

Risking House and Home:
Disasters, Cities, Public Policy

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Editors

2008
Berkeley Public Policy Press
Institute of Governmental Studies Publications
Berkeley, California

Cover: Loma Prieta Earthquake, October 17, 1989. San Francisco, California.
Collapsed and burned buildings at Beach and Divisadero streets in the city's
Marina District.
Photograph: C. E. Meyer, US Geological Survey

Library of Congress Cataloging-in-Publication Data

Risking house and home : disasters, cities, public policy / John M. Quigley
and Larry A. Rosenthal, editors.

p. cm.

Includes bibliographical references.

ISBN 978-0-87772-427-8

1. Disaster relief—United States. 2. Insurance, Disaster—United States. 3.
Urban policy—United States. I. Quigley, John M., 1942- II. Rosenthal, Larry
A., 1959-

HV555.U657 2008

363.34'80973—dc22

2007043427

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Public vs. Private Underwriting of Catastrophe Risk: Lessons from the California Earthquake Authority

2

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Historically, relatively few California households have purchased earthquake insurance. The rate of purchase has been declining since the mid-1990s. This decline can be partly attributed to a combination of limited appetite by private underwriters and challenges faced by the public underwriter (the California Earthquake Authority) in reaching customers. This chapter studies the reasons why private underwriters are reluctant to underwrite and why the public underwriter has not sold more policies. In particular, it identifies a number of possible factors—ranging from marketing considerations to risk management costs—that have contributed to the retreat of private insurers from underwriting. Importantly, it finds little evidence of insurers suffering for this retreat in other lines of business, suggesting that consumer tolerance of earthquake risk has enabled insurers to ignore it.

1. Introduction

Few Californians buy residential earthquake coverage, despite various public initiatives aimed at promoting voluntary purchase. This outcome is not unusual in the context of disaster insurance markets. Surveys of consumers (e.g., Kunreuther, 1978; Palm, 1995) have identified a variety of factors that could contribute to weak demand. Moreover, research on the supply side of the market has also identified problems; for example, Jaffee and Russell (1997) note that insurers are reluctant to provide catastrophe coverage and argue further that earthquake risks may be “uninsurable” within the private insurance market as it exists today. This chapter studies the supply side of the market and attempts to under-

The author thanks Tom Davidoff, Dwight Jaffee, Nancy Kincaid, Richard Roth, Jr., Tom Russell, and Craig Tillman for helpful comments and discussions. The author also is grateful to Jeremy Forster, Michael Suher, and Becky Trubin for research assistance. The author states that any remaining errors are his. The views expressed in this article are those of the author and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.

stand why today's combination of private and public underwriting has not yielded higher penetration of earthquake coverage.

The chapter starts by studying the reluctance of insurers to underwrite earthquake risk within the context of the formation of the California Earthquake Authority (CEA) in 1996. The CEA offers an unusual opportunity to study this issue because, unlike many government catastrophe insurance programs that are effectively imposed on the industry, participation in the CEA program was and is voluntary. A participating company agrees to offer CEA earthquake coverage to its residential policyholders, with the effect that earthquake risk becomes the responsibility of the CEA—a “privately financed, publicly managed” corporation¹ formed by the state in the aftermath of the Northridge earthquake of 1994. A company choosing not to participate is obligated to offer earthquake coverage along with its residential policies (e.g., homeowner policies) and thus retains responsibility for managing any ensuing earthquake exposure.

Given this choice in 1996, some insurers proved more reluctant than others. Insurers holding roughly seventy percent of the California homeowners (HO) market joined the CEA.² Thus, although a majority of residential earthquake risk was effectively transferred to the CEA within a year of its inception, a significant and growing private fringe remained outside the CEA. The coexistence between private and public underwriting persists today, but purchase rates have slumped sharply since 1996. By the end of 2004, only fourteen percent of California residences were insured against earthquake—down from thirty-one percent at the end of 1996. To understand this performance, we must understand (1) why private underwriters, who are in the best position to provide coverage, vary in their willingness to do so, and (2) what challenges face the public underwriter (the CEA) in filling the void left by private underwriters who are unwilling to underwrite.

What considerations compelled some insurers to participate while others stayed out? Some factors seem easy to grasp. Joiners had worse-than-average experience in the Northridge earthquake, higher business volume in the California residential market, and were more likely to have nonproprietary organizational forms. These associations all fit well with modern economic and corporate finance theory (e.g., Froot and Stein, 1998). For example, it is hardly surprising that those with poor results in earthquake underwriting and greater exposure to risk were more inclined to participate in the CEA. Nor is it surprising that institutions with limited access to capital markets, such as mutuals and reciprocals, imputed greater benefits to participation than stock firms. But the evidence suggests that other considerations came to bear as well.

Marketing considerations appear to have played a role. CEA participation was concentrated among insurers that relied primarily on direct marketing methods to serve residential consumers. Participation by insurers using independent agents was rare. This finding suggests that the position of the company with respect to its

¹ The characterization is from the CEA's mission statement at <http://www.earthquakeauthority.com>.

² This aggregate share had changed little by the end of 2004.

competitors and the nature of its customer base may have mattered. Companies utilizing independent agents stand side by side with their competitors and are thus more exposed to adverse selection when losing control of pricing and policy design. They also may serve clients who are wealthier than average and may demand more extensive earthquake coverage. Thus, companies using agency distribution networks may have had more to lose in terms of customer defection and, consequently, chose to retain control and bear the risks.

Underwriting focus may also have played a role. The companies that joined were largely focused on personal lines, particularly automobile. Beyond homeowners, most seem to have had little appetite for insurance lines with catastrophic potential or highly volatile underwriting results. In short, the skills that breed success in personal auto may have little to do with catastrophe risk management, and the companies distinguishing themselves in the former area may have had little need for or interest in developing sophistication with respect to the latter.

Indeed, the evidence suggests that companies suffered little for trimming residential earthquake exposure—whether by joining the CEA or by restricting their coverage offerings. Companies joining the CEA were able to maintain or grow their HO market share despite consumer migration away from CEA policies. And, in the absence of any threat to the associated auto and HO business, it is not surprising that insurers choose to avoid earthquake underwriting.

The rest of this chapter is organized as follows. Section 2 offers background on the California earthquake insurance market and the formation of the CEA. Section 3 studies how the industry split at the time the CEA was formed, with an eye to identifying and interpreting the factors associated with participation. Section 4 examines the disappointing performance of the California earthquake insurance market subsequent to the formation of the CEA. In particular, it documents the drop in purchase of CEA policies after 1996 and offers possible reasons why the CEA has struggled to reach and retain customers. Section 5 concludes.

2. Background

Damages from earthquakes and floods are excluded from the coverage offered under the standard HO policy forms. Consumers desiring protection from these natural disasters must purchase coverage separately. In the case of earthquake, coverage is accomplished either through the addition of a “rider” to the existing HO policy or the purchase of a separate “stand-alone” policy. The latter policies are issued by the CEA and some private companies.

California has a “mandatory offer” law, dating from 1985, requiring that earthquake coverage be offered along with HO insurance. The law specifies a minimum level of coverage offering. Specifically, the dwelling must be covered fully, but the statutory minimums for other coverages are low. To illustrate, minimum coverage for contents and for the loss of use of residential premises are \$5,000 and \$1,500, respectively, and appurtenances such as pools or patios need not be covered at all. In addition, a deductible of up to fifteen percent of the dwell-

ing coverage amount is permitted. Earthquake rates and rating plans are subject to commissioner approval. After the 1994 Northridge earthquake, companies took steps to reduce exposure to earthquake risk. Because of the mandatory offer law, companies could not simply stop offering earthquake coverage. Instead, many either stopped selling new HO policies or restricted their offerings. Repeal of the mandatory offer law, however, was not a politically feasible solution to the emerging difficulties in the HO market. Instead, the CEA was devised as a putative solution after discussions among regulators, lawmakers, and the industry.³

The CEA became operational in December 1996, pursuant to enabling legislation passed in that year. Participating insurers were obligated to make a capital contribution based on market share and agreed to provide layers of additional contingent funding for the CEA in the form of post-earthquake assessments. Upon joining, a participating insurer stopped issuing basic residential earthquake policies (i.e., policies offering coverage within the terms and limits defined by the statutory minimums); all subsequent new and renewal policies of basic earthquake coverage were to be issued by the CEA, with the participating firms allowed a percentage of premiums to cover selling and operational expenses. Participating insurers participated on a *group* basis: in all cases where an insurer joined, all group-affiliated insurers writing residential earthquake risk also joined.⁴

Firms joining the CEA effectively ceded control of earthquake policy design and pricing to the CEA.⁵ The CEA's "basic" policy of 1996 featured coverages corresponding to the statutory minimums, but it started offering supplemental coverage in 1999. The supplemental policy increased the contents coverage limit to \$100,000 and the loss-of-use limit to \$15,000; it also offered the option of a lower deductible (as low as ten percent of the dwelling coverage amount). Actuarial techniques were used for pricing, but political considerations were also important: final CEA pricing reduced rate variation by limiting the number of geographical "rating zones." Of course, the reduced variation was accomplished at the expense of introducing the potential for mispricing within each zone (Jaffee and Russell, 2000).

³ See Roth, Jr. (1998) for background on the mandatory offer law and the politics behind the proposal of the CEA. For further details on coverage minimums and regulation of rates, see California Insurance Code, sections 10081 to 10089.4 (Earthquake Insurance) and 1861.01 to 1861.16 (Reduction and Control of Insurance Rates).

⁴ California Insurance Code, section 10089.27, and sections 8.2 and 8.4 of the CEA Insurer Participation Agreement (CEA, 2005) both mandate group participation and forbid competition with the CEA's basic residential coverage. Although the referenced section of the statute became effective in 2004, a CEA representative indicated that the participation agreements had contained these features since inception.

⁵ The insurer is permitted to offer coverage supplemental to that offered by the CEA—although a CEA representative opined that supplemental offerings by CEA participants were insignificant as of 12/31/05.

3. The Calculus of CEA Participation

The main apparent benefit for a company joining the CEA is in being relieved of the responsibility for underwriting earthquake risk (required under the mandatory offer law), while continuing to participate in the California HO market. In addition, there are potential pecuniary benefits—in the form of commissions and operating expense reimbursements—to be derived from acting as a service provider to the CEA. The proximate costs of participation include the non-refundable capital contribution, potential for post-earthquake assessments, and loss of pricing control over the earthquake coverage being sold to clients.

Table 2.1 lists the private insurers that joined the CEA in 1996, along with their respective market shares (based on 1996 direct premiums written in the HO market). The twelve groups that joined held about two-thirds of the HO market and about three-quarters of the residential earthquake market. There were seventy-nine groups opting to remain outside the CEA.

The survival of the private market, even in the presence of a public alternative, shows that catastrophe risk is not “uninsurable,” suggesting instead that insurability may best be characterized according to degrees rather than absolutes. Private underwriting continued after 1996 and, as will be detailed below, grew in relation to the public market despite the cooperation of the state’s largest personal lines companies with the CEA. Yet, the latter cooperation illustrates that commitment to private underwriting is far from absolute and evidently depends on factors particular to the underwriter in question. In what follows, we study what factors were associated with private willingness to continue underwriting earthquake risk.

Since only twelve groups joined the CEA, attempts to distill an “essential” factor from the data are very likely to be misleading. Accordingly, we start by characterizing the distinguishing features of the joiners via univariate tests. The primary data source is insurance company statutory reports compiled by the National Association of Insurance Commissioners (“NAIC”). All analysis is at the group level and is restricted to the ninety groups that had direct premiums written (“DPW”) in the HO line in California in 1996.⁶ Table 2.2 presents summary statistics by group (companies that joined versus companies that did not join) for a number of key variables. For each variable, the table presents a t-statistic for a test of the equality of means across the two groups.

⁶ There were in fact ninety-one groups, but one, Twentieth Century, is omitted from the analysis. This group sustained especially heavy losses in Northridge and reached a special arrangement with the California Department of Insurance to exit the HO market. The California “Fair Access to Insurance Requirements” Plan (“FAIR”), a state insurer that joined the CEA, is also excluded from the analysis.

Table 2.1. 1996 California Homeowners Market Shares of Private CEA Insurers

Group	Share	Group	Share
State Farm	24.1%	Prudential	1.3%
Allstate	14.8%	Liberty Mutual	0.8%
Farmers	14.4%	CNA	0.7%
California State Automobile Association	4.1%	Mercury	0.2%
USAA	4.1%	Armed Forces Insurance Exchange	0.2%
Auto Club Interinsurance Exchange	1.9%	Preferred Risk	0.0%

Exposure to California Earthquake Risk

By some measures, companies with a significant presence in the California HO market were more likely to participate. In particular, the five largest underwriters in terms of California HO market share joined. Although this difference was statistically significant in a univariate test, high market share was not a prerequisite for participation: most of the remaining firms that joined had small shares.

There was not an obvious connection between participation and *relative* exposure. On average, California homeowners premiums made up a slightly *lower* percentage of a participating group's insurance book, and there were companies with significant relative exposure that did not join. Similarly, California earthquake premiums made up a lower percentage of a participating group's insurance book, and 1994 earthquake losses amounted to a smaller percentage of a participating group's 1996 surplus, although neither difference was statistically significant in a univariate test. On the other hand, the foregoing results were driven somewhat by several companies with heavy exposure and heavy losses that did not join. Analysis based on the median firm suggests a positive association between relative exposure and participation.

Table 2.2. Factors Associated with CEA Participation

Variable	Groups that joined the CEA (12)										T-test
	Mean	1	5	25	50	75	95	99			
(1) 1996 commercial lines DPW / 1996 total DPW	21.0	0.6	0.6	4.5	8.1	40.2	69.5	69.5			-3.9
(2) 1996 California HO DPW / 1996 total DPW	3.1	0.1	0.1	0.5	2.3	5.2	8.2	8.2			-2.1
(3) 1996 California HO market share	5.5	0.0	0.0	0.5	1.6	9.3	24.1	24.1			2.3
(4) 1994 California earthquake loss ratio (DLI / DPE)	1070.0	23.7	23.7	608.2	1128.0	1476.2	1863.6	1863.6			2.5
(5) 1994 California earthquake DLI / 1996 surplus	5.8	0.0	0.0	0.4	2.3	8.5	27.8	27.8			-0.6
(6) 1996 California earthquake DPW / 1996 total DPW	0.6	0.0	0.0	0.1	0.6	1.1	1.8	1.8			-1.2
(7) Logarithm of 1996 assets	22.53	18.77	18.77	21.38	22.71	24.07	25.09	25.09			3.5
(8) Majority of HO premiums written using "direct" marketing:				9 of 22 joined							4.3
(9) 1996 group Best rating of "A++" or "A+"				5 of 24 joined							1.2
(10) Organizational form of top company in group is stock:				4 of 61 joined							-2.6

Table 2.2 continued

Variable	Groups that did not join the CEA (78)										T-test
	Mean	1	5	25	50	75	95	99			
(1) 1996 commercial lines DPW / 1996 total DPW	50.0	0.1	3.3	29.0	51.0	77.0	93.0	100.0			3.9
(2) 1996 California HO DPW / 1996 total DPW	7.0	0.0	0.0	0.1	0.9	4.7	45.0	75.3			2.1
(3) 1996 California HO market share	0.4	0.0	0.0	0.0	0.1	0.5	1.7	4.0			-2.3
(4) 1994 California earthquake loss ratio (DLI / DPE)	566.0	0.0	0.0	154.0	369.0	765.0	1773.0	3943.0			-2.5
(5) 1994 California earthquake DLI / 1996 surplus	9.1	0.0	0.0	0.0	0.2	0.9	63.0	393.0			0.6
(6) 1996 California earthquake DPW / 1996 total DPW	1.0	0.0	0.0	0.0	0.1	0.8	7.3	11.8			1.2
(7) Logarithm of 1996 assets	20.46	14.97	16.39	18.99	20.4	22.25	23.81	24.95			-3.5
(8) Majority of HO premiums written using "direct" marketing:									13 of 22 did not join		-4.3
(9) 1996 group Best rating of "A++" or "A+"									19 of 24 did not join		-1.2
(10) Organizational form of top company in group is stock:									57 of 61 did not join		2.6

Notes: See text for additional details on the variables. T-tests compare the sample means of the joiners and the non-joiners under the assumption of unequal variances. In all cases except one, the sample sizes are 12 for joiners and 78 for non-joiners. For the "1994 California earthquake loss ratio," there were 10 joiners and 55 non-joiners. Thus, 25 observations are omitted because they did not have positive 1994 DPE for CA earthquake.

Unfavorable Experience in Northridge

Groups that joined tended to have had worse experience in the Northridge earthquake. The 1994 loss ratio for the earthquake line [estimated as direct losses incurred (“DLI”) divided by direct premiums earned (“DPE”)] was higher on average for CEA joiners than for nonjoiners, and this is also true at the median. This was not, however, an absolute criterion. The percentiles in Table 2.2 reveal examples of firms that fared well in Northridge joining the CEA, as well as firms that fared poorly staying out.

Specialization in Personal Lines versus Commercial Lines

Participation was linked to specialization in personal lines. Most of the groups that joined had relatively little involvement in underwriting commercial lines. “Commercial lines” are defined here as fire, allied lines, farmowners multiple peril, commercial multiple peril, ocean marine, inland marine, medical malpractice, workers compensation, other liability, products liability, commercial auto liability, aircraft, fidelity, surety, glass, burglary and theft, boiler and machinery, credit, and international. Again, however, the distinction was not absolute: three of the joiners had more than fifty percent of premiums in commercial lines.

Reliance on Direct Marketing

Participation was significantly higher among companies relying on direct marketing methods. Nine of twenty-two direct writers joined the CEA, while only three of sixty-eight using other methods (mostly independent agents) joined. Designation of marketing method was based on *Best’s Key Rating Guide* (1996). A. M. Best classifies firms as “direct” if they use exclusive agents or direct selling techniques (e.g., mail order). Each firm was classified as “direct” or “non-direct” based on the Best’s classification, and groups were classified as “direct” if fifty percent or more of their California HO DPW were written in member companies classified as “direct.”

Stock versus Nonstock Organizational Forms

Eight of twenty-nine mutual and reciprocal groups (including five of the six reciprocal groups) joined, while only four of sixty-one stock groups joined. Groups here are classified according to the flagship company in the hierarchical structure. More precisely, it is common for mutual and reciprocal companies to own stock subsidiaries; in these cases, the group was classified according to the organizational form of the top company rather than the subsidiary.

Size and Financial Strength

The firms that joined the CEA tended to be larger than average, although there were examples of small groups that joined and large groups that did not. The association between financial strength and participation, however, was weak.

* * *

As noted earlier, some of these findings are consistent with theory of risk management in financial firms (e.g., Froot and Stein, 1998). Since risk transfer in the catastrophe reinsurance market is costly (e.g., Froot, 1999), those primary companies with the greatest needs for reinsurance would seem to be the likeliest candidates for CEA participation. The evidence supports this view. Those with the greatest absolute amounts of exposure to the residential market (and, consequently, with the highest risk management costs per unit of exposure due to high correlation with the industry's "peak" risks) joined, as did many of the insurers who were stung badly by the Northridge earthquake. Consumer-owned firms with limited access to capital markets (and, thus, higher implicit costs of financial distress) were significantly more likely to join than stock firms.

Other evidence relating to the cost of risk-bearing was mixed. The firms best positioned to bear risk due to diversification or strong balance sheets were not necessarily those that continued underwriting. For example, extensive diversification through underwriting in other geographic markets does not seem to have dissuaded some of the largest national carriers from joining, while heavy concentration in the California residential market did not persuade some of the smaller regional carriers to join. Theory, of course, predicts that firms with heavier concentration in the California market would, *ceteris paribus*, have higher costs associated with bearing California risk. Evidently, other considerations were also important.

One possibility, suggested by the correlation between personal lines specialization and CEA participation, is that the decision to join partly reflected idiosyncratic organizational attitudes toward risk.⁷ Relative to personal lines, commercial lines feature bigger individual risks and, with less regulated pricing, more volatile industry underwriting results from year to year. Hence, specialization in personal lines could reflect insurer risk aversion beyond what can be identified with observable variables. Such risk aversion, whether stemming from idiosyncratic cultural factors or from variation in sophistication with respect to risk management, might explain the inclination among large personal lines specialists toward participation.

Another consideration is suggested by the strong association between direct marketing methods and CEA participation. Specifically, this might mean that insurers had different expectations with respect to the consequences of participation,

⁷ Kunreuther, Hogarth, and Meszaros (1993) document risk and ambiguity aversion among decision-makers in the insurance industry.

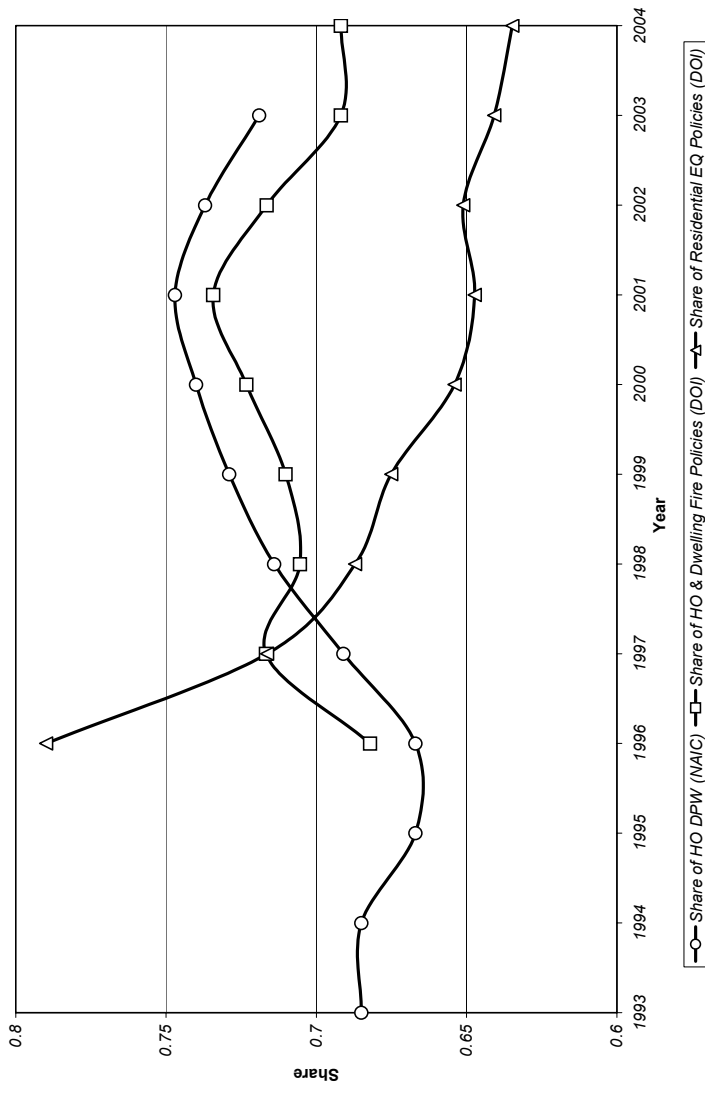
depending on what clientele they were serving and how they interacted with customers. Direct marketers interface with consumers on a one-to-one basis and thus may be less likely to lose business if a consumer is unhappy with the CEA earthquake coverage. To illustrate, an exclusive agent might be tempted to persuade the consumer that CEA coverage was the only or best option, and even a skeptical consumer would be confronted with starting the insurance search from scratch (i.e., having to contact a different company or agent and restarting the risk-classification process). Companies using independent agents, however, stand side-by-side with their competitors. Thus, independent agents can easily steer a consumer who desires extensive earthquake coverage to a suitable company. Moreover, a company selling through independent agents might face adverse-selection risks if its competitors prove capable of exploiting any mispricing by the CEA. Such shortcomings would be accentuated for those companies with wealthy customers needing high coverage limits. In summary, these marketing considerations could potentially affect how a company's other business lines would be affected by participation in the CEA.

Participation in the CEA does not seem to have hurt member companies in other lines of business. In particular, the CEA's relative losses in earthquake-insurance market share (shown in Figure 2.1, and discussed further in Section 4 below) seem neither to have affected nor to have been affected by the performance of participating companies in the HO market. As seen in Figure 2.1, California Department of Insurance (DOI) data show the aggregated California homeowners and dwelling-fire market share of CEA companies increasing between 1996 and 2004, and even jumping three points in 1997, perhaps reflecting the removal of underwriting restrictions at companies as they joined the CEA.⁸

The longer term picture offered by NAIC data confirms that the combination of Northridge-related retrenchment and CEA participation was associated with a small positive change in the longer term HO market share of participating groups. The formation of the CEA was associated with a full recovery of California HO market share lost after 1994, plus additional gains. This compares favorably with a slight drop in aggregated market share nationally over the same time period.

⁸ The DOI figures, downloaded from its website's compilation of "Earthquake Premium and Policy Count Data Calls," are based on policies, while the NAIC figures are based on DPW taken from the California state-page of the statutory reports. The DOI figures also include the California FAIR Plan. Removing the latter does not substantially change the results.

Figure 2.1. CEA Companies' Homeowners and Residential Earthquake Market Share



The CEA companies did lose share in California's personal auto market, but this performance was mirrored in the national statistics.⁹

4. Earthquake Insurance after 1996

Public involvement did not prove to be a panacea. Although the evidence above suggests that the CEA initiative may have helped to stabilize the homeowners market after Northridge, it has borne little fruit with respect to increasing insurance purchase. The disappointing performance of the California earthquake insurance market after 1996 makes it imperative for us to reflect not only on the factors restraining private willingness to underwrite but on the reasons why the CEA has not attracted more business.

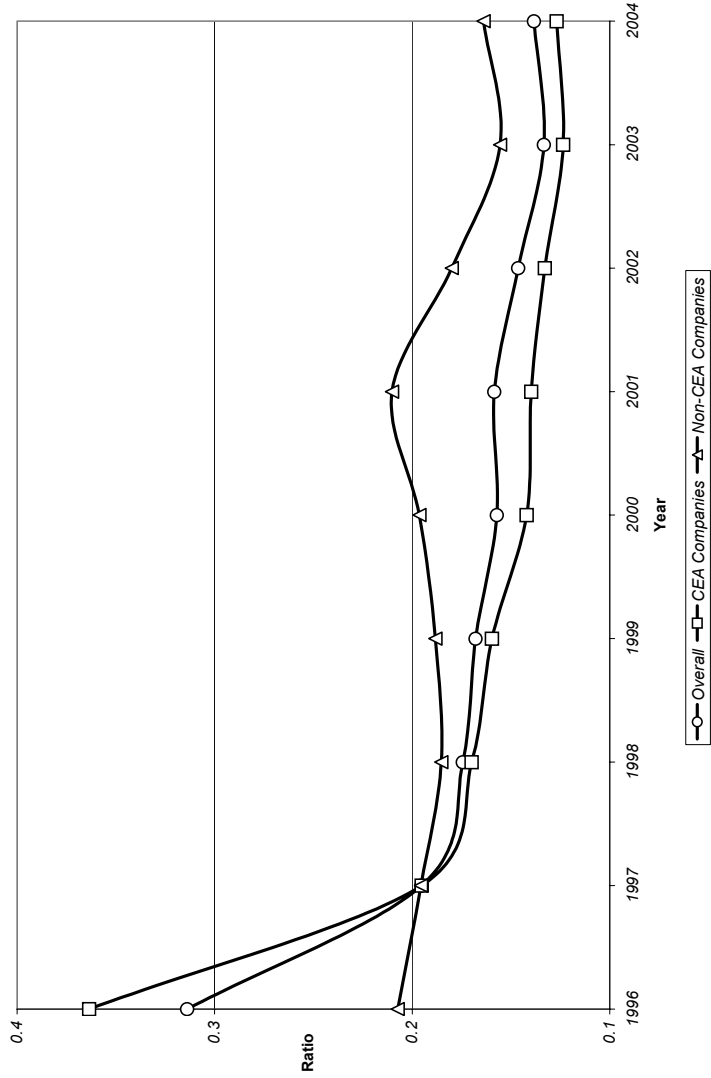
Jaffee and Russell (2000) document a decline in the purchase of residential earthquake insurance between 1996 and 1998, noting further that the decline was especially steep with respect to CEA policies. Figure 2.2 shows that these trends have continued. At the end of 2004 (the most recent data available from the DOI), only twelve percent of the residential policyholders in participating companies bought earthquake coverage from the CEA. This was a dramatic drop from the thirty-six percent take-up rate at participating companies in 1996.¹⁰ For non-CEA companies, earthquake policies as a fraction of residential policies also fell (from twenty-one percent in 1996 to sixteen percent in 2004), but the decline was not nearly so sharp. As shown earlier in Figure 2.1, CEA market share fell from seventy-nine percent of policies in 1996 (issued, at the time, mostly by the participating companies themselves) to sixty-three percent in 2004.

Part of the divergent experience can be accounted for by changes within the private (non-CEA) market since 1996. Prior to the creation of the CEA, residential earthquake coverage was mostly issued along with homeowners policies. Jaffee and Russell (2000) describe the emergence of earthquake policy *specialists* after the formation of the CEA, arguing further that these firms were "cherry-picking" the CEA's customer base. By 2003, the state's largest underwriter of residential earthquake insurance (after the CEA) was GeoVera Holdings. In 2003, the GeoVera group, whose California business consists solely of stand-alone residential earthquake policies, accounted for nearly forty percent of the residential earthquake premiums outside the CEA. Thus, the drop in purchase of CEA coverage may partly reflect migration by potential CEA customers toward stand-alone policies. On the other hand, GeoVera's rise seems more likely to be an outgrowth of

⁹ Statutory report data indicates CEA group-share of California personal auto liability DPW fell from seventy-two percent in 1995 to sixty-three percent in 2003. Nationally, their share of personal auto liability and personal injury protection fell from fifty to forty-four percent over the same time period.

¹⁰ Since the CEA was formed in December, most of the earthquake policies in the 1996 data were presumably underwritten by the companies themselves.

Figure 2.2. Ratio of Earthquake Policies Sold to Residential-Property Policies Sold



the turmoil surrounding the CEA's creation than a proximate cause. The take-up rate among CEA customers plummeted by nearly fifty percent between 1996 and 1997, while GeoVera commenced operations in 1997 and did not have sufficient business at that time to account for the loss of business at the CEA.

The CEA is not the first public disaster insurance initiative to face challenges with respect to market penetration. The National Flood Insurance Program (NFIP), founded in 1968, is a noteworthy example of a government disaster insurance initiative that has faced similar problems over its lifetime. Like the CEA, the NFIP offers standardized policies with limited coverage (currently, up to \$250,000 for the dwelling and up to \$100,000 for contents) (FEMA, 2006) and markets the policies largely through "participating" insurance companies who issue and service the policies in return for a percentage of the premium. Pricing is based on actuarial principles, although subsidies are allowed for structures in flood hazard areas that predated the creation of the Flood Insurance Rate Map.

From its inception, the NFIP has struggled with lower-than-desired penetration, a problem that has led to various legislative initiatives. Specifically, the Flood Disaster Protection Act of 1973 tied community participation in the NFIP to eligibility for disaster assistance and required flood-insurance purchase for federally related mortgages; the National Flood Insurance Reform Act of 1994 took aim at lender compliance with mandatory purchase provisions. Even with these initiatives, however, the NFIP has been unable to fully solve the problem of low penetration (see Pasterick, 1998).

While there are important differences between the two programs, the basic similarities between the CEA and NFIP suggest that the shared problem of low penetration may have similar causes. In general, private insurance companies devote significant resources to pricing, designing policies to meet identified consumer needs, and marketing. In each of these areas, to varying degrees, the public programs seem to face ongoing challenges in replicating the private activity. We consider each in turn.

Pricing

It is a well known theoretical result that pooled prices for insurance may lead to adverse selection under a variety of conditions. Specifically, if the low-risk customers in the pool do not find the price attractive, they will decline to buy the insurance. As noted by Jaffee and Russell (2000), the politicization of CEA pricing¹¹ opened the door to adverse selection by giving low-risk consumers incentives either to drop coverage or to shop elsewhere for insurance.

¹¹ See also Petak and Elahi (2001).

Coverage

As noted above, CEA coverage in 1996 corresponded to statutory minimums, which meant that the contents and loss-of-use coverage were insufficient for many customers. The CEA adapted by introducing supplemental coverage in 1999 that, among other things, extended the contents and loss-of-use limits and featured a lower deductible option. Even with the introduction of supplemental coverage, the CEA offering falls short of what is available in the private market.¹² It seems likely that the CEA has lost consumers who desired more extensive coverage (and had homes that met stricter underwriting criteria) to private insurers, such as the earthquake specialists, especially before supplemental coverage was available.

Testimony to the importance of extended coverage can be found in the private market. A number of other insurers outside the CEA offered only limited coverage, perhaps partly as a means of managing earthquake exposure. Using a website for earthquake insurance consumers, we identified a sample of companies offering “limited” earthquake coverage similar to the CEA’s coverage and a sample offering “extensive” coverage.¹³ We then compared the subsequent premium growth in earthquake premiums for the two groups over the 1993–2003 period. The group offering limited coverage had only 0.4 percent annual growth in aggregated earthquake premiums over the decade, despite annual growth in aggregated homeowners premiums of eleven percent. The group offering extensive coverage,¹⁴ on the other hand, saw annual growth of fifteen percent in aggregated earthquake and HO premiums.¹⁵

While this test is far from definitive, it seems that those offering limited coverage enjoyed some success in controlling earthquake exposure, despite growth in the HO market. This may be attributable in part to concurrent measures, in addi-

¹² For example, the author was able to obtain a quote for \$2,000,000 of dwelling coverage, \$1,000,000 of contents coverage, and \$25,000 for loss-of-use coverage at the website of a broker specializing in California earthquake insurance.

¹³ The companies were identified based on a list provided at <http://earthquakeadvisor.com>. Note that this method may have classification error, since it classifies companies based only on a single point in time. The “limited” companies were Civil Service Employees, Eagle West, California Capital, Residence Mutual, Topa, Century-National, and Travelers Property Casualty. The “extensive” companies were Amica Mutual, Clarendon National, Hartford Underwriters, Chubb Custom, GeoVera, and Pacific Select.

¹⁴ GeoVera and Pacific Select are omitted from the analysis because they (1) wrote earthquake policies only and no HO and (2) entered the market in the middle of the sample period. However, it should be noted that they experienced rapid growth over the period and soon eclipsed the other underwriters in the sample in terms of earthquake volume.

¹⁵ Shifts in the split between commercial and personal lines at the sample companies do not seem likely to account for the differences between the groups. Commercial multi-peril property premiums grew at about the same rate as HO premiums at companies offering limited coverage and were insignificant relative to HO premiums at the companies offering extensive coverage, except at Chubb Custom. Chubb Custom, however, reported minimal amounts of HO and earthquake coverage.

tion to limiting the coverage offerings, taken to limit exposure. For example, they may have set prices at relatively unattractive levels (while staying within the boundaries of the usual fairness standards required by statute). But it seems likely that the stagnation in earthquake business at these companies owed partly to offering coverage options that were unattractive to consumers.

Marketing

Life insurance, it is said, is sold rather than bought. While persuasion and selling skills are not usually accorded such respect in property-casualty insurance, they may be important in the disaster insurance context where many consumers are reluctant to purchase (Palm, 1998). The NFIP has attempted to boost penetration with advertising campaigns in recent years, apparently with some success. More fundamentally, the approach to selling NFIP policies was revamped in 1983 with the creation of the Write-Your-Own (WYO) program. With this change, the NFIP moved away from selling directly through private agents to selling through insurers acting as servicing carriers, as described above (Pasterick, 1998).

The CEA also sells through participating companies acting as servicing carriers, but it is not clear if the participating companies have strong incentives to push earthquake insurance. Participating companies are currently¹⁶ allowed to retain 12.8 percent of the CEA premium to cover commissions and operating expense. This is lower than that allowed by the NFIP (a commission of fifteen percent plus an expense allowance that has amounted to an additional fifteen percent or more in past years). Moreover, a participating company's exposure to contingent assessments depends on its corresponding share of CEA premiums: The more CEA policies sold by a participating company, the greater its assessment in the event of an earthquake. Given the commission rate and the assessment issue, it would not be surprising if the sale of CEA policies were being de-prioritized at participating companies.¹⁷

5. Conclusion

There are plausible economic rationales for why private underwriters have a limited appetite for California earthquake risk. The risk is difficult to diversify and, consequently, costly to manage. Thus, it is not surprising that earthquake coverage in the primary market is perceived to be expensive and that many companies have taken steps to limit exposure.

This chapter finds little evidence of private underwriters being penalized for shunning earthquake risk. Companies joining the CEA were able to maintain their

¹⁶ See FAQ page at CEA's website, <http://www.earthquakeauthority.com>.

¹⁷ Roth, Jr. (1998) notes that participating insurers may have attempted to limit exposure to assessment by restricting their sale of HO policies.

residential market share. Companies staying outside the CEA but offering only limited earthquake coverage did grow more slowly in the residential market than those offering extensive coverage, but the evidence was hardly definitive. Overall, insurers seem to have succeeded in reducing their residential earthquake exposure without jeopardizing the associated HO and auto business. In short, it seems that many insurers avoid residential earthquake risk partly because there are no compelling competitive pressures to underwrite. Many consumers are apparently willing to go without coverage or to settle for what is offered. Even a consumer who shops for earthquake coverage may end up purchasing a stand-alone policy and keeping the existing carrier for HO and auto coverage. Whatever the case, companies opting either to join the CEA or to reduce their earthquake underwriting by other means do not seem to have suffered significant consumer defections as a result.

A number of insurers stayed out of the CEA. These companies tended to have smaller books of California business; this may have made the risk easier to manage, even though some had significant concentration in the California market. They also tended to have fared better in the Northridge earthquake, which could possibly indicate better underwriting skills and sophistication with respect to seismic risk. They also may have had more to lose: insurers who stayed out mostly used independent agents and thus had choosier clienteles with greater risk of defections to competitors who stayed out of the CEA. Retaining control over pricing and coverage options could well have been more valuable to such insurers.

Importantly, those insurers with an appetite for earthquake risk—such as the specialist underwriters and other companies offering extensive coverage—have shown an ability to grow their earthquake business quickly. However, the overall appetite is limited. Even with the entry of specialist underwriters after 1996, private earthquake insurance still covers a relatively small portion of the residential market.

Before evaluating the CEA itself, two caveats should be noted. First, it is not obvious where low purchase rates of earthquake coverage should rank among other insurance issues in terms of importance. Specifically, households appear uninsured or underinsured with respect to many risks, including floods, long-term care, disability, and housing prices. Viewed in this light, the extent to which public resources should be devoted to promoting earthquake coverage is debatable, and it is not evident what level of voluntary purchase is reasonable to expect in the presence of federal disaster assistance programs. Second, although the CEA operates, in some sense, as an “insurer of last resort,” it was conceived in the context of resolving problems in the HO insurance market rather than as a means of boosting coverage among households. Hence, any assessment of its performance in the latter capacity should be made with due regard to its original purpose.

Caveats aside, those who hoped that the CEA would be able to increase purchase rates have been disappointed. California DOI data shows that CEA policy counts have dropped every year except 2004 and, in that year, stood at less than half the level of those issued in 1996 by participating companies. This chapter argued that this performance may owe to difficulties that public insurers face in

replicating the richness of pricing, coverage options, and selling innovations offered by a private market. In the case of the CEA, regulatory and statutory limits on pricing, coverage, operating expenses, and executive compensation, as well as requirements that policies be sold through participating companies that face conflicting incentives with respect to sales of CEA product, may have constrained the CEA's ability to reach consumers and respond to developments in the marketplace.

California's experience holds important lessons both for those assessing the prospects for private disaster-insurance markets and for those contemplating a form of public intervention.

The first lesson is that demand matters. To the extent that consumers are indifferent about earthquake coverage, private personal-lines insurers face little competitive pressure to underwrite. Palm (1998:66) observes that, due to limited demand, "universal, voluntary insurance coverage, even in an area at risk from earthquakes . . . is unlikely to be realized." Unfortunately, the extent of demand often determines the extent of underwriting interest. But the willingness of insurers to underwrite, even aggressively in some circumstances, suggests that private suppliers will respond to increased consumer demand for coverage with an increased appetite for risk.

A second lesson is that the details of public insurance provision—such as pricing, coverage design, and marketing—weigh heavily on its prospects for reaching consumers. As with any product, consumers value price and selection (of coverage options, in this case), and may respond to persuasion. If the public program lacks flexibility in coverage offerings and faces constraints in its sales channels or in providing sales incentives to its producers, it may well struggle to obtain and retain customers. In summary, even if a public underwriter is chartered, voluntary purchase by consumers is far from guaranteed.

A final lesson is that there are real costs of production associated with underwriting earthquake risk. The aversion of private underwriters to earthquake risk partly reflects the high costs of managing that risk. In particular, both the CEA and private underwriters protect themselves with reinsurance, which is well known to be expensive for catastrophic risks such as earthquake. Thus it seems likely, even with improvements in consumer demand, that equilibrium purchase rates may remain relatively low in the absence of pricing subsidies.

