon \quad (2)$$

¹³ As Willig (1976) has shown, this form, with constant marginal utility of income, is appropriate for demand modeling when the good in question does not absorb a significant fraction of the homeowner's budget, a reasonable assumption in the case of insurance (the typical homeowners insurance premium is around \$300-\$500 and somewhat higher in catastrophe-prone areas). This is not to say, of course, that there are no income effects across consumers, only that the marginal utility of income for each consumer is assumed constant over the range of policy options offered.

¹⁴ Indeed, if V and P are estimated using bilinear or translog families of functions, then knowledge of one will lead (up to a constant of integration) to knowledge of the other.

where we have separated the policy features into categories: those pertaining to the policy itself (the vector F); those that pertain to the company (the vector X); and those pertaining to neighborhood characteristics (the vector Z). In this model, $P(F, X, Z)$ could be either the total premium for a given policy or more likely, normalizing by units of coverage (e.g., the expected or indicated loss costs), premium per unit of coverage.

"Price" for insurance products, as for other products and services, is defined on the basis of value-added per unit (in this case, per dollar) of output. At the policy level, this value-added measure of price can be captured by subtracting the discounted value of expected losses covered by the policy from the policy's premium.¹⁵ Denoting by $L(F, Z)$ the expected losses for a policy h with features F and by $P(F, X, Z)$ its premium, we obtain the following definition of price $p(F, X, Z)$ for a homeowners policy $h = (F, X, Z)$ characterized by the parameters (F, X) and indexed by consumer and loss characteristics Z :

$$p(F, X, Z) = \frac{P(F, X, Z) - PV(L(F, Z))}{PV(L(F, Z))} = \frac{(1+r)P(F, X, Z) - L(F, Z)}{L(F, Z)} \quad (3)$$

where $PV(L(F, Z)) = L(F, Z)/(1+r)$ is the present value of expected losses on the policy for the policy period and " r " is the insurer's return on equity for the period. $L(F, Z)$ is the indicated loss costs per unit of coverage for the policy features (F) and structure (Z) in question. We will, in fact, directly estimate (3) using a functional form similar to (2). For the ISO database underlying this study, we have information on the premium charged for each policy (or group of identical

¹⁵ Note that we do not consider the effects of taxes in this model. See Myers and Cohn (1987) and Cummins (1990) for a more detailed discussion of "price" in the insurance context. See also Cummins, Weiss and Zi (1999) for a related empirical study of price and profitability using frontier efficiency methods. As noted in the latter paper, the definition of price in (3) properly accounts for the insurer's expenses and the opportunity costs of the owner's capital invested in the insurance business.

policies), " r " is the average ratio of investment income to earned premiums for insurers, and $L(F, Z)$ represents the advisory Indicated Loss Costs (ILC), as computed using ISO filed loss cost manuals and rules, for the policy characteristics (F, Z) .¹⁶

We further analyze the Indicated Loss Costs. We employ our indicated loss costs as a measure of real insurance services output. Using ISO loss cost filing information, we calculated an expected indicated loss cost for each contract.¹⁷ That is, ISO loss cost information can be used to determine the expected loss costs for a given homeowners policy form that covers a brick house in Zip code 30029 with certain specified coverage provisions and endorsements/exclusions, such as ordinance/law coverage. ISO also has provided information on catastrophe loss costs and a non-catastrophe loss costs that we have applied to each possible combination of location, policy form, and additional contract terms. Thus, we can estimate three additional regressions.

Indicated loss costs for a particular policy are an estimate of the expected claims costs (including claims adjustment expenses) of insurance coverage under the terms of that policy for a particular house. Thus, indicated loss costs are a proxy for the amount of insurance embodied in a specific policy. One could also employ the Coverage A limit as a proxy for the insurance embodied in a policy. However, while the Coverage A limit reflects the homeowners perceived

¹⁶ We discuss the ISO procedures briefly in Grace, et. al., (1999) and in Grace, et. al. (2000). For the moment, the reader should take these advisory Indicated Loss Costs as our best estimates of the expected annual costs resulting from policy features, structural characteristics and location of a property. The non-catastrophe portion of Indicated Loss Costs is based on actuarial experience and the catastrophe portion is based on catastrophe modeling results. As discussed below, the expected loss costs implied in individual insurers' prices can vary from the ISO Indicated Loss Costs, which represent overall industry projected costs. Also, Indicated Loss Costs are not necessarily the same loss costs approved by regulators.

¹⁷ ISO advisory loss costs filings and associated information present indicated, filed and implemented (i.e., approved) loss costs for a "base" policy and a number of rating factors and rules which effectively enable one to calculate a loss cost for a particular policy, reflecting a set of standard coverage and risk characteristics.

value of the home, it does not necessarily reflect the risk of loss to the home.¹⁸ It is essentially the maximum possible loss rather than the expected loss.¹⁹ We will therefore focus on indicated loss costs.

As mentioned above, three loss cost equations will be estimated. The first is for the catastrophe coverage and the second is for the non-catastrophe coverage. The third will be for the total coverage.

They will be of the following general form:

$$L(F, Z)_{i=C,NC,TOT} = \beta_1 F + \beta_2 Z + \beta_3 X + \beta_4 P + e \quad (4)$$

where $L(F, Z)_i$ reflects the quantity demanded of real insurance services measured by the Indicated Loss Costs for catastrophe, non-catastrophe, or total coverage, F represents a vector of policy form terms, Z represents a vector of neighborhood characteristics, X represents a vector of company characteristics, and P represents price.

These general forms of the Premium equation (2), the Price equation (3) and the Loss Cost equations (4) will serve as the basis for our estimation procedures. They incorporate both non-catastrophe perils and catastrophe perils or windstorms. The reader may think of these simply as separate features of the policy in question. We are interested in identifying the separate effects of these factors in our empirical analysis.

Hypotheses

The received theory on factors influencing demand for insurance products is rich and long,

¹⁸ Insurers typically require homeowners to insure at least 80 percent of the insured value of their home (e.g., its market value or replacement cost) and are reluctant to sell coverage significantly exceeding market value or replacement cost. Most insurers use a model or formula to estimate the market value or replacement cost of a home.

¹⁹ Actually, the maximum expected loss encompasses the limits of all non-liability coverages minus deductibles, but other coverage limits are typically stated as percentages of the Coverage A limit. The standard HO3 policy contains

both in terms of the rational consumer model (e.g., Arrow, 1971) as well as in behavioral and experimental studies of protective behavior (e.g., Kunreuther, 1998b). The basic theory recognizes that, through pooling, insurance provides a mechanism to reduce the volatility of losses at a price, the “risk premium” or loading, that risk averse consumers are prepared to pay. Competition then assures that the coverages that are provided in the market are produced efficiently so as to minimize the total costs of providing such coverages, including the capital costs backing these policies. Behavioral and experimental studies of insurance underwriters and consumers (Kunreuther, et al., 1995 and Kunreuther, 1996), however, show that both the supply and demand of insurance is more complicated in reality. This is especially true in areas like catastrophe insurance where understanding and evaluating the peril itself is more difficult. Thus, in what follows, we begin with the standard hypotheses derived from the normative theory based on risk pooling among risk averse individuals. We are also interested in such issues as price dispersion (for similar policies), which would suggest less-than-complete consumer search or other “market imperfections” on the demand side.

C. Descriptive Statistics for Various Policies in Florida

The basic contract features of the Florida policies are summarized in Table 1. The HO3 policy is the typical contract sold. It has coverages for the home and attached structures, detached structures, personal property, loss of use, personal liability, and medical payments to others. There are also options (not shown in Table 1) to cover personal property at a greater value than the standard limits, or to cover liability at a greater level than the standard limit (\$100,000), e.g., 10 percent of the home's insured value. The major difference between an HO3 policy and an HO5 policy is that the HO5 policy has broader coverage provisions built in. While

standard percentage limits for these other coverage, but insureds may select alternative limits.

replacement cost coverage on personal property or contents is optional for the HO3 policy, it is a standard term of the HO5 policy.²⁰ Ordinance or law coverage is typically chosen as an endorsement on HO3 policies while it is a standard coverage in HO5 policies.²¹ Also, HO3 policies typically cover contents on a “named-perils” basis, while HO5 policies typically cover contents on an “open-perils” basis.²² Finally, there is a wind device protection credit that consumers in Florida can obtain if they have installed specified mitigation features, such as storm shutters or roof tie-downs.

The difference between the HO3 and HO5 policies and the HO8 policies is the overall comprehensiveness of the coverage. HO5 and HO3 contracts provide open-perils coverage (except HO3 provides named-perils coverage on contents) except those specifically excluded while the HO8 policy covers a less inclusive list of named perils. HO8 policies have been designed primarily for homes in older urban areas.²³

Table 2 shows descriptive statistics on the various contracts in Florida during the period

²⁰ Under the standard HO3 policy, the dwelling and other structures are covered on an “open perils” basis with losses settled according to the replacement cost of destroyed property. Contents or personal property are typically covered on a “named perils” basis with losses settled according to their actual cash value. Actual cash value is equal to replacement cost minus estimated depreciation or estimated market value. For other, more limited policy forms, all coverages are on a “named perils” basis, and losses may be settled according to replacement cost or actual cash value depending on the specific policy form and coverage (see Rejda, 1998).

²¹ Ordinance or Law Coverage will upgrade a rebuilt house after a covered loss to the current building code. Without the coverage, the house will be “repaired” or rebuilt according to code only as long as doing so does not exceed the Coverage A limit on the policy.

²² “Named-perils coverage encompasses a long list of perils, including windstorms, but if losses are caused by a peril not listed, the burden of proof is on the insured to show the loss is covered. Under “open-perils” coverage, all perils are assumed to be covered unless specifically excluded and the burden of proof is on the insurer to show that a particular loss is caused by a specifically excluded peril.

²³ HO-8 policies cover a more limited set of perils than other policy forms and theft coverage is restricted to property on the premises with a limit of \$1,000. Also, as HO8 policies are often written on old homes, the insurer agrees to repair or replace a damaged home with materials of like kind and quality but not necessarily original materials or special workmanship such as plaster walls or intricate wooden moldings.

1995-1998. These data are aggregated at the Zip code level by certain contract characteristics.²⁴ We see that HO3 contracts make up the majority of contracts written in the state by the sample companies during this period. Overall, HO3 contracts account for approximately 96.44 % of all contracts written by the sample companies. The other two policies, HO5 (3.54%) and HO8 (0.14%) account for the remainder of the transactions sampled. It is apparent that most homeowners purchase HO3 policies and may select endorsements to supplement the standard HO3 coverages and limits.

The average HO3 premium is less than the average HO5 premium while the average HO8 premium is less than the average HO3 premium. This makes intuitive sense. The HO3 is the typical policy sold and it is more expensive than the less inclusive HO8 policy, but not as expensive as the more comprehensive HO5 policy. Further the price mark-up differs among the policies. The mark-up is the variable we employ as our definition of price and is defined as $(1+r)(\text{Premiums}-\text{Indicated Loss Costs})/\text{Indicated Loss Costs}$.

HO5 contracts have the highest average deductible followed by HO3 and then by HO8 policies. We can also look at some of the contract terms across policies. While not many people obtained the wind protection credit, many purchased the additional ordinance or law coverage. Further, persons who purchased HO8 policies seem to live in areas with a lower ratio of catastrophe loss costs to total loss costs than people who purchased HO5 or HO3 policies.

D. Descriptive Statistics for Bundled Contracts

²⁴ Contracts for Tables 2 and 3 were aggregated by: 1) whether the contract had replacement cost coverage; 2) whether the contract excluded the windstorm peril (which often may be insured separately through the wind pool but not necessarily); 3) whether the contract was in a Zip code that was in the top 25 percent, middle 50 percent, or bottom 25 percent of median home values in the state; and whether its 4) wind or 5) fire deductibles were above the mean.

Table 3 shows the average premiums and prices for bundled and unbundled HO3 contracts and for the average HO5 and the average HO8 policy. It should be noted that the average premium per contract for the HO5 policy is \$934 and for the bundled HO3 policy with open perils/replacement cost coverage on contents, ordinance and law coverage and a wind device protection credit is \$1067. It is interesting to note that there were 65 observations for the fully bundled HO3 policy while there were 1,457 for the HO5. These are essentially similar policies with different relative demands and different prices. Figure 1 shows the graphical relationship between the bundled contract terms and premiums and price mark-ups using the data from Table 3.

III. Demand Estimation for Florida Homeowners Policies

In this section we undertake two related analyses. The first is an examination of the determinants of premiums and prices for HO3 policies in Florida. We then estimate the demand for homeowners insurance in Florida using two-stage least squares regression. We are interested in how the quantity of insurance demanded changes as price and other variables change.

We focus on HO3 policies in the remainder of the paper because they account for approximately 95 percent of all policies in the sample. Further, by focusing on one product first, we can understand issues that will lead to more efficient modeling of other products.

A number of interesting problems develop in estimating demand. First is the issue of the level of aggregation one uses to estimate these models. It is possible to estimate the model at the individual contract level, but at some future time we need to be able to calculate cross elasticities of demand for the various contract terms. Thus, if we were to estimate the demand model at the individual contract level, there would be no observations for contracts not purchased.

Also, the market in which the consumer makes purchases is larger than the "home." This means that some homeowners may shop for insurance and that the demographic characteristics of a consumer's neighborhood (in addition to the consumer's home characteristics) may influence the type of insurance he purchases. Because we have the Zip code location of the insured house and we have access to Zip code level information from the Census, we assume, for now, that a consumer shops in a market defined by his Zip code.²⁵

A second problem is that the demand for homeowners insurance is derived from the demand for housing. We account for the demand for housing by including the Census value for the Zip code's median housing cost as an endogenous variable. This variable reflects the value of housing services to the homeowner and is employed in housing demand studies as a proxy for the quantity of housing services demanded. Factors expected to influence housing demand include such Zip code characteristics as median income, median travel distance to work, and Census reported housing characteristics for the Zip code and these factors are used as instrumental variables.

We first estimated several models of the form (2) for PREMS (premium per contract) and PRICE1 (the price mark-up + 1) in order to understand the statistical association between observed premiums and prices and various explanatory variables in our Florida database. Our primary interest is to determine the factors that appear to vary more or less significantly than the expected loss costs and expense costs associated with these factors might suggest.

For example, as deductibles increase for a particular property, the expected loss costs and associated expense costs facing an insurer offering coverage for that property should decrease, all else equal. If price and premium levels for policies with different deductible levels exactly

²⁵ We recognize that some Zip codes are quite large geographically and many are diverse demographically, but this is the smallest level of aggregation that will permit analysis of our data. Further work will also attempt to take into

tracked the changes in the ISO advisory indicated loss costs for different deductibles, then additional variables in an estimated demand equation to reflect the level of deductibles purchased should have no additional effect.

More generally, if there were no significant (perceived) quality differences in the coverage or policy services offered by different companies, one might hypothesize that the ISO indicated loss costs would capture all the observed variation in policy premium and price. We will see that, in fact, this is not the case, perhaps reflecting price-quality tradeoffs and associated differences in company-specific attributes in the market. Indeed, a variety of factors beyond the ISO indicated loss costs influence observed premiums for and prices of insurance coverage in these markets. These factors include not only insurer characteristics, but also contract provisions, insured risk characteristics and economic/demographic variables. Reflecting the structure of (2), the factors of interest are separated into three groups:

F = Policy features or contract terms;

X = Characteristics of the company (in the State) that might be factors influencing demand (company effects);

Z = Characteristics of the structure, location and other factors influencing the expected losses on the policy over the period of insurance coverage (insured risk characteristics and neighborhood and demographic effects).

For uniformity, we annualize all period (i.e., quarterly) values, such as losses, premiums, etc.

Tables A1-A3 in the appendix to this paper provide a list of the potential (F , X , Z) variables available for use in this analysis. Note that Table A1 contains both information specific to the policy issued as well as to the type of structure insured. It also includes certain structural and protection features of the structure and the community in which it is located. The information in Table A1 is available for over 1.8 million house-years in New York and nearly 900,000 house-

account the spatial relationships among the Zip codes or other markets.

years in Florida, or approximately 450,000 house-years in New York and 225,000 house-years in Florida, for each of the four years studied. In the data used below, however, we have a smaller set of usable data. In Florida, we have approximately 663,500 house years over the four-year period and in New York we have approximately 1.3 million house years. Some of the difference is due to incompatible records, the generation of new Zip codes over the reporting period (making their integration with collateral census data difficult), and missing information on some records.

A. PREM and PRICE1 Regression Estimation

We first estimate PREM and PRICE1 regressions using ordinary least squares (OLS) regression. These are essentially hedonic equations that allow us to see how policy terms, insured risk characteristics, firm characteristics, and neighborhood variables affect the premium per contract and the price mark-up.

In interpreting these results, it is important to recall what we expect to be measuring with our two dependent variables. We report two sets of results in Table 4: 1) the log of Premium per contract (LPREMS); and 2) the log of PRICE1 (LPRICE1). PREMS is the premium for a given exposure and is the total amount of money that the insured pays for his policy.²⁶ PRICE1 is the transformed price variable $PRICE + 1 = (1+r)[PREMIUM-ILC]/ILC$ (adding 1 to PRICE simply assures that our price measure in (3) is always positive).

Conceptually, the premium per policy consists of the expected loss cost (i.e., “pure

²⁶ When there is more than one house-year reported in a given exposure record, which occurs when more than one contract shares exactly the same characteristics, PREMS is calculated as the total premiums for that record divided by the number of in-force house years, i.e., the premium per house covered. Similar adjustments are made for other “amount” fields, such as the total amount of insurance in force (the sum of the Coverage A limits on the homes represented in the data record), to transform all data elements to a per-house basis.

premium”) and the insurer’s loading for expenses and profit. In terms of the supply function, some of our explanatory variables would be expected to affect one or the other component, but some variables may affect both components at different rates. For example, because of insurers’ fixed costs in servicing a given policy, a variable that has a positive effect on the expected loss cost may also have a positive but smaller relative effect on insurers’ expenses, i.e., loss costs increase at a greater rate than expenses. Hence, the coefficients for certain variables in the PREMS equation reflect a variable’s combined effects on the loss cost portion and expense loading portion of the premium.

Further, it should be noted that we are using ISO indicated loss costs as an explanatory variable, which may differ from the indicated or regulator-approved loss costs assumed by each insurer in their pricing. We can calculate the former; we can only infer the latter. Hence, the effect of a given contract provision or risk factor (e.g., the type of structure or its location) on PREMS, represented by the coefficient for the variable, could also reflect deviations in insurers’ estimations of expected loss costs (or the loss costs effectively approved by regulators) from ISO indicated loss costs.

Overall, when PREMS is the dependent variable, the independent variables are intended to account for the premium effects of calculated ISO indicated loss costs, deviations of insurer expected loss costs from ISO indicated loss costs, and other factors that would be expected to affect the expense and profit loadings that insurers build into the premiums they charge.

PRICE is intended to measure the “loading” received by insurers in relation to the amount of risk protection (i.e., the expected payout on the policy) received by the insured, which is viewed as the real cost of insurance. When the loading is measured this way, a variable that has a positive effect on expected loss costs may have a negative effect on PRICE (the relative loading

or price mark-up). This occurs when a variable increases expected loss costs at a greater rate than insurers' expenses.

Additionally, we are using ISO indicated loss costs in the denominator for PRICE as a proxy for the amount of risk protection the insured receives, rather than the indicated or regulator-approved loss costs assumed by each insurer in their pricing. Hence, the coefficients for certain variables in the PRICE1 equation could also reflect deviations in insurers' estimates of expected loss costs (or the loss costs effectively approved by regulators) from ISO loss costs.²⁷

Of course, there are many other influences on the relative loading or price mark-up charged by insurers. It is important to keep in mind our assumption that this market is workably competitive. However, this does not imply price or premium uniformity since there are still potential significant variations in underwriting stringency, firm and product quality and service delivery features and some of these can be expected to survive in a competitive equilibrium. Since we also include the ISO indicated loss costs as explanatory variables in our hedonic equations, the other explanatory variables should reflect the effects of factors that are not reflected in the ISO ILCs. Thus, our statistical results include the effects of both consumer preferences for various policy features and efficient modes of delivering these features under competition, i.e. the alternatives consumers will actually see in the market.

In sum, the statistical relationships we observe between the explanatory variables and premiums and prices in these hedonic equations can be influenced by both supply-side and demand-side factors, imperfections in our measurement of expected loss costs, and our

²⁷ We should also note that ISO indicated loss costs do not include a "risk premium" factor, reflecting the additional return that should be earned by the insurer for the possibility that actual losses will exceed expected losses. This is especially important for the catastrophe portion of insurers' costs, as these losses are highly volatile from year to year. Some insurers may include a "risk premium" in their loading and others may not. This risk premium should reflect the cost of objective risk to the insurer, which could be realized in the cost of diversifying or transferring this risk or the extra return that owners will demand for retaining this risk.

specification of the explanatory variables, as well as omitted variables. For any one variable, some of these effects may move in the same direction and others may move in opposite directions. This makes it difficult to sort out what is driving the statistical relationships we observe. Hence, we must be cautious in interpreting the results of these hedonic equations.

B. Initial Regression Results for *LPRICE1* and *LPREMS* Regressions

Table 4 Panel A shows the results of the premium (*LPREM*) regression and Panel B shows the price (*LPRICE1*) regression results. We estimated these regressions with three sets of explanatory variables: Policy Form variables, Demographic variables, and Firm Characteristics.

What we show here is a representative set of regressions. We also estimated a number of alternative specifications. We wish to make one point here. If we regress price or premiums against contract terms (or the policy form variables) only, we obtain models with explanatory power of approximately 50 percent. By adding demographic and firm specific variables we see an increase in explanatory power to around 60 percent. Finally, adding company fixed effects we can raise the explanatory power of the models to approximately 75 percent. Table 4 shows the price and premium regressions results for a model with policy terms, demographic and firm variables, and geographical as well as company specific fixed effects.

The regression estimates in Table 4 thus show a reduced form of the effect of various variables on prices and premiums. To examine each coefficient to determine its proper sign is not helpful at this stage because of the interaction of supply and demand influences in the reduced form. What we desire to point out here is that even including loss costs, demographic, contract and firm specific variable we still do not get much above a 75 percent explanatory power for either model. To see how demand is ultimately influenced by prices and policy variables,

bundling of contract terms, demographics, and firm specific variables, we must estimate a slightly different model that can take into account the endogeneities implicit in a demand model. We undertake this analysis in the next section.

C. Estimation of Quantity Demand

Table 5 shows the results of our two-stage least squares estimation of the demand for HO3 contracts for homeowners insurance in Florida. In this estimation, we employed the indicated loss costs (in the logged form) as our proxy of the quantity of insurance demanded. We also employed PRICE1 in the logged form as our proxy for price. In the model estimated in Table 5, a number of variables are estimated as endogenous. First, PRICE1 is estimated as an endogenous variable in the first stage. This is standard for demand models. We also must account for a number of other possible endogenous variables reflecting housing costs, deductibles, and the choice to invest in wind protection devices.

We also estimate the demand for catastrophe coverage separately from the demand for non-catastrophe coverage. We have estimated catastrophic related indicated loss costs for each policy in the sample. ISO employed RMS to use their CAT model to develop these costs. In addition we have ISO estimated non-catastrophic indicated loss costs which are loss costs developed by ISO based on previous claims. Thus, we can think of the homeowners policy as a joint (or bundled) product where the coverages for both catastrophe and non-catastrophe perils are built into the contract. By estimating the two demands separately, we are acknowledging that different factors may affect the demands for insurance for these two perils.

Table 5 Panel A shows the results for the demand for catastrophe coverage (i.e., the catastrophe portion of total indicated loss costs), while panel B shows the demand for non-catastrophe coverage (i.e., the non-catastrophe portion of indicated loss costs). Panel C shows the

observable bundled result. Initially, two important results need to be discussed: 1) the price elasticity of demand; and 2) the income elasticity of demand. The coefficient on the log of PRICE1 (LPRICE1) for catastrophe coverage is approximately -1.62 and this represents the price elasticity of demand. Essentially, this result indicates that a 10 percent increase in the price mark-up will yield a 16.2 percent decrease in the quantity of catastrophe coverage demanded. This is highly elastic. In contrast, the elasticity for non-catastrophe coverage is approximately -0.571 . A 10 percent increase in the price mark-up yields a 5.71 percent decrease in the quantity of non-catastrophe coverage demanded. If the demands are estimated together so that the quantity demanded is the sum of catastrophe and non-catastrophe indicated loss costs, the overall price elasticity (not shown in the table) is -1.05 . Thus, we see very different behavior by estimating the price elasticities for catastrophe and non-catastrophe coverages separately.

Another interesting observation is that while we cannot separate the two products, changes in external factors, including public policy changes, could influence the demand for both products jointly. For example, a change in tax policy that would allow insurers to establish tax-favored catastrophe reserves could increase the amount of insurance protection that is purchased. Our analysis suggests that small reductions in the overall price mark-up (which includes taxes on catastrophe reserves carried in the form of additional surplus) will have a greater than proportional effect on the demand for insurance. In other words, favored tax treatment for catastrophe reserves could foster better risk management by homeowners through the purchase of adequate insurance, rather than relying on externalizing their losses to other parties and/or retaining greater risk and the negative effects of this greater risk.²⁹ We intend to more

²⁹ This externalization could occur through mortgage defaults, bankruptcy, tax deductions for uninsured catastrophe losses, and other demands on public services. We also know from the economic theory of expected utility under uncertainty that risk averse individuals value the reduction in uncertainty provided by insurance and will increase their utility by purchasing more insurance if the price mark-up of insurance decreases.

specifically estimate the demand and supply effects of changing the tax treatment of catastrophe reserves in future work.

We also see that the income elasticity of the demand for catastrophe coverage, reflected by the coefficient for the log of median income shown near the bottom of the table under marginal effects (measured at the means), is approximately .819. This implies that a 10 percent increase in the median income in a Zip code yields an 8.19 percent increase in the quantity of catastrophe insurance demanded. In contrast, the income elasticity for non-catastrophe insurance is even more inelastic and is estimated to be 0.115. Thus, a 10 percent increase in median income will yield a 0.115 percent increase in the quantity demanded. While both types of coverage are normal goods (consumption increases as income increases) consumers are more income sensitive for catastrophic coverage. When we analyze the combined demand for catastrophe and non-catastrophe coverages, rather than their separate demands, the income elasticity is approximately .438.

Insured Risk Characteristics and Contract Terms

The type of home construction is negatively related the demand for cat coverage while positively related to non-catastrophic cover. This seems to suggest that relative to the omitted classification of house (superior fire resistant (SFR)) that owners of brick and frame houses believe their housing needs less catastrophic protection relative to the SFR housing. However, the reverse is true for non-catastrophic which likely relates to the relative fire protection afforded by the SFR housing.

The median year that housing was built in the zip is negatively related to the demand for both coverages. This comports with intuition as newer houses built to more modern building

codes are less "risky" all other things held constant than older homes. In addition, zip codes in areas with good municipal protection services (fire and police) would have lower demands on the margin for insurance coverage. We find evidence of this as shown in table 5. As the protection code increases (moving to lower quality municipal services), the demand for insurance for both types of coverage increases.

The age of a home is a statistically related to the demand for both non-catastrophe and catastrophe coverage. Since newer homes would be expected to be lower risk, all else equal, this shows up with a lower quantity of coverage demanded for newer homes.

The ISO database also contains information regarding the quality and level of municipal service (fire and police) protection codes. Higher protection codes represent decreasing levels of municipal services available in the zip code. One would expect that better (lower code) municipal protection services would be negatively related to the quantity demanded. We find this to be true for both cat and non-catastrophic coverages.

Contract provisions that expand coverage would be expected to increase the demand for insurance if the marginal benefit of expanded coverage is greater than the marginal cost in terms of a higher price. Similarly, provisions that reduce coverage would be expected to decrease demand. Factors indicating higher risk also would be expected to increase the demand for insurance and vice versa.

Replacement cost coverage on contents is significantly negative for catastrophe insurance demand, and significantly positive for non-catastrophe insurance demand. Consumers do not value this coverage for catastrophic cover. The stronger association for non-catastrophe insurance may be due to homeowners' concern about the threat of theft.

Ordinance/law coverage is significantly positive for both catastrophe insurance and non-

catastrophic coverage. A strong positive association for catastrophe insurance could be explained by the greater relevance of ordinance/law coverage for the windstorm peril for which damage or destruction of the principal dwelling is the greatest concern. Publicity concerning the need for homeowners to repair or rebuild their homes according to current codes after a hurricane could increase this demand.

The windstorm protection credit is endogenously determined in our model. This credit is available for those who purchase special shutters, for example. It is significantly positive for both catastrophe and non-catastrophic insurance demand. This makes intuitive sense for the catastrophic coverage demand. The credit lowers the premium for the insured and contributes to homeowners' incentives to invest in wind mitigation measures. It also will have greater value as the wind peril and the catastrophe portion of the premium increases. We would expect it to have no relevance to non-catastrophe insurance demand, but the bundling of the catastrophe and non-catastrophe coverage in most contracts may play a role.

For both demands, we see that the fire deductibles are positively related to the quantity demanded. A priori one can suppose that as the deductible increases the "quantity" of insurance demand decreases and that a deductible should be negatively related to quantity demanded. However, when the level of a deductible increases the price of coverage changes too. Thus, as deductibles increase, it is possible the quantity demanded increases all other things equal. This makes sense if the marginal benefit of a premium decrease due to the increasing deductible is greater than the marginal cost of a lower amount of insurance coverage.

If deductibles do not affect the quantity demanded this implies that consumers have properly maximized their utility taking into account the trade-off between increased deductibles and lower prices. If we look at the wind deductible coefficients in Table 5 we see that they are both

significantly different from zero. The coefficient on the catastrophic demand is positive while it is negative in the non-catastrophic. This suggests that the wind deductible can be used to increase catastrophic coverage on the margin, while it has the opposite effect on the demand for non-catastrophic coverage. Further, while the coefficients are significant for all deductibles for catastrophic and non-catastrophic insurance, the estimated coefficients are quite small and may not be different from zero in an economic sense.

Demographics

We have a number of variables that describe the housing stock and the population in Florida Zip codes. Some of these variables convey additional information about the characteristics of consumers (and their homes) buying homeowners insurance, including the consumers represented in our sample. Other variables indicate neighborhoods effects, i.e., the influence of characteristics of a homeowner's area on his demand for insurance.

Starting with the housing stock, we examine the ratio of selected home costs to median income in the zip. This is also an endogenously determined variable. We use this to control for the consumer's choice of housing. The select costs are mortgage, utilities, real estate taxes and fees and which represent a proxy for the value of housing services provided by the housing in the zip. Since insurance is a derived demand from the demand for housing we need to account for the choice of housing in the model. For catastrophic coverage we see that this coefficient is positive which suggests that consumers with higher values of perceived homes values have a higher demand for catastrophic coverage. In contrast, we see the reverse is true for non-catastrophic coverage.

The number of residential structures (1-4 unit structures) in a Zip code, for which homeowners are eligible to purchase homeowners insurance, is a neighborhood control variable

and can be thought of as a measure of housing (in contrast to apartments or condo) density in the Zip code. It is negatively related to the demand for both catastrophe coverage and positively related to the demand for non-catastrophe coverage.

The percentage of condos in the Zip (which is also a control variable for housing mix) affects the demands for catastrophe and non-catastrophe insurance differently. For catastrophe coverage it is positively related to demand, while for non-catastrophe coverage it is negatively related to demand. The latter is understandable. The greater the percentage of housing units that are condos in a market, the less demand there would be for homeowners coverage, all other things being equal. It is not clear why this variable is related to catastrophe coverages, although it may be that the percentage of condos is related to beachfront exposures in a Zip, which could explain the positive association with the demand for catastrophe coverage.³⁰

Moving to population characteristics, Zip codes with higher percentages of high school graduates and college-educated consumers have lower demand for both types of coverage. The cause of this result is unclear as one might expect that homeowners with greater education may be more aware of catastrophic and non-catastrophic perils, which would have a positive effect on demand.³¹ Alternatively, higher educated homeowners may be more adept at finding ways to economize on their coverage, such as installing safety devices that would decrease expected loss costs, our measure of the quantity of risk protection purchased.

The percentage of people living in urban areas in a Zip also is positively associated with the demand for catastrophe coverage, but negatively (although quite small in magnitude) related to

³⁰ We should also note that while we have excluded HO6 (condo-owners) policies from our sample, it is possible that some condo-owners policies are still in our database because they were not specifically identified as such. Since condo-owners policies only insure the contents and furnishings of a condo unit (the structure is insured by a separate commercial policy), the expected loss costs for these policies will tend to be lower, implying a lower demand for coverage based on our measure of quantity.

³¹ Recall that our measure of the real insurance services provided is the loss costs. Thus higher educated people may

the demand for non-catastrophe coverage. This may reflect the greater population density along coastal areas.

Zip codes with high percentages of married couples with children have a higher demand for catastrophe coverage, but a lower demand for non-catastrophe coverage. The first result is consistent with our hypothesis that having children increases a homeowner's desire for risk reduction and insurance, but the negative coefficient for non-catastrophe insurance is puzzling. It is possible that families with children tend to face tighter budget constraints for what they can spend on insurance. In this instance, higher premiums because of their exposure to catastrophe risk may force these families to economize on the amount of non-catastrophe risk protection that they purchase.

Finally, since Florida is a retirement state, we are interested in how age affects the demand for insurance. After controlling for the interaction effect of income, we find that age is insignificantly related to the demand for catastrophe coverage, but its relationship to the demand for non-catastrophe coverage is not negative and significant. Thus as the mean age rises in a zip code, it demands less non-catastrophic coverage. However, as the percentage of retirees goes up, we see a diminishing effect on the demand for non-catastrophe coverage just as we see for the median age of the householder in the zip code. However, we also see a positive and statistically significant relationship between the percent of people in the zip code over 65 years of age and the demand for catastrophic cover.

Curiously, the percentage of homes with mortgages is negatively associated with the demand for catastrophe insurance and positively associated with the demand for non-catastrophe insurance. Since lenders typically require homeowners to carry hazard insurance, our a priori expectation was that having a mortgage increases the demand for insurance. A second variable,

engage in personal risk management to reduce these loss costs.

the percentage of housing units where mortgage payments exceed 30 percent of household income, is significantly positive for catastrophe insurance and significantly negative for non-catastrophe insurance. Although homeowners with mortgages may be required to buy an insurance policy, budget constraints (particularly in the face of higher catastrophe insurance premiums) may prompt these homeowners to economize on the amount of insurance they purchase to the extent that their lenders allow.

Firm Characteristics

At this stage of the analysis, we limit firm specific variables to those that we believe may affect consumer demand. We included the typical organizational form and marketing variables as controls, as well as the size of the firm in terms of total assets. Further we look to examine cross marketing effects and the influence of A.M. Best Ratings. We included A.M. Best ratings because consumers can use these easily as an indicator of company quality or financial strength when they decide to purchase insurance.³²

Our results suggest that direct writers have a positive influence on the demand for catastrophic coverage and a negative influence on the demand for non-catastrophic coverage. Further, stock companies exhibit the same pattern. These essentially are control variables reflecting the structure of the companies in the Florida homeowners market.³³ We also note that large firms (in terms of total assets) are related to higher demand. This may be due to greater name recognition or economies of scale.

³² The significance that consumers attach to financial strength ratings is uncertain, but there is reason to expect that these ratings have some relevance. Insurers typically advertise their Best ratings and agents typically convey this information to consumers. The ratings descriptions (Superior (A++, A+), Excellent(A,A-), Very Good (B+, B++), Adequate (B, B-), and Fair (C+, C++)) are A.M. Best's categories and are ranked in order of highest to lowest. The omitted category is not rated companies (NR-1 – NR-4).

³³ As shown below in Table 6, after controlling for whether the firm reports to ISO, the results are essentially unchanged. However, we do not control for the selection affect of the decision to enter Florida, just the decision to report to ISO.

In terms of cross marketing effects, the amount of auto insurance written in Florida by an insurer is negatively related to the demand for both catastrophe and non-catastrophe coverages. Thus, as the insurer sells more auto insurance in the state, it is likely to sell less homeowners insurance, as reflected by the amount of indicated loss costs. This result may be due to an increasing tendency by individual companies to specialize in either auto or home insurance.³⁴ In contrast, we see that life insurance sales by affiliated companies within the same group are positively related to the sale of homeowners insurance. This latter result is consistent with our hypothesis that consumers view buying life insurance and home insurance from the same company as a benefit. It would be interesting to see if this is true in other states. We will undertake a similar analysis for New York to compare and contrast the results.

It is conceivable that consumers value financial strength differently for catastrophe coverage and non-catastrophe coverage, where the latter involves more frequent claims. Catastrophe insurance may be viewed as an unfortunate necessity, particularly for homeowners in high-risk areas forced to pay high premiums, for which quality considerations take a back seat to saving money on premium expenditures.

The effects of the A.M. Best Ratings for the top three categories are significantly greater than the Non-Rated Companies on catastrophic cover. Thus, consumers value the ratings to help them discern companies for catastrophic coverage.³⁵ In contrast only the Excellent category had a significant influence in the demand for non-catastrophic cover. This seems to make some sense as consumers will be more sensitive to a company if it is more likely to suffer financial distress from a catastrophe, but less sensitive to the a company's financial strength if the risks are

³⁴ We should also note that we measure this variable at the company level rather than the group level. A group may segregate its homeowners insurance and auto insurance in different companies within the group.

³⁵ There are no Adequate or Fair Rated companies in the dataset employed in these regressions.

individually smaller and less likely result in the failure of a company. Overall, the effect of the top three rating classifications is significantly positive, so it appears that for the bundled good that the ratings are important.

We also estimate in a similar fashion the demand for HO3 and HO5 policies. As mentioned above, HO3 policies represent a much greater number of policies than HO5. Thus, our sample of zip code contract combinations where there is both HO3 and HO5 policies being sold is smaller. By add HO5 polices to the model we obtain similar results for most variables. The major changes for the elasticities are that the HO3 demand elasticity is lower in absolute at -1.202 rather than the -1.62 for HO3 contracts estimated without the presence of HO5 contracts. This is consistent with theory as we are adding a potential substitute. The HO5 price elasticity for catastrophic coverage is -1.167 and the cross-elasticity of demand is very low, but positive at 0.049 . A positive cross price elasticity indicates that the two services are substitutes while a negative elasticity would imply that the two services are complements. Logic dictates that people can only buy one contract and that HO3 and HO5 contracts should be substitutes in consumption.

For the non-catastrophic demand the results are also qualitatively similar. The HO3 demand elasticity is the about the same as for the case when HO3 contracts are estimated solely. The HO5 demand elasticity is much more inelastic, however. Further, the two are again complements.

Finally the income elasticity for catastrophic cover is about half as much as the similar elasticity estimated from the HO3 only model, while the non-catastrophic income elasticity is about the same.

The results of the model shown in Table 6 contain one additional variable. This is the

exclusion of wind peril coverage where the wind portion is excluded or transferred to a windstorm pool and it only applies to HO5 policies. The exclusion of the wind peril is significantly negative for catastrophe insurance demand and significantly positive for non-catastrophe insurance. For these policies, the wind peril could be transferred to the wind pool or not covered at all. In either instance, the homeowner may find this less desirable than having their primary insurer cover the wind peril.³⁶ Excluding the wind peril could have a positive effect on the demand for non-catastrophe coverage if homeowners seek to expand the latter to compensate for their lack of wind coverage. Endogeneity also may play a role here if homeowners who exclude or have wind coverage transferred to the pool also tend to have more expensive homes which would increase non-catastrophe indicated loss costs, our measure of quantity demanded.

One further concern is raised is whether our sample companies are representative of the Florida market. We address this in the next section.

D. Demand for Homeowners' Policies Controlling for Selection

One of the concerns of our model is that the companies reporting to the ISO may not represent the universe of companies writing in the Florida market. In our sample we have some 60 different companies in the sample over the four years. In Florida, over the time period we study, this represents about 30 percent of the total homeowners' premiums written in each year. The firms that report to ISO may be significantly different than the other firms in the market. Thus, we control for this result by estimating a probit regression that attempts to classify those

³⁶ It also should be noted that the wind pool may charge higher premiums for wind coverage than insurers. Our two-stage procedure would not control for this price effect as our price measure only reflects the coverage provided by the primary insurer and not the wind pool.

companies that participate from those that do not. This selection model employs firm specific characteristics to determine whether the firm is an "ISO Reporter".

The regression we estimate is:

Probit (ISO Reporter=1/0 otherwise) =

$f(\log$ of total assets,

\log of Florida homeowners premiums,

Best Capital Adequacy Ratio,

business concentration ratio (top four lines),

geographical four state concentration ratio,

percent of claims paid within two years,

percent of claim value paid within two years,

Stock Dummy, Direct Writer Dummy, and year dummies).

From this regression we obtain the inverse Mills ratio for each observation as

$\lambda = -\phi(X'\beta)/\Phi(X'\beta)$ from the estimates of the probit regression where $\phi(*)$ represents the normal density function and $\Phi(*)$ represents the cumulative normal distribution function (See Green 2000). This variable can then be employed in the demand equation to account for the fact that some firms report to ISO and others do not. In our model the coefficient on λ in the demand represents the effect on the quantity demanded for a firm that is a participant in the ISO Reporting scheme. If the coefficient is positive (negative) then the mean level of demand is higher (lower) relative to firms who do not report to ISO.

For the model where we estimated the demand for HO3 contracts (Table 7) the selection indicator (λ) is significantly positive for catastrophic coverage, thus implying that the ISO Reporting companies are more likely to be in markets with catastrophic coverages. Thus, the

mean level of catastrophic insurance demanded is higher for reporting companies than non-reporting companies. In contrast, the reverse is true for the non-catastrophic coverage demand. ISO Reporting companies have slightly lower mean levels of demand than non-reporting companies. However, for the overall demand the mean level is statistically higher for the reporting companies.

Table 8 contains the results of a model when we estimate the demand for both HO3 and HO5 contracts. We see that the selection term for both demands is not significant.

The results for the contract and policy terms, demographic, and firm specific variables shown in Tables 7 and 8 are not qualitatively different than those reported in tables 5 and 6. Thus the fact that a firm reports to ISO does not have a material effect upon the other variables that influence demand. The major exception is that for the ISO reporting companies in Tables 7 and 8 the A.M. Best Ratings are no longer significant.

The main elasticity results are summarized in Table 9. We see that in general the price elastic for catastrophic insurance is more elastic than for non-catastrophic coverage. Further, the income elasticity for catastrophic demand is also greater than for non-catastrophic coverage. By moving from the HO3 only results to those that include HO5 policies we see that the cat coverage elasticity of demand becomes lower, but the non-catastrophic cover elasticity is relatively stable across all possible estimation methods. We also see that HO3 and HO5 policies are substitutes as the Cross-Elasticity of Demand is positive in all but one case and in that case the result is not significantly different than zero.

It is important to note that the HO3 samples (Tables 5 and 7) and the HO3 and HO5 samples (Tables 6 and 8) are very different. We have not made an attempt to determine the differences yet. For example, HO5 policies are not offered in every zip. This could be for

demand reasons (no one desires to purchase them) or it could be for supply reasons (no firm desires to sell them in that market). This needs to be address in the future.

IV. Summary and Description of Future Work

This paper is part of an ongoing project to estimate the supply and demand for residential property insurance in Florida and New York. We examine in an exploratory manner, the demand for homeowners HO3 and Ho5 insurance contracts in Florida. We estimate these models with a 2SLS approach to account for the endogeneity of a number of important explanatory variables. We first examine the hedonic forms of the price and premium OLS regressions to understand how policy terms, insured risk factors, neighborhood variables, and firm characteristics influence premiums and price mark-ups. We also examine the quantity of catastrophe versus non-catastrophe insurance demanded to show that there are some potentially important differences in the factors affecting the demands for these two coverages.

The results for the OLS hedonic premium and price equations suggest that many factors affect these outcome measures. In other words, variations in our calculated ISO indicated loss costs do not fully account for variations in the premium per policy or the price-mark up. We believe that one contributor to premium and price dispersion is the deviation of insurers' assumed loss costs from ISO indicated loss costs. We also hypothesize that, in a workably competitive homeowners insurance market subject to certain regulatory constraints, varying consumer preferences and insurer product and service differentiation further contribute to premium and price dispersion.

Two interesting and plausible observations arise from the demand analysis. First, we find that catastrophe coverage is more price sensitive than non-catastrophe coverage. Second,

catastrophe coverage is a normal good whose income elasticity is considerably higher than non-catastrophe coverage.

The results for other variables hypothesized to affect demand are more mixed in terms of our ability to offer plausible explanations. Among the results that tend to be more robust, it appears that factors associated with higher risk tend to increase the demand for insurance. Also, greater demand for housing services, in turn, appears to increase the demand for insurance. The effects of various coverage provisions on demand are less predictable. Homeowners may tradeoff certain coverage enhancements and reductions as their premiums increase due to higher catastrophe risk. Finally, we note that there does not appear to be an important material difference between the ISO companies that report and those that do not report.

In future work we will examine both New York and Florida. This will allow a comparison of two regulatory regimes and two different markets. In addition to homeowners insurance, we will also include data on the dwelling, fire and extended coverage contracts sold in each state. These latter coverages are substitutes for more bundled homeowners insurance policies. Additionally, we will refine our model specification to more accurately measure certain factors and incorporate potentially important omitted variables, such as underwriting stringency and quality of service. Finally, we also will estimate the supply of homeowners insurance in the state markets that we would include in a joint estimation of supply and demand.

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Appendix A
Data in Florida Demand and Supply Study

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Table A1: Features of Policies and Structures

Variable Name	Short Description	Comments and Codings
COMPNO	Company Number (1-83)	Link to Company Data
YEAR	Year (1995-1998)	0 (1995), 1 (1996), 2 (1997), 3 (1998)
ZIP	Zip Code	Zip code
STATE	State	Separate Panels for FL & NY
TERRIT	Territory	Location Identifier for Cat-Losses
POLICY	Policy Form HO1 (NY only), HO3, HO5, HO8	Dummy Variables to Reflect Policy Form Coverages
SUBLINE	Subline	Reflects Loss Settlement Basis(Dummy variable :1 if Replacement Cost Coverage)
EXCIND	Exception Indicator	Dummy Variable: 1 = Wind Transferred to Pool
STEXCIND or STEX	State Exception Indicator	Dummy Variable: 1 = Off-Premises Theft Coverage
ORD_LC or ORD	Ordinance or Law Coverage	Dummy Variable: 1 = Coverage Pays Additional Cost Required To Repair a Damaged Home According To Current Building Codes
FAM	Number of Families	Dummy Variable: 1 = Multiple Families
TYPECON	Type of Construction Frame Brick SFR	Dummy Variables to Reflect Different types of Structures
YEARCON	Year of Construction	Dummy Variable: 1 = Constructed after 1960
WIND_DS	Wind Deductible Size (\$'s)	Wind Deductible Converted to \$'s if Expressed as Percentage of COVA
FIRE_DS	Fire Deductible Size (\$'s)	Fire Deductible Converted to \$'s if Expressed as Percentage of COVA
PROTCD	Protection Code	Ordinal Ranking Variable for the Structure (1-10), the Lower the Better
BCEG	Building Code Effectiveness Grading	Community Grading
COVA	Coverage A Limit	Dollar Amount of Coverage A Limit
COVCPCT	Coverage C as Percent of COVA	In Standard Policy, COVCPCT = 50%
COVELIM	Coverage E (Liability) Limit	Converted to \$'s if expressed as Percentage of COVA
ILC	Total ISO Indicated Loss Costs	Dollar Amount
ILC_C	ISO Indicated Loss Costs Cat Portion	Dollar Amount
ILC_NC	ISO Indicated Loss Costs NonCat Portion	Dollar Amount
PREMS	Annualized Premium Limit	Dollar Amount
PRICE	Annualized Price	$(1+r)(PREMS-ILC)/[ILC]$
PRICE1	1 + Annualized Price	Linear Transform of PRICE =PRICE + 1

Table A2: Company Data
From the NAIC Annual Statement, Supplemented by Data from the AMBest Key
Rating Guide as Indicated

Variable Name	Short Description	Comments and Codings
MKT_CODE	Marketing System Employed by the Firm Agent = 1 if an "agency writer" Direct = 1 if a "direct writer"	Dummy Variables to Represent Various Forms of Marketing and Distribution Systems
Company ID	Various Identifiers for the Company and the Group in Which it Operates	Link to AMBest Data
CAPSURP	Capital and Surplus	Total Firm C&S
BCAR	Best Capital Adequacy Ratio	This is a risk-based capital measure
FSC	Best Financial Size Category	Discrete size categories based on Adjusted Policy Holder Surplus
STRENGTH	Best Strength Category	Numeric coding from 1 to 9 Reflecting AMBest Rating, where 1 is the best (A++)
RATING	AM Best Rating	Alpha Numeric Coding of Best Rating
TOTASS	Total Assets	In \$
LTOTASS	Log of Total Assets	In Log \$
SOBnRAT	State Line of Business Concentration	The % of Total Firm Business in top "n" States in which it does business, a geographic concentration indicator
HOME1	Homeowners is First Line of Business	Dummy Variable if HO is the highest % of Direct Premiums Written (DPW) to Total DPW for the Firm
HOME2	Homeowners is Second Line of Business	Defined as in HOME1
LOBnRAT	n-Line of Business Concentration Ratio	Percent of writings in the top "n" Lines of Business divided by DPW
FLAUTO/ NYAUTO	Total of Personal Auto Lines Premiums in each State	An Indicator of Cross-Marketing potential for the Firm
FLHOTOT/ NYHOTO	Percent of Business in State (FL & NY)	Ratio of Homeowners to Total DPW in the respective State
Table 2 Continues on Next Page		

Table 2: Company Data (Continued)

Variable Name	Short Description	Comments and Codings
FLLPREM/ NYLPREM	Total Life Insurance Premiums written by Companies in Same Group as the Firm	An Indicator of Cross Marketing potential for the Firm
HOMEDPW	Sum of HO Premiums in the State	
LHOMEDPW	Log of HOMEDPW	
TOTDPW	Total of Direct Premiums Written Nationwide	
TOTHODPW	Total Direct Homeowners Premiums Written Nationwide	
Organizational Form: Stock Mutual	Organizational form	Dummy Variables to reflect Organizational Form Mutual = 1 if a mutual Stock = 1 if a stock
HO_EX	Homeowners Line Expenses	Direct Loss Adjustment Expenses Incurred + Brokerage Fees and Taxes, Licenses & Fees for HO Line
HO_EX_RT	Expense Ratio for Homeowners Line	Ratio of HO_EX to Homeowners DPW in the State
IEE_EX	Unallocated Homeowners Line Expenses	Amount of total Homeowners expense that remains unallocated after allocations to all States.
C_OUT	Total Number of Claims Outstanding for the year in question and the previous two years	
C_REPT	Total Number of Claims Reported during the year in question and the two previous years	
C_RAT	Ratio of total number of claims outstanding to the number of claims (Reported and Outstanding)	A Quality of Service Measure
TOT_PD	Total Paid Claims From Past Three Years, in the year in question and the previous two years	
TOT_UNPD	Total Unpaid Claims from Past Three Years, the year in question and the previous two years	
TOT_RAT	Ratio of Unpaid Claims to Total Claims, i.e. the ratio of TOT_PD to TOT_UNPD	A Quality of Service Measure

Table A3: Socio-Demographic Data Used in the Demand Analysis
All data taken at the ZIP-Code level from the 1990 Census Data

Median Householder Income In The Zip Code
% Of Housing Units That Have A Mortgage
% Of Housing Units In Which Mortgage Is Greater Than 30% Of Household Exps
Average Age Of Householder
% Of Housing Units Occupied By Owner
% Of Income That Constitutes Retired Income
Percentage Of People Above 25 Who Have Completed 12Th Grade
Percentage Of People Above 25 Who Have A College Degree
Median Year Structures Were Built In The Zip
Median Value Of Structures In The Zip
% Of Population That Is In The Urban Areas In The Zip
% Of Population That Is In The Rural Areas In The Zip
Number Of People Above The Age Of 16
Number Of People Above The Age Of 25
% Of Married Couples With Children In The Population

Florida Demand
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Figure 1
Average Premiums and Average Mark-up by Contract Type
(Sorted in Order of Increasing Premium)

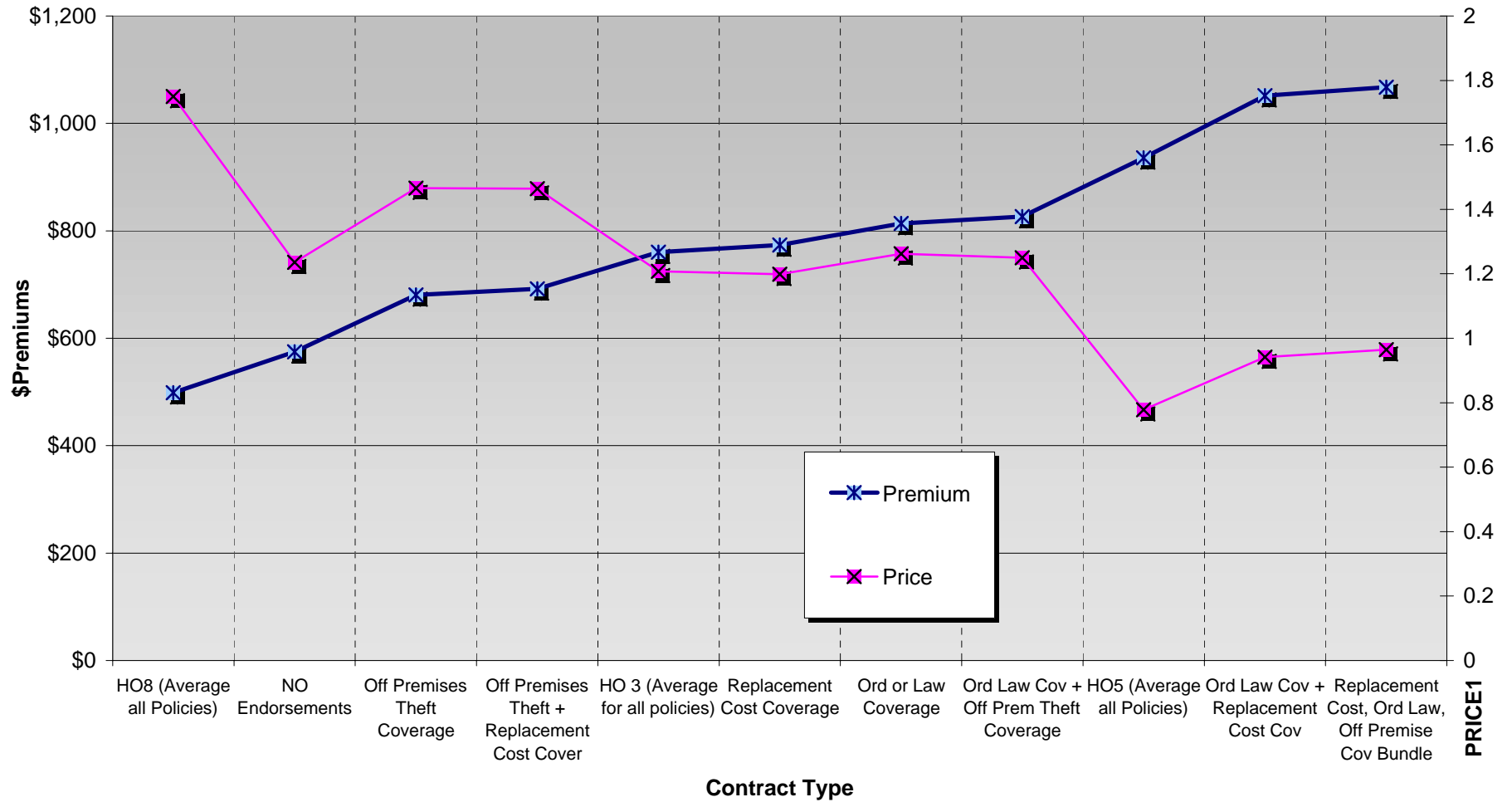


Table 1
Comparison of Florida Homeowners Contracts Basic Terms

Contract Terms ...	Policy Form			
	HO3	Typical	HO5 Most Comprehensive	HO8 Least Comprehensive
Insurance Covers ...	Everything Except Exclusions (all perils)	Everything Except Exclusions (all perils)	Everything Except Exclusions (all perils)	Only Specifically Included Items (named perils)
Home	x	x	x	x
Other Attached Property and Structures	x	x	x	x
Personal Property	x	x	x	x
Loss of Use	x	x	x	x
Personal Liability to Others	x	x	x	x
Medical Payments to Others	x	x	x	x
Replacement cost Coverage or Repair	Repair but Endorsement Available (contents)	Replace		Repair (contents and Home)
Ordinance or Law Coverage	Endorsement Available		x	Endorsement Available?

Source: Authors' analysis of Standard ISO Contracts for Florida

Table 2**Descriptive Statistics on Florida Homeowners Contracts with Various Contract Terms**

(contracts are summed to the level of the Zip code)

HO 3 Contracts

Variable Label	N	Mean	Std Dev	Minimum	Maximum
Premiums Per Contract In Zip Code	53,096	766.568	625.271	1.000	25396.000
Log Of Premium Per Policy	53,096	6.487	0.513	0.000	10.142
(Premiums - Indicated Loss Costs)/Indicated Loss Costs	53,096	1.228	0.568	0.001	4.790
Log Of (Price + 1)	53,096	0.087	0.520	-7.439	1.566
Dummy For Windstorm Protection Credit	53,096	0.067	0.222	0.000	1.000
Fire Deductible In \$	53,096	351.823	258.276	0.000	5000.000
Wind Deductible In \$	53,096	388.940	176.650	100.000	1200.000
Dummy Variable Of Ord Or Law Coverage	53,096	0.537	0.471	0.000	1.000
Dummy Value Of Subline = 1 If Replacement Cost	53,096	0.894	0.243	0.000	1.000
Dummy Var =1 If Wind Portion Transf'D To Pool	53,096	0.015	0.105	0.000	1.000
Ratio of ISO ILC for Cats to Total ISO ILCs	53,096	0.438	0.223	0.000	0.911
Log Of Iso Cat Related Indicated Loss Costs	53,096	5.489	1.292	0.000	10.510
Log Of Iso Non-Cat Related Indicated Loss Costs	53,096	5.811	0.500	4.473	9.413
Percent of Total Zip level Policies that are HO3	95.19%				

HO 5 Contracts

Variable Label	N	Mean	Std Dev	Minimum	Maximum
Premiums Per Contract In Zip Code	2,626	887.135	679.235	1.000	10576.000
Log Of Premium Per Policy	2,626	6.606	0.597	0.000	9.266
(Premiums - Indicated Loss Costs)/Indicated Loss Costs	2,626	0.909	0.416	0.001	3.306
Log Of (Price + 1)	2,626	-0.215	0.548	-7.370	1.196
Dummy For Windstorm Protection Credit	2,626	0.005	0.048	0.000	1.000
Fire Deductible In \$	2,626	462.740	172.524	150.000	1200.000
Wind Deductible In \$	2,626	466.257	281.397	2.240	5000.000
Dummy Variable Of Ord Or Law Coverage	2,626	0.000	0.000	0.000	0.000
Dummy Value Of Subline = 1 If Replacement Cost	2,626	0.994	0.071	0.000	1.000
Dummy Var =1 If Wind Portion Transf'D To Pool	2,626	0.018	0.103	0.000	1.000
Ratio of ISO ILC for Cats to Total ISO ILCs	2,626	0.435	0.220	0.000	0.888
Log Of Iso Cat Related Indicated Loss Costs	2,605	5.902	1.367	2.648	9.597
Log Of Iso Non-Cat Related Indicated Loss Costs	2,626	6.247	0.555	5.203	8.460
Percent of Total Zip level Policies that are HO5	4.71%				

HO 8 Contracts

Variable Label	N	Mean	Std Dev	Minimum	Maximum
Premiums Per Contract In Zip Code	57	525.824	135.441	249.000	889.000
Log Of Premium Per Policy	57	6.234	0.248	5.517	6.790
(Premiums - Indicated Loss Costs)/Indicated Loss Costs	57	1.673	0.522	0.655	2.760
Log Of (Price + 1)	57	0.458	0.357	-0.424	1.015
Dummy For Windstorm Protection Credit	57	0.000	0.000	0.000	0.000
Fire Deductible In \$	57	288.387	76.870	250.000	500.000
Wind Deductible In \$	57	284.016	85.670	0.870	500.000
Dummy Variable Of Ord Or Law Coverage	57	0.829	0.324	0.000	1.000
Dummy Value Of Subline = 1 If Replacement Cost	57	0.000	0.000	0.000	0.000
Dummy Var =1 If Wind Portion Transf'D To Pool	57	0.046	0.199	0.000	1.000
Ratio of ISO ILC for Cats to Total ISO ILCs	57	0.250	0.197	0.000	0.745
Log Of Iso Cat Related Indicated Loss Costs	57	4.183	1.135	1.903	6.616
Log Of Iso Non-Cat Related Indicated Loss Costs	57	5.492	0.216	5.197	6.048
Percent of Total Zip level Policies that are HO8	0.10%				

Table 3
Bundled versus Unbundled Premiums and Prices: Average for Contract Terms

Variable Label	Mean	Std Dev	Minimum	Maximum
Premiums in Zip code (Average for all policies)	760.511	1927.200	1.000	17268.180
Premiums w/ Replacement Cost, Ord Law, Off Premise Cov Bundle	1067.430	1361.860	376.000	7229.500
Premiums with Ord or Law Coverage	813.562	1387.350	4.000	10442.500
Premiums w/ Ord Law Cov + Off Prem Theft coverage	826.401	1591.590	11.000	10442.500
Premiums w/Ord Law Cov + Replacement Cost Cov	1051.370	1260.940	250.000	7229.500
Premiums with Replacement Cost Coverage	773.717	2171.530	3.000	17268.180
Premiums w/ Winstorm Protection Credit	680.508	756.936	3.000	7229.500
Premiums w/Off Premises Theft + Replacement Cost Cov	692.004	801.771	3.000	7229.500
Premiums w/NO Endorsements	574.861	634.691	2.000	6293.670
Premiums Per Contract In Zip Code HO5	934.342	1859.980	18.000	8856.330
Premiums Per Contract In Zip Code HO8	498.723	143.937	308.000	889.000
PRICE1 Average Price (price1=price+1)	1.208	1.892	0.002	4.904
PRICE1 for Replacement Cost, Ord Law, Off Prem Cov Bundle	0.965	0.548	0.317	2.606
PRICE1 with Ord or Law Coverage	1.262	1.445	0.006	4.713
PRICE1 w/ Ord Law Cov + Off Prem Theft coverage	1.250	1.612	0.007	4.654
PRICE1 w/Ord Law Cov + Replacement Cost Cov	0.941	0.490	0.317	2.606
PRICE1 with Replacement Cost Coverage	1.199	2.076	0.002	4.904
PRICE1 w/Off Premises Theft coverage	1.466	0.817	0.002	3.682
PRICE1 w/ Winstorm Protection Credit	1.464	0.840	0.002	3.172
PRICE1 w/NO Endorsements	1.235	0.757	0.006	4.359
PRICE1 In Zip Code HO5	0.778	1.241	0.062	3.032
PRICE1 In Zip Code HO8	1.748	0.662	0.636	2.760

Table 4
OLS Regressions for LPREMS and LPRICE1 for Florida HO-3 Contracts
Premiums and Price Markups

<i>Variable</i>	Panel A. Dependent Variable is Log of Premiums/Contract				Panel B. Dependent Variable is Log of Price1 (Mark-up)			
	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>
Percent Of Contracts In Zip W/Ord Or Law Coverage	0.000	0.005	-0.026	0.979	0.018	0.005	3.704	0.000
Percent Of Contracts In Zip W/ Replacement Cost	-0.022	0.006	-3.381	0.001	-0.040	0.006	-6.444	0.000
Percent Of Contracts W/Windstorm Protection Device Credit	0.003	0.008	0.360	0.719	0.012	0.008	1.538	0.124
Percent Of Contracts W/ Wind Portion Transferred To Pool	0.181	0.021	8.462	0.000	0.599	0.021	28.398	0.000
Log Of Coverage A	0.164	0.006	28.239	0.000	0.309	0.006	53.871	0.000
Wind Deductible In \$	0.000	0.000	-8.403	0.000	0.000	0.000	-8.055	0.000
Fire Deductible In \$	0.000	0.000	16.783	0.000	0.000	0.000	11.395	0.000
Log Of Iso Cat Related Indicated Loss Costs	0.089	0.002	57.635	0.000	-0.302	0.002	-197.671	0.000
Log Of Iso Non-Cat Related Indicated Loss Costs	0.398	0.006	62.329	0.000	-0.321	0.006	-51.016	0.000
Percent Of Contracts In Zip W/Frame Construction	0.043	0.026	1.693	0.091	0.155	0.025	6.141	0.000
Percent Of Contracts W/Brick Construction In Zip	-0.036	0.025	-1.407	0.159	0.108	0.025	4.300	0.000
Protection Code (1 = Highest)	0.025	0.001	25.002	0.000	0.019	0.001	19.165	0.000
Median Year Built In Zip	-0.009	0.000	-40.297	0.000	-0.007	0.000	-32.796	0.000
Log Of Median Age Of Householder In Zip	-0.106	0.016	-6.853	0.000	-0.047	0.015	-3.047	0.002
Ratio Of Select Owner Costs To Med. Inc.	0.725	0.042	17.361	0.000	0.803	0.041	19.517	0.000
Log Of Median Income In Zip	0.208	0.013	16.465	0.000	0.318	0.012	25.649	0.000
% Of People > 25 Who Completed Grade 12	-0.003	0.000	-16.220	0.000	-0.006	0.000	-26.783	0.000
Log Of Median Home Value	0.055	0.009	6.028	0.000	-0.022	0.009	-2.492	0.013
Log Of Auto Premiums Sold By Company In State	-0.011	0.000	-31.937	0.000	-0.010	0.000	-28.567	0.000
Log Of Life Premiums Sold By Related Company In State	0.009	0.001	14.405	0.000	0.010	0.001	16.598	0.000
Log Of Total Assets Of Company Selling Policy	0.024	0.001	27.157	0.000	0.023	0.001	27.507	0.000
Direct Writer Form Of Mktg System	0.172	0.006	27.488	0.000	0.170	0.006	27.651	0.000
Stock Form Of Organization	0.081	0.006	13.225	0.000	0.095	0.006	15.825	0.000
AM Best Rating of Superior (A++,A+)	0.261	0.040	6.513	0.000	0.208	0.039	5.271	0.000
AM Best Rating of Excellent (A,A-)	0.336	0.040	8.371	0.000	0.273	0.040	6.903	0.000
AM Best Rating of Very Good (B++,B+)	0.392	0.041	9.601	0.000	0.364	0.040	9.063	0.000
AM Best Rating of Adequate (B,B-)	(dropped)				(dropped)			
AM Best Rating of Fair (C++,C+)	(dropped)				(dropped)			
1996 Year Indicator Variable	0.209	0.004	47.063	0.000	0.166	0.004	37.826	0.000
1997 Year Indicator Variable	0.382	0.010	36.697	0.000	0.358	0.010	34.889	0.000
1998 Year Indicator Variable	0.466	0.010	45.938	0.000	0.431	0.010	43.145	0.000
Intercept	16.696	0.420	39.790	0.000	12.094	0.413	29.265	0.000
R ²	0.667				0.683			
Adjusted R ²	0.667				0.682			
N=50178								

Table 5
Two Stage Least Squares Results
Florida HO3 Contract Demand Equations

<i>Variables</i>	<i>Endogenous Variable</i>	Panel A. Dependant Variable is the Log of the Cat Indicated Loss Costs				Panel B. Dependant Variable is the Log of the Non-Cat Indicated Loss Costs				Panel C. Dependant Variable is the Log of the Total Indicated Loss Costs			
		<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>
Intercept		-49.611	5.022	-9.879	0.000	25.955	2.010	12.915	0.000	19.965	2.613	7.641	0.000
<i>Insured Risk Characteristics</i>													
Percent Of Contracts In Zip W/Frame Construction		-0.239	0.057	-4.187	0.000	0.242	0.023	10.599	0.000	-0.031	0.030	-1.056	0.291
Percent Of Contracts W/Brick Construction In Zip		-0.177	0.057	-3.111	0.002	0.270	0.023	11.850	0.000	-0.024	0.030	-0.826	0.409
Median Year Built In Zip		-0.012	0.001	-16.307	0.000	-0.010	0.000	-34.018	0.000	-0.013	0.000	-33.238	0.000
Protection Code (1 = Highest)		0.016	0.003	5.475	0.000	0.012	0.001	10.836	0.000	0.019	0.001	13.184	0.000
<i>Contract Terms</i>													
Log Of (Price + 1)	x	-1.621	0.008	-200.661	0.000	-0.571	0.003	-176.460	0.000	-1.053	0.004	-250.424	0.000
Percent Of Contracts In Zip W/ Replacement Cost		-0.028	0.014	-2.005	0.045	0.091	0.006	16.031	0.000	0.032	0.007	4.327	0.000
Percent Of Contracts In Zip W/Ord Or Law Coverage		0.437	0.023	18.635	0.000	0.098	0.009	10.458	0.000	0.242	0.012	19.842	0.000
Fire Deductible In \$	x	0.004	0.000	43.078	0.000	0.006	0.000	157.947	0.000	0.005	0.000	105.738	0.000
Wind Deductible In \$	x	0.000	0.000	3.459	0.001	0.000	0.000	-6.237	0.000	0.000	0.000	-0.849	0.396
Percent Of Contracts W/Windstorm Protection Device Credit	x	1.102	0.064	17.273	0.000	0.103	0.026	4.023	0.000	0.546	0.033	16.446	0.000
<i>Neighborhood Characteristics</i>													
Ratio Of Select Owner Costs To Med. Inc.	x	3.309	0.120	27.545	0.000	-0.253	0.048	-5.259	0.000	1.321	0.063	21.136	0.000
Percent Of Homes In Zip (1-4 Units)		-0.351	0.038	-9.312	0.000	0.027	0.015	1.779	0.075	-0.182	0.020	-9.302	0.000
Percent Condo Housing Units In Zip		1.458	0.065	22.589	0.000	-0.120	0.026	-4.639	0.000	0.717	0.034	21.344	0.000
Percent Of Housing Units Occupied By Owner		0.002	0.001	3.647	0.000	0.002	0.000	9.217	0.000	0.003	0.000	10.820	0.000
Percent Of People 65+ In Zip		1.154	0.145	7.980	0.000	-0.355	0.058	-6.138	0.000	-0.357	0.075	-4.740	0.000
Percent Of Population In Urban Areas		0.004	0.000	27.896	0.000	0.000	0.000	-5.980	0.000	0.001	0.000	15.640	0.000
Log Of Median Age Of Householder In Zip		33.151	2.181	15.198	0.000	-7.124	0.873	-8.160	0.000	0.001	1.135	0.001	0.999
Log of Age Squared		-4.058	0.288	-14.114	0.000	-0.523	0.035	-14.941	0.000	-0.232	0.045	-5.094	0.000
Percent Of Married Couples With Children		0.010	0.001	14.202	0.000	-0.002	0.000	-8.203	0.000	0.001	0.000	2.164	0.031
Percent w/HS or GED only		-4.737	0.170	-27.875	0.000	-0.829	0.068	-12.185	0.000	-2.133	0.088	-24.125	0.000
Percent With Some Or More College		-3.363	0.100	-33.596	0.000	-0.559	0.040	-13.952	0.000	-1.464	0.052	-28.106	0.000
Log Of Median Income In Zip		1.405	0.344	4.088	0.000	2.158	0.138	15.682	0.000	1.344	0.179	7.510	0.000
Percent Of Homes In Zip With A Mortgage		-0.559	0.055	-10.197	0.000	0.474	0.022	21.614	0.000	-0.120	0.029	-4.196	0.000
Percent Of Housing Units With Mort. Cost >30% Of Inc.		0.019	0.001	19.010	0.000	-0.009	0.000	-22.856	0.000	0.001	0.001	1.024	0.306
Percent of (HS or GED)* Percent of Some College Educ.		6.234	0.313	19.915	0.000	-1.369	0.125	-10.924	0.000	1.490	0.163	9.145	0.000
Log Of Age * Log Of Median Income		-0.150	0.087	-1.718	0.086	1.558	0.115	13.535	0.000	0.304	0.150	2.035	0.042

Table 5
Two Stage Least Squares Results
Florida HO3 Contract Demand Equations

<i>Variables</i>	Panel A. Dependant Variable is the Log of the Cat Indicated Loss Costs				Panel B. Dependant Variable is the Log of the Non-Cat Indicated Loss Costs				Panel C. Dependant Variable is the Log of the Total Indicated Loss Costs				
	<i>Endogenous Variable</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>
<i>Firm Characteristics</i>													
Direct Writer Form Of Mktg System		0.187	0.014	13.470	0.000	-0.056	0.006	-10.023	0.000	0.050	0.007	6.933	0.000
Stock Form Of Organization		0.176	0.014	12.656	0.000	-0.046	0.006	-8.335	0.000	0.050	0.007	6.872	0.000
Log Of Auto Premiums Sold By Company In State		-0.018	0.001	-23.634	0.000	-0.003	0.000	-8.705	0.000	-0.009	0.000	-21.682	0.000
Log Of Life Premiums Sold By Related Company In State		0.032	0.001	22.300	0.000	0.008	0.001	14.016	0.000	0.019	0.001	24.793	0.000
Log Of Total Assets Of Company Selling Policy		0.028	0.002	11.959	0.000	0.013	0.001	13.840	0.000	0.018	0.001	15.232	0.000
AM Best Rating of Superior (A++,A+)		0.502	0.089	5.649	0.000	0.049	0.036	1.378	0.168	0.281	0.046	6.075	0.000
AM Best Rating of Excellent (A,A-)		0.506	0.089	5.676	0.000	0.118	0.036	3.318	0.001	0.324	0.046	6.983	0.000
AM Best Rating of Very Good (B++,B+)		0.625	0.091	6.909	0.000	-0.047	0.036	-1.291	0.197	0.290	0.047	6.153	0.000
AM Best Rating of Adequate (B,B-)		(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000
AM Best Rating of Fair (C++,C+)		(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000
<i>Time</i>													
1996 Year Indicator Variable		-0.006	0.015	-0.382	0.703	-0.052	0.006	-8.761	0.000	-0.026	0.008	-3.363	0.001
1997 Year Indicator Variable		0.332	0.026	12.711	0.000	0.058	0.010	5.594	0.000	0.183	0.014	13.511	0.000
1998 Year Indicator Variable		0.371	0.027	13.954	0.000	0.016	0.011	1.545	0.122	0.178	0.014	12.847	0.000
<i>Marginal Effects*</i>													
<i>Marginal Effect w.r.t.log of Income</i>		0.819	0.034	24.423	0.000	0.115	0.013	8.602	0.000	0.438	0.017	25.128	0.000
<i>Marginal Effect w.r.t Percent HS or GED</i>		-1.931	0.090	-21.432	0.000	1.445	0.036	-40.058	0.000	-1.463	0.047	-31.197	0.000
<i>Marginal Effect of Some College (or More)</i>		-1.464	0.059	-24.721	0.000	-0.976	0.024	-41.157	0.000	-1.010	0.031	-32.774	0.000
<i>Marginal Effect w.r.t. log of Age</i>		-0.115	0.142	-0.810	0.418	-0.306	0.057	-5.396	0.000	0.005	0.074	0.074	0.941
"R ² "**		0.863				0.851				0.895			
N		50,458											

*Marginal effects are estimated at the mean.

**Two Stage Least Squares "R²" defined as the correlation between the predicted and actual value for the regression.

Table 6
Two Stage Least Squares Results
Florida HO3 and HO5 Contract Demand Equations

<i>Variables</i>	<i>Endogenous Variable</i>	Panel A. Dependant Variable is the Log of the Cat Indicated Loss Costs				Panel B. Dependant Variable is the Log of the Non-Cat Indicated Loss Costs				Panel C. Dependant Variable is the Log of the Total Indicated Loss Costs			
		<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>
Intercept		50.641	11.815	4.286	0.000	97.859	7.767	12.599	0.000	110.707	8.919	12.413	0.000
<i>Insured Risk Characteristics</i>													
Percent Of Contracts In Zip W/Frame Construction		-0.474	0.091	-5.188	0.000	0.406	0.060	6.752	0.000	-0.060	0.069	-0.865	0.387
Percent Of Contracts W/Brick Construction In Zip		-0.316	0.091	-3.464	0.001	0.470	0.060	7.850	0.000	0.019	0.069	0.272	0.785
Median Year Built In Zip		-0.019	0.001	-16.718	0.000	-0.009	0.001	-11.710	0.000	-0.014	0.001	-16.085	0.000
Protection Code (1 = Highest)		-0.010	0.005	-2.246	0.025	-0.005	0.003	-1.541	0.123	-0.002	0.004	-0.528	0.598
<i>Contract Terms</i>													
Log Of (Price + 1)	x	5.200	2.434	2.136	0.033	11.591	1.600	7.243	0.000	12.824	1.838	6.979	0.000
Log of (Price + 1) for HO5	x	-24.215	2.813	-8.607	0.000	-25.624	1.849	-13.855	0.000	-30.653	2.124	-14.434	0.000
Log of (Price + 1) for HO3 *Log of Median Income		-0.632	0.236	-2.678	0.007	-1.178	0.155	-7.598	0.000	-1.330	0.178	-7.471	0.000
Log of (Price + 1) for HO5 *Log of Median Income		2.248	0.273	8.232	0.000	2.491	0.180	13.873	0.000	2.933	0.206	14.229	0.000
Log of (Price + 1) for HO3 Squared		-0.190	0.007	-25.916	0.000	-0.050	0.005	-10.427	0.000	-0.114	0.006	-20.698	0.000
Log of (Price + 1) for HO5 Squared		-0.185	0.011	-16.095	0.000	0.034	0.008	4.471	0.000	-0.042	0.009	-4.873	0.000
Log of (price+1) for HO3 * Log of (Price+1) for HO5	x	0.049	0.029	1.714	0.087	0.216	0.019	11.425	0.000	0.257	0.022	11.855	0.000
Percent Of Contracts In Zip W/ Replacement Cost		-0.022	0.024	-0.914	0.361	0.104	0.016	6.625	0.000	0.045	0.018	2.528	0.011
Percent Of Contracts In Zip W/Ord Or Law Coverage		0.288	0.036	7.936	0.000	0.136	0.024	5.701	0.000	0.214	0.027	7.817	0.000
Fire Deductible In \$	x	0.005	0.000	33.024	0.000	0.006	0.000	59.432	0.000	0.005	0.000	47.964	0.000
Wind Deductible In \$	x	0.000	0.000	1.861	0.063	0.000	0.000	-2.469	0.014	0.000	0.000	-0.276	0.783
Percent Of Contracts W/ Wind Portion Transferred To Pool		-0.176	0.078	-2.246	0.025	0.534	0.052	10.355	0.000	0.240	0.059	4.057	0.000
Percent Of Contracts W/Windstorm Protection Device Credit	x	0.641	0.099	6.472	0.000	0.195	0.065	2.990	0.003	0.425	0.075	5.690	0.000
<i>Neighborhood Characteristics</i>													
Ratio Of Select Owner Costs To Med. Inc.	x	0.905	0.186	4.856	0.000	-0.696	0.123	-5.678	0.000	-0.035	0.141	-0.248	0.804
Percent Of Homes In Zip (1-4 Units)		-0.891	0.089	-9.957	0.000	-0.508	0.059	-8.628	0.000	-0.799	0.068	-11.826	0.000
Percent Condo Housing Units In Zip		1.346	0.107	12.523	0.000	-0.293	0.071	-4.152	0.000	0.536	0.081	6.610	0.000
Percent Of Housing Units Occupied By Owner		0.010	0.001	8.072	0.000	0.008	0.001	10.127	0.000	0.011	0.001	11.708	0.000
Percent Of People 65+ In Zip		0.253	0.269	0.943	0.346	-1.033	0.177	-5.852	0.000	-1.250	0.203	-6.167	0.000
Percent Of Population In Urban Areas		0.004	0.000	14.668	0.000	0.000	0.000	-1.927	0.054	0.001	0.000	5.283	0.000
Log Of Median Age Of Householder In Zip		0.783	4.474	0.175	0.861	-31.908	2.941	-10.849	0.000	-31.950	3.377	-9.461	0.000
Log of Age Squared		-1.401	0.496	-2.826	0.005	1.093	0.141	7.753	0.000	1.296	0.162	8.010	0.000
Percent Of Married Couples With Children		0.007	0.001	6.141	0.000	-0.002	0.001	-2.986	0.003	0.000	0.001	0.016	0.987
Percent w/HS or GED only		-3.121	0.349	-8.944	0.000	-1.297	0.229	-5.656	0.000	-2.266	0.263	-8.603	0.000
Percent With Some Or More College		-2.197	0.205	-10.725	0.000	-0.840	0.135	-6.236	0.000	-1.459	0.155	-9.439	0.000
Log Of Median Income In Zip		-2.725	0.828	-3.291	0.001	-3.494	0.544	-6.419	0.000	-4.053	0.625	-6.485	0.000
Percent Of Homes In Zip With A Mortgage		-0.722	0.104	-6.954	0.000	-0.093	0.068	-1.368	0.171	-0.588	0.078	-7.507	0.000
Percent Of Housing Units With Mort. Cost >30% Of Inc.		0.032	0.003	11.621	0.000	0.008	0.002	4.274	0.000	0.018	0.002	8.747	0.000
Percent of (HS or GED)* Percent of Some College Educ.		2.441	0.568	4.295	0.000	-0.983	0.374	-2.630	0.009	0.877	0.429	2.045	0.041
Log Of Age * Log Of Median Income		0.936	0.214	4.366	0.000	2.643	0.326	8.110	0.000	2.394	0.374	6.398	0.000

Table 6
Two Stage Least Squares Results
Florida HO3 and HO5 Contract Demand Equations

<i>Variables</i>	Panel A. Dependant Variable is the Log of the Cat Indicated Loss Costs				Panel B. Dependant Variable is the Log of the Non-Cat Indicated Loss Costs				Panel C. Dependant Variable is the Log of the Total Indicated Loss Costs				
	<i>Endogenous Variable</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>
<i>Firm Characteristics</i>													
Direct Writer Form Of Mktg System		0.113	0.025	4.518	0.000	-0.034	0.016	-2.067	0.039	0.026	0.019	1.394	0.163
Stock Form Of Organization		0.093	0.025	3.760	0.000	-0.029	0.016	-1.776	0.076	0.029	0.019	1.540	0.124
Log Of Auto Premiums Sold By Company In State		-0.012	0.001	-10.248	0.000	-0.004	0.001	-5.323	0.000	-0.008	0.001	-8.906	0.000
Log Of Life Premiums Sold By Related Company In State		0.020	0.002	9.088	0.000	0.010	0.001	7.025	0.000	0.015	0.002	9.087	0.000
Log Of Total Assets Of Company Selling Policy		0.026	0.004	7.054	0.000	0.015	0.002	5.971	0.000	0.020	0.003	7.086	0.000
AM Best Rating of Superior (A++,A+)		-0.299	0.399	-0.750	0.453	-0.084	0.262	-0.320	0.749	-0.188	0.301	-0.625	0.532
AM Best Rating of Excellent (A,A-)		-0.250	0.399	-0.628	0.530	-0.036	0.262	-0.136	0.892	-0.147	0.301	-0.489	0.625
AM Best Rating of Very Good (B++,B+)		-0.220	0.399	-0.550	0.582	-0.168	0.262	-0.639	0.523	-0.188	0.301	-0.625	0.532
AM Best Rating of Adequate (B,B-)		(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000
AM Best Rating of Fair (C++,C+)		(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000
<i>Time</i>													
1996 Year Indicator Variable		0.055	0.023	2.374	0.018	-0.060	0.015	-3.983	0.000	0.005	0.017	0.296	0.767
1997 Year Indicator Variable		0.341	0.043	7.893	0.000	0.051	0.028	1.798	0.072	0.196	0.033	6.008	0.000
1998 Year Indicator Variable		0.477	0.044	10.752	0.000	-1.804	0.096	-18.839	0.000	0.237	0.033	7.075	0.000
<i>Marginal Effects*</i>													
Marginal Effect w.r.t. Log of Income (Income Elasticity)		0.403	0.063	6.402	0.000	0.178	0.041	4.313	0.000	0.310	0.047	6.517	0.000
Marginal Effect w.r.t. Log(Price+1) for HO3 (Price Elasticity)		-1.202	0.022	-53.707	0.000	-0.519	0.015	-35.305	0.000	-0.824	0.017	-48.798	0.000
Marginal Effect w.r.t. Log(Price+1) for HO5 (Price Elasticity)		-1.167	0.022	-52.850	0.000	-0.076	0.015	-5.236	0.000	-0.567	0.017	-34.047	0.000
Cross Price Elasticity between HO3 and HO5		0.049	0.029	1.714	0.087	0.216	0.019	11.425	0.000	0.257	0.022	11.855	0.000
Marginal Effect w.r.t Percent HS or GED		-2.023	0.175	-11.533	0.000	-1.740	0.115	-15.090	0.000	-1.871	0.132	-14.135	0.000
Marginal Effect of Some College (or More)		-1.453	0.111	-13.057	0.000	-1.139	0.073	-15.565	0.000	-1.192	0.084	-14.190	0.000
Marginal Effect w.r.t. Log of Age**		-0.571	0.245	-2.332	0.020	-0.039	0.161	-0.244	0.807	0.059	0.185	0.319	0.750
"R ² "**		0.901				0.746				0.853			
N		17,025											

**Marginal effects are estimated at the mean.

***Two Stage Least Squares "R²" defined as the correlation between the predicted and actual value for the regression.

Table 7
Two Stage Least Squares Results
Florida HO3 Contract Demand Equations with Selection

<i>Variables</i>	<i>Endogenous Variable</i>	Panel A. Dependant Variable is the Log of the Cat Indicated Loss Costs				Panel B. Dependant Variable is the Log of the Non-Cat Indicated Loss Costs				Panel C. Dependant Variable is the Log of the Total Indicated Loss Costs			
		<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>
Intercept		-47.796	5.116	-9.342	0.000	25.664	2.024	12.679	0.000	20.620	2.656	7.764	0.000
Lambda Selection Term*		0.098	0.022	4.388	0.000	-0.018	0.009	-2.024	0.043	0.040	0.012	3.397	0.001
<i>Insured Risk Characteristics</i>													
Percent Of Contracts In Zip W/Frame Construction		-0.237	0.058	-4.111	0.000	0.244	0.023	10.679	0.000	-0.030	0.030	-1.008	0.313
Percent Of Contracts W/Brick Construction In Zip		-0.178	0.058	-3.094	0.002	0.272	0.023	11.948	0.000	-0.025	0.030	-0.831	0.406
Median Year Built In Zip		-0.012	0.001	-16.313	0.000	-0.010	0.000	-34.262	0.000	-0.013	0.000	-33.206	0.000
Protection Code (1 = Highest)		0.016	0.003	5.693	0.000	0.012	0.001	10.757	0.000	0.020	0.001	13.419	0.000
<i>Contract Terms</i>													
Log Of (Price + 1)	x	-1.619	0.008	-195.729	0.000	-0.569	0.003	-173.808	0.000	-1.052	0.004	-244.876	0.000
Percent Of Contracts In Zip W/ Replacement Cost		-0.041	0.015	-2.786	0.045	0.094	0.006	16.120	0.000	0.027	0.008	3.560	0.000
Percent Of Contracts In Zip W/Ord Or Law Coverage		0.465	0.026	17.866	0.000	0.082	0.010	7.989	0.000	0.252	0.014	18.689	0.000
Fire Deductible In \$	x	0.004	0.000	41.674	0.000	0.006	0.000	155.080	0.000	0.005	0.000	102.774	0.000
Wind Deductible In \$	x	0.000	0.000	3.517	0.001	0.000	0.000	-5.668	0.000	0.000	0.000	-0.583	0.560
Percent Of Contracts W/Windstorm Protection Device Credit	x	1.227	0.076	16.216	0.000	0.057	0.030	1.905	0.057	0.596	0.039	15.183	0.000
<i>Neighborhood Characteristics</i>													
Ratio Of Select Owner Costs To Med. Inc.	x	3.300	0.122	27.118	0.000	-0.234	0.048	-4.862	0.000	1.333	0.063	21.097	0.000
Percent Of Homes In Zip (1-4 Units)		-0.343	0.038	-9.005	0.000	0.024	0.015	1.594	0.111	-0.181	0.020	-9.171	0.000
Percent Condo Housing Units In Zip		1.469	0.065	22.483	0.000	-0.122	0.026	-4.732	0.000	0.719	0.034	21.186	0.000
Percent Of Housing Units Occupied By Owner		0.002	0.001	3.501	0.000	0.002	0.000	9.524	0.000	0.003	0.000	10.751	0.000
Percent Of People 65+ In Zip		1.155	0.147	7.881	0.000	-0.349	0.058	-6.022	0.000	-0.353	0.076	-4.637	0.000
Percent Of Population In Urban Areas		0.004	0.000	27.560	0.000	0.000	0.000	-5.947	0.000	0.001	0.000	15.573	0.000
Log Of Median Age Of Householder In Zip		33.289	2.214	15.037	0.000	-6.941	0.876	-7.924	0.000	0.190	1.149	0.165	0.869
Log of Age Squared		-4.086	0.292	-14.007	0.000	-0.532	0.035	-15.166	0.000	-0.234	0.046	-5.088	0.000
Percent Of Married Couples With Children		0.010	0.001	14.120	0.000	-0.002	0.000	-8.218	0.000	0.001	0.000	2.248	0.025
Percent w/HS or GED only		-4.759	0.172	-27.646	0.000	-0.825	0.068	-12.121	0.000	-2.134	0.089	-23.877	0.000
Percent With Some Or More College		-3.358	0.102	-33.081	0.000	-0.556	0.040	-13.844	0.000	-1.456	0.053	-27.638	0.000
Log Of Median Income In Zip		1.363	0.349	3.907	0.000	2.197	0.138	15.924	0.000	1.352	0.181	7.467	0.000
Percent Of Homes In Zip With A Mortgage		-0.547	0.056	-9.855	0.000	0.469	0.022	21.353	0.000	-0.120	0.029	-4.152	0.000
Percent Of Housing Units With Mort. Cost >30% Of Inc.		0.019	0.001	18.612	0.000	-0.009	0.000	-22.702	0.000	0.001	0.001	0.940	0.347
Percent of (HS or GED)* Percent of Some College Educ.		6.300	0.317	19.848	0.000	-1.373	0.126	-10.931	0.000	1.507	0.165	9.146	0.000
Log Of Age * Log Of Median Income		-0.141	0.089	-1.595	0.086	1.546	0.115	13.393	0.000	0.284	0.151	1.873	0.061

Table 7
Two Stage Least Squares Results
Florida HO3 Contract Demand Equations with Selection

<i>Variables</i>	Panel A. Dependant Variable is the Log of the Cat Indicated Loss Costs				Panel B. Dependant Variable is the Log of the Non-Cat Indicated Loss Costs				Panel C. Dependant Variable is the Log of the Total Indicated Loss Costs				
	<i>Endogenous Variable</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>
<i>Firm Characteristics</i>													
Direct Writer Form Of Mktg System		0.245	0.025	9.963	0.000	-0.076	0.010	-7.829	0.000	0.070	0.013	5.454	0.000
Stock Form Of Organization		0.115	0.016	7.189	0.000	-0.053	0.006	-8.412	0.000	0.020	0.008	2.373	0.018
Log Of Auto Premiums Sold By Company In State		-0.018	0.001	-23.036	0.000	-0.003	0.000	-8.893	0.000	-0.009	0.000	-21.339	0.000
Log Of Life Premiums Sold By Related Company In State		0.033	0.002	22.074	0.000	0.008	0.001	12.857	0.000	0.019	0.001	24.351	0.000
Log Of Total Assets Of Company Selling Policy		0.009	0.005	1.902	0.000	0.016	0.002	8.580	0.000	0.011	0.003	4.317	0.000
AM Best Rating of Superior (A++,A+)		-0.400	0.466	-0.860	0.000	-0.095	0.184	-0.517	0.605	-0.206	0.242	-0.853	0.393
AM Best Rating of Excellent (A,A-)		-0.406	0.466	-0.872	0.000	-0.021	0.184	-0.112	0.911	-0.246	0.242	-1.016	0.310
AM Best Rating of Very Good (B++,B+)		-0.289	0.466	-0.619	0.000	-0.188	0.184	-1.020	0.308	-0.241	0.242	-0.998	0.318
AM Best Rating of Adequate (B,B-)		(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000
AM Best Rating of Fair (C++,C+)		(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000	(dropped)	0.000	0.000	0.000
<i>Time</i>													
1996 Year Indicator Variable		-0.014	0.016	-0.905	0.703	-0.045	0.006	-7.156	0.000	-0.029	0.008	-3.576	0.000
1997 Year Indicator Variable		0.316	0.028	11.339	0.000	0.068	0.011	6.139	0.000	0.178	0.014	12.266	0.000
1998 Year Indicator Variable		0.350	0.029	12.137	0.000	0.026	0.011	2.288	0.022	0.169	0.015	11.304	0.000
<i>Marginal Effect w.r.t.log of Income**</i>		0.810	0.034	23.858	0.000	0.118	0.013	8.804	0.000	0.437	0.018	24.772	0.000
<i>Marginal Effect w.r.t Percent HS or GED</i>		-1.924	0.091	-21.077	0.000	-1.443	0.036	-39.963	0.000	-1.455	0.047	-30.717	0.000
<i>Marginal Effect of Some College (or More)</i>		-1.440	0.060	-23.968	0.000	-0.974	0.024	-40.983	0.000	-0.997	0.031	-31.991	0.000
<i>Marginal Effect w.r.t. log of Age**</i>		-0.108	0.144	-0.749	0.454	-0.310	0.057	-5.452	0.000	0.006	0.075	0.081	0.935
"R ² " ^{***}		0.861				0.851				0.894			
N		49,826											

*Lambda self selection term is the inverse mills ratio for a firm derived from a probit regression to determine whether a company is in the ISO dataset.

*The selection regression took the following form: $\text{probit}(\text{Sample} = 1) = f(\log \text{ of total assets, log of total florida home owners dpw, Am Best Cap. Adequacy Ratio, 4 line of business concentration ratio, 4 state of business concentration ratio, age of company, claims paying speed, stock company, direct writer, and year dummies}).$

*Company specific dummy variables omitted for clarity.

**Marginal effects are estimated at the mean.

***Two Stage Least Squares "R²" defined as the correlation between the predicted and actual value for the regression.

Table 8
Two Stage Least Squares Results
Florida HO3 & HO5 Contract Demand Equations Controlling for ISO Reporting Selection Bias

Variables		Panel A. Dependant Variable is the Log of the Cat Indicated Loss Costs				Panel B. Dependant Variable is the Log of the Non-Cat Indicated Loss Costs				Panel C. Dependant Variable is the Log of the Total Indicated Loss Costs			
		<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t stat</i>	<i>P> t </i>
Intercept		50.181	11.813	4.248	0.000	97.686	7.784	12.549	0.000	110.525	8.932	12.375	0.000
Lambda Selection Term*		-0.034	0.035	-0.970	0.332	-0.013	0.023	-0.552	0.581	-0.013	0.027	-0.506	0.613
Insured Risk Characteristics													
Percent Of Contracts In Zip W/Frame Construction		-0.472	0.091	-5.165	0.000	0.407	0.060	6.756	0.000	-0.059	0.069	-0.850	0.395
Percent Of Contracts W/Brick Construction In Zip		-0.312	0.091	-3.431	0.001	0.471	0.060	7.854	0.000	0.020	0.069	0.290	0.772
Median Year Built In Zip		-0.019	0.001	-16.714	0.000	-0.009	0.001	-11.681	0.000	-0.014	0.001	-16.062	0.000
Protection Code (1 = Highest)		-0.011	0.005	-2.333	0.020	-0.005	0.003	-1.585	0.113	-0.002	0.004	-0.575	0.565
Contract Terms													
Log Of (Price + 1)	x	5.574	2.462	2.264	0.024	11.731	1.623	7.230	0.000	12.972	1.862	6.968	0.000
Log of (Price + 1) for HO5	x	-24.561	2.833	-8.670	0.000	-25.754	1.867	-13.795	0.000	-30.789	2.142	-14.374	0.000
Log of (Price + 1) for HO3 *Log of Median Income		-0.668	0.239	-2.799	0.005	-1.192	0.157	-7.581	0.000	-1.345	0.180	-7.453	0.000
Log of (Price + 1) for HO5 *Log of Median Income	x	2.282	0.275	8.297	0.000	2.503	0.181	13.813	0.000	2.947	0.208	14.170	0.000
Log of (Price + 1) for HO3 Squared	x	-0.189	0.007	-25.908	0.000	-0.050	0.005	-10.394	0.000	-0.114	0.006	-20.665	0.000
Log of (Price + 1) for HO5 Squared		-0.184	0.011	-16.025	0.000	0.034	0.008	4.490	0.000	-0.042	0.009	-4.831	0.000
Log of (price+1) for HO3 * Log of (Price+1) for HO5		0.048	0.029	1.672	0.095	0.216	0.019	11.375	0.000	0.257	0.022	11.814	0.000
Percent Of Contracts In Zip W/ Replacement Cost		-0.016	0.024	-0.673	0.501	0.106	0.016	6.570	0.000	0.047	0.018	2.575	0.010
Percent Of Contracts In Zip W/Ord Or Law Coverage		0.272	0.040	6.823	0.000	0.130	0.026	4.948	0.000	0.208	0.030	6.895	0.000
Fire Deductible In \$	x	0.005	0.000	32.910	0.000	0.006	0.000	59.168	0.000	0.005	0.000	47.781	0.000
Wind Deductible In \$	x	0.000	0.000	1.965	0.049	0.000	0.000	-2.383	0.017	0.000	0.000	-0.214	0.831
Percent Of Contracts W/ Wind Portion Transferred To Pool		-0.178	0.078	-2.271	0.023	0.533	0.052	10.326	0.000	0.240	0.059	4.042	0.000
Percent Of Contracts W/Windstorm Protection Device Credit	x	0.592	0.111	5.312	0.000	0.176	0.073	2.400	0.016	0.406	0.084	4.821	0.000
Neighborhood Characteristics													
Ratio Of Select Owner Costs To Med. Inc.	x	0.910	0.186	4.884	0.000	-0.694	0.123	-5.655	0.000	-0.033	0.141	-0.235	0.814
Percent Of Homes In Zip (1-4 Units)		-0.892	0.089	-9.973	0.000	-0.508	0.059	-8.620	0.000	-0.799	0.068	-11.822	0.000
Percent Condo Housing Units In Zip		1.349	0.107	12.562	0.000	-0.292	0.071	-4.125	0.000	0.538	0.081	6.619	0.000
Percent Of Housing Units Occupied By Owner		0.010	0.001	8.100	0.000	0.008	0.001	10.123	0.000	0.011	0.001	11.709	0.000
Percent Of People 65+ In Zip		0.255	0.268	0.950	0.342	-1.033	0.177	-5.840	0.000	-1.250	0.203	-6.159	0.000
Percent Of Population In Urban Areas		0.004	0.000	14.706	0.000	0.000	0.000	-1.906	0.057	0.001	0.000	5.293	0.000
Log Of Median Age Of Householder In Zip		0.798	4.469	0.179	0.858	-31.902	2.945	-10.832	0.000	-31.944	3.379	-9.453	0.000
Log of Age Squared		-1.396	0.495	-2.819	0.005	1.091	0.141	7.725	0.000	1.294	0.162	7.988	0.000
Percent Of Married Couples With Children		0.007	0.001	6.135	0.000	-0.002	0.001	-2.988	0.003	0.000	0.001	0.010	0.992
Percent w/HS or GED only		-3.144	0.349	-8.999	0.000	-1.306	0.230	-5.673	0.000	-2.275	0.264	-8.612	0.000
Percent With Some Or More College		-2.212	0.205	-10.779	0.000	-0.845	0.135	-6.252	0.000	-1.465	0.155	-9.444	0.000
Log Of Median Income In Zip		-2.692	0.828	-3.252	0.001	-3.482	0.546	-6.382	0.000	-4.040	0.626	-6.454	0.000
Percent Of Homes In Zip With A Mortgage		-0.724	0.104	-6.982	0.000	-0.094	0.068	-1.378	0.168	-0.589	0.078	-7.512	0.000
Percent Of Housing Units With Mort. Cost >30% Of Inc.		0.032	0.003	11.638	0.000	0.008	0.002	4.271	0.000	0.018	0.002	8.744	0.000
Percent of (HS or GED)* Percent of Some College Educ.		2.470	0.569	4.344	0.000	-0.972	0.375	-2.594	0.009	0.889	0.430	2.067	0.039
Log Of Age * Log Of Median Income		0.930	0.214	4.342	0.000	2.645	0.326	8.104	0.000	2.396	0.374	6.398	0.000

Table 8
Two Stage Least Squares Results
Florida HO3 & HO5 Contract Demand Equations Controlling for ISO Reporting Selection Bias

Variables	Panel A. Dependant Variable is the Log of the Cat Indicated Loss Costs				Panel B. Dependant Variable is the Log of the Non-Cat Indicated Loss Costs				Panel C. Dependant Variable is the Log of the Total Indicated Loss Costs			
	Coef.	Std. Err.	t stat	P> t	Coef.	Std. Err.	t stat	P> t	Coef.	Std. Err.	t stat	P> t
Firm Characteristics												
Direct Writer Form Of Mktg System	0.085	0.038	2.245	0.025	-0.045	0.025	-1.774	0.076	0.015	0.029	0.535	0.592
Stock Form Of Organization	0.099	0.025	3.886	0.000	-0.026	0.017	-1.585	0.113	0.031	0.019	1.616	0.106
Log Of Auto Premiums Sold By Company In State	-0.012	0.001	-10.301	0.000	-0.004	0.001	-5.343	0.000	-0.008	0.001	-8.896	0.000
Log Of Life Premiums Sold By Related Company In State	0.019	0.002	8.712	0.000	0.010	0.001	6.758	0.000	0.015	0.002	8.790	0.000
Log Of Total Assets Of Company Selling Policy	0.033	0.008	4.285	0.000	0.017	0.005	3.385	0.001	0.022	0.006	3.891	0.000
AM Best Rating of Superior (A++,A+)	-0.307	0.398	-0.770	0.441	-0.087	0.262	-0.331	0.741	-0.191	0.301	-0.635	0.526
AM Best Rating of Excellent (A,A-)	-0.253	0.398	-0.636	0.525	-0.037	0.262	-0.140	0.888	-0.148	0.301	-0.492	0.623
AM Best Rating of Very Good (B++,B+)	-0.223	0.399	-0.559	0.576	-0.169	0.263	-0.643	0.520	-0.189	0.302	-0.628	0.530
AM Best Rating of Adequate (B,B-)	(dropped)				(dropped)				(dropped)			
AM Best Rating of Fair (C++,C+)	(dropped)				(dropped)				(dropped)			
Time												
1996 Year Indicator Variable	0.063	0.025	2.566	0.010	-0.057	0.016	-3.509	0.000	0.009	0.019	0.459	0.646
1997 Year Indicator Variable	0.352	0.045	7.886	0.000	0.055	0.029	1.877	0.061	0.201	0.034	5.934	0.000
1998 Year Indicator Variable	0.489	0.046	10.639	0.000	0.027	0.030	0.903	0.367	0.242	0.035	6.954	0.000
Marginal Effects**												
Marginal Effect w.r.t. Log of Income (Income Elasticity)	0.405	0.063	6.444	0.000	0.179	0.041	4.327	0.000	0.311	0.048	6.529	0.000
Marginal Effect w.r.t. Log(Price+1) for HO3 (Price Elasticity)	-1.199	0.023	-53.209	0.000	-0.518	0.015	-34.904	0.000	-0.823	0.017	-48.312	0.000
Marginal Effect w.r.t. Log(Price+1) for HO5 (Price Elasticity)	-1.168	0.022	-52.798	0.000	-0.077	0.015	-5.257	0.000	-0.568	0.017	-33.946	0.000
Cross Price Elasticity between HO3 and HO5	0.048	0.029	1.672	0.095	0.216	0.019	11.375	0.000	0.257	0.022	11.814	0.000
Marginal Effect w.r.t. Percent HS or GED	-2.033	0.176	-11.583	0.000	-1.744	0.116	-15.076	0.000	-1.875	0.133	-14.131	0.000
Marginal Effect of Some College (or More)	-1.460	0.111	-13.106	0.000	-1.141	0.073	-15.547	0.000	-1.195	0.084	-14.184	0.000
Marginal Effect w.r.t. Log of Age	-0.108	0.144	-0.749	0.454	-0.310	0.057	-5.453	0.000	0.006	0.075	0.082	0.935
"R ² "***	0.902				0.744				0.853			
N	16,791											

*Lambda self selection term is the inverse mills ratio for a firm derived from a probit regression to determine whether a company is in the ISO dataset.

The selection regression took the following form: $\text{probit}(\text{Sample} = 1) = f(\log \text{ of total assets, log of total florida home owners dpw, Am Best Cap. Adequacy Ratio, 4 line of business concentration ratio, 4 state of business concentration ratio, age of company, claims paying speed, stock company, direct writer, and year dummies})$.

**Marginal effects are estimated at the mean.

***Two Stage Least Squares "R²" defined as the correlation between the predicted and actual value for the regression.

Table 9
Summary of Elasticity Results

	HO3 Demand Estimation		Joint HO3 and HO5 Demand Estimation					
	No-Selection	Selection	No-Selection			Selection		
			HO3	HO5	Cross Elasticity between HO3 and HO5	HO3	HO5	Cross Elasticity between HO3 and HO5
<i>Price Elasticity of Demand</i>								
Catastrophe	-1.621	-1.619	-1.202	-1.167	0.049	-1.199	-1.168	0.048
Non-Catastrophe	-0.571	-0.569	-0.519	-0.076	0.216	-0.518	-0.077	0.216
Total	-1.053	-1.052	-0.824	-0.567	0.257	-0.823	-0.568	0.257
<i>Income Elasticity of Demand</i>								
Catastrophe	0.819	0.810	0.403			0.405		
Non-Catastrophe	0.115	0.118	0.178			0.179		
Total	0.438	0.437	0.310			0.311		

Note: No-Selection refers to regression results when selection bias is not accounted for while Selection results account for a potential ISO Reporting bias. HO3 refers to HO3 contract and HO5 refers to HO5 contracts. All non-zero results are significantly different from zero at standard levels.