# The Role of Disclosure in the Flood Zone: Assessing the Price Effects of the California Natural Hazard Disclosure Law (AB 1195)

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## Abstract

In 1998, California passed the Natural Hazard Disclosure Law (AB 1195), requiring home sellers to inform potential buyers of flood, wildfire and seismic hazards affecting a property. This study uses hedonic analysis to examine the effects of flood disclosure under AB 1195 on property values throughout California and to examine the variability of these price effects in relation to demographic factors. The study found that flood disclosure under AB 1195 reduced the value of the average floodplain home by roughly 4% relative to comparable floodplain homes selling before the law. Addition of interaction terms indicated that most of the negative variance due to flood disclosure was accounted for by highly Hispanic neighborhoods. This suggests not only that disclosure under the previously existing National Flood Insurance Program (NFIP) was incomplete, but that homeowners in Hispanic communities are better disclosed to under AB 1195 than under the NFIP, possibly because disclosure under the latter is triggered by financing mechanisms that may not be as prevalent in some Hispanic neighborhoods.

## Introduction

While a great deal of research has looked at the effects of floodplain location on housing values (see Schilling *et al.* 1985, MacDonald *et al.* 1987, Donnelly 1989, Tobin and Montz 1994, Fridgen and Schultz 1999, Harrison *et al.* 2001), the question of imperfect information in floodplain housing markets has gone largely overlooked. Flood disclosure, which has been regulated at the federal level under the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP), has generally been assumed to be complete. However, this study provides evidence that disclosure may be imperfect under the NFIP, particularly in the Western U.S., and that the mechanisms that trigger NFIP disclosure may bias the dissemination of information to the detriment of certain groups.

A relatively new law, the California Natural Hazards Disclosure Law of 1998 (AB 1195), offers an excellent opportunity to study floodplain housing markets under a more rigorous approach to disclosure. AB 1195 requires sellers to disclose on an approved Natural Hazard Disclosure Statement if a property is located in statutory wildfire, flood or seismic hazard zones[i]. Unlike the NFIP, which invokes disclosure through the mortgage process and often does not result in a timely enough disclosure for the added expenses to be capitalized into housing values, written disclosure is required under AB 1195 in all housing transactions prior to closing, with a three-day rescission clause to encourage timely disclosure. An incentive for compliance with AB 1195 is that it protects the seller and their agent from liability exposure due to error, omission or inaccuracy in the disclosure, transferring it instead to the company, hired by the seller, that makes the hazard designation.

This study examines the effects of AB 1195 on property values in flood hazard zones throughout California. Using hedonic analysis of tens of thousands of property transactions in a variety of housing markets, it isolates longitudinal price differentials between comparable floodplain and non-

floodplain properties before and after AB 1195, as well as cross-sectional differentials between comparable floodplain and non-floodplain properties both before and after the law. A more negative differential between comparable floodplain and non-floodplain properties following AB 1195 relative to before is an indication that the law has affected prices, indicating a greater level of information in transactions. It explores whether the price effect of disclosure under AB 1195 varies with income, ethnicity or market segment.

The study has three purposes. The first is to add information to the literature on how the costs and risks of living in hazard zones are internalized by housing markets. This study is of particular significance in that it is one of the first to address capitalization of flood hazards in housing markets in the American West. The second purpose is to determine the extent to which information is better disseminated under AB 1195 relative to the NFIP. This is intended not only to illustrate inadequacies with disclosure under the NFIP, but also to assess the success of AB 1195 as a new approach. The third is to determine whether biases existed in the disclosure mechanisms of the NFIP that may have systematically resulted in lower levels of information being passed on to certain income or ethnic groups, and, if so, whether AB 1195 has helped to correct those biases.

In theory, disclosure should enhance the efficiency of market allocations of land in hazardous areas. Better information about the presence of hazards should reduce the relative price of hazard zone properties by increasing buyers' knowledge of the risks and additional expenses associated with living in them. The negative premium due to disclosure should consist of the capitalized value of the added expenses, such as insurance and flood proofing costs, plus an “option price” or risk aversion premium that compensates for the uncertainty of potential damages in excess of insurance coverage.

Most research has found that floodplain location is capitalized negatively into housing prices, although they have only looked at this question in a small number of housing markets in the Eastern and Midwestern U.S. Using hedonic analysis of home sales prices in Louisiana, MacDonald *et al.* (1987) found that statutory floodplain homes sell on average for between 6% and 8% less than comparable non-floodplain homes. They found that the differential was equated with the present value of insurance premiums at a 2.8% discount rate but that an "option price" emerged at a higher discount rate. In MacDonald *et al.* (1990), they added that the selling price differential also includes the difference in non-insurable costs. Using hedonic analysis of sales prices Shilling *et al.* (1985) found that floodplain location in Louisiana reduced home values on average by 6.4% from comparable houses outside the floodplain and that the reduction in value equaled the present value of insurance costs when calculated at a 5% discount rate. Donnelly (1989) conducted a hedonic analysis on sales prices for floodplain and non-floodplain properties in La Crosse Wisconsin and concluded that floodplain location reduced sales price by 12%, or $6,000 for the average house in his study area. This is compared with a $3100 to $3500 present value of flood insurance payments. At a 10% discount rate, he calculated that this results in a $2,500, or 6% risk aversion premium. Harrison *et al.* (2001) used hedonic analysis to look at floodplain properties in Florida and found a smaller differential. They found that prior to the 1994 National Flood Insurance Reform Act, that differential was roughly $985 for the average house while it rose to $2,126 after. This amount was found to be less than the present value of flood insurance premiums. Fridgen and Schultz (1999) used hedonic analysis to study how floodplain location affected housing values in Fargo, North Dakota and Moorehead, Minnesota. Location in the 100 year floodplain lowered values on average by $8,990, while after a major flood that negative premium rose to $10,241. One study did find the opposite effect of floodplain location. Using nonparametric tests of differences in mean appreciation rates, Muckleston (1983) found that in Oregon, regulations for floodplain homes did not serve to depress property values, as hypothesized, but rather tended to be associated with an increase in value.

However, the author cautioned that those conclusions were tentative and offered the caveat that study areas were not uniform due to heavy development right before the implementation of the floodplain regulations. He also cautioned that at the time of the study, regulations were in the "emergency" phase, meaning they were less stringently enforced and less likely to impact property values.

None of these studies differentiates buyers according to the information they possess. That is, lacking an adequate disclosure law, their data sets include transactions where the parties both did and did not know about the hazard designation at the time of sale. Because they cannot control for information, their estimates of floodplain capitalization are likely based on a market operating under imperfect information. But they yield important results nonetheless. Not only do they show how land markets internalize the costs and risks associated with natural hazards, but they also show that many homebuyers do have good information about floodplain location independent of AB 1195.

This study differs from previous ones in several respects. First, its assessment of capitalization effects should be more accurate, because higher levels of information in floodplain transaction can be assumed under the combination of AB 1195 and NFIP than under just the NFIP. Second, it looks at the inadequacies of information dissemination under the NFIP, using AB 1195 as a baseline for comparison. Third, it looks at the distributional consequences of disclosure under the NFIP and AB 1195. Fourth, it is among the first studies to address the question of floodplain price effects in California or the American Far West (except for Muckleston's study in Oregon, whose results were at odds with all other studies cited). While most of the literature has focused on the Midwest and East, it is likely that the results they yield are not entirely applicable to California, not only because of the different nature of the hydrology of many western rivers and streams, but also because of the significantly different nature of housing markets in California. It is likely that housing prices are affected differently by floodplain location in California, because of housing markets where demand

significantly outstrips supply. It is also likely that the different hydrology of western river systems affects consumer perception differently. Californians are likely less aware of flood hazards than residents in less arid parts of the country because many western watercourses can be highly deceiving; seasonal precipitation and generally smaller watersheds mean that rivers may appear non-threatening or even dry, yet pose a serious risk in the long-term. By contrast, watercourses in the wetter East and Midwest have a tendency to be much larger and more perennial, making floodplains more discernable and residents more aware of the significance of their location.[ii] In situations where homebuyers have this awareness, it is far more likely that they will factor those added expenses into the home buying decision even if they are not disclosed to through official channels. Because this awareness may be less prevalent in the West, statutory disclosure takes on a greater importance in terms of correction of information asymmetries.

## Previous Flood Hazard Disclosure Requirements

The National Flood Insurance Program (NFIP)[iii] requires transfer disclosure for houses in Special Flood Hazard Areas (SFHA's)[iv], the same houses that are required to purchase NFIP insurance, but disclosure is inconsistent because the program is designed less to protect consumers than to protect the federal government's financial interests. When Congress amended the National Flood Insurance Act in 1974, flood insurance became mandatory for Special Flood Hazard Area (SFHA) properties with mortgages originated by federally regulated institutions and mortgages that were sold on the secondary market to the Federal National Mortgage Association (FNMA, or "Fannie Mae") or the Federal Home Loan Mortgage Corporation (FHMC, or "Freddie Mac"). This arrangement left many homebuyers and some sectors of the mortgage industry unregulated by the NFIP, and hence not subject to disclosure. In addition to those who self-financed, or financed through informal sources, this included those who financed through non-federally regulated "mortgage companies." Flood determinations, and hence flood disclosures, are generally only triggered for mortgage companies

when they sell a mortgage portfolio to a larger federally regulated lending institution, many of which in turn resell those portfolios to FHMC or FNMA. This is because federally regulated lending institutions require a federally compliant mortgage contract which requires flood determinations; if any determinations in the portfolio are positive, those owners must buy insurance.

According to Jack Eldridge, Community Mitigation Program Branch Chief for FEMA Region IX, property owners who financed through mortgage companies frequently do not learn that their house is in a floodplain until the mortgage company resells the portfolio, which may be years after the owners purchased their property (personal communications, 2000, 2001). Disclosure after the transaction is essentially meaningless from the perspective of the consumer. It fails to protect consumers, because they did not know about the flood zone status when they chose to purchase that property, and it fails to correct market inefficiencies stemming from information asymmetries, since bids do not reflect the costs and risks associated with living in that location. From the perspective of this study, late disclosure is equivalent to no disclosure.

## The California Natural Hazard Disclosure Law of 1999

AB 1195[v] represents a more inclusive approach to hazard disclosure. It requires home sellers of properties within designated natural hazard zones to show prospective buyers a Natural Hazard Disclosure Statement prior to escrow. The statement informs buyers that the property is potentially located in one or more of these zones:

- Special Flood Hazard Areas (SFHAs), corresponding with the 100 year flood plain, designated by the Federal Emergency Management Agency (FEMA)
- Areas of Potential Flooding in the Event of Dam Failure, designated by the State Office of Emergency Services (these are not examined in this article)
- Very High Fire Hazard Severity Zones (VHFHSZs), designated by the California Department of Forestry (CDF) in conjunction with local governments
- Wildland Fire Areas, also known as State Responsibility Areas (SRAs), designated by CDF
- Earthquake Fault Zones, designated by the State Geologist; and
- Seismic Hazard Zones, designated by the State Geologist.

The Statement warns buyers "these hazards may limit your ability to develop the real property, to obtain insurance, or to receive assistance after a disaster." Once a local agency makes available maps showing parcels affected by the hazard zones, the seller and the seller's agent are responsible for disclosing that information. The law additionally requires that homeowners in a flood zone purchase flood insurance, in accordance with the NFIP regulations.

AB 1195 consolidated previous state[vi] and federal hazard disclosure requirements into one Natural Hazard Disclosure Statement (NHDS) and added requirements for several new zones, including a new statutory wildfire hazard zone. It makes written disclosure of FEMA flood hazard zone location required for all housing transactions in the state. While to some it may seem redundant to have flood disclosure in California regulated at both the federal and state levels, AB 1195's inclusion of FEMA flood zones is a tacit recognition that flood disclosure provisions are inadequate under federal legislation, at least from the perspective of the consumer. AB 1195 placed the code sections for all six types of hazard disclosure in the state Civil Code. This is important, according to Peter Detwiler, Staff Director of the California Senate Local Government Committee, because legal council for the real estate industry typically refer most closely to that section of code (personal communications 1999, 2001). AB 1195 also granted a three-day rescission period during which buyers have the right to terminate a transfer after signing a contract if proper disclosure was not made. This provision gave sellers and their agents an incentive to disclose early in the process rather than at the last minute, as was commonly the case when disclosure did occur in the past. Finally, in contrast to previous hazard disclosure laws, AB 1195 clearly articulates where real estate agents are liable for disclosure and where they are not. It makes clear which hazards the agent is responsible for disclosing, and it protects the seller and their agent from liability exposure due to error, omission or inaccuracy in the disclosure.[vii] Instead, that liability is transferred to a third party company hired by the seller to

conduct the report, usually for a fee of between $50 to $100. This shielding of liability is likely a significant incentive for compliance with the law.

## Methods

This study uses hedonic analysis to isolate the price effects of disclosure under AB 1195. Economists including Rosen (1974), Quigley and Kain (1970) and Griliches (1971) developed the concept of hedonic price analysis, in which the observed price of a good is econometrically disaggregated into a schedule of implicit marginal attribute prices. The first step hedonic equation is estimated by regressing observed market price on a vector of neighborhood, locational and structural attributes. Willingness to pay (WTP) for a marginal change in the attribute can then be determined by taking first order conditions for utility maximization subject to a budget constraint. This gives the partial derivative of the hedonic price equation for housing with respect to a marginal attribute change under equilibrium:

$$W_a\,(h) = \delta p(h) / \delta(a),$$

where $W_a\,(h)$ is the WTP for a marginal change in the amenity, $p(h)$ is the hedonic equation and $a$ is the level of the (dis)amenity. If it were calculated separately for each household, this derivative would be an estimate of the household's WTP for marginal increases in the amenity. In this study, sales price was regressed on a vector of neighborhood, locational and structural attributes, in addition to dummy variables for flood zone and fire zone location (the results of fire zone location are not discussed in this paper) and a dummy variable for transaction before or after the law.

A two-tier cluster sample method was used to get a representative sample of housing transactions from across California. In the first tier, zip codes from across the state were sampled by stratifying them by population density, median 1999 housing price and presence of hazards, for zip codes meeting a minimum threshold value for percentage of the land area occupied by statutory fire zones

or flood zones.[viii] The resulting sampling matrix is given in Table 1. Cells in gray represent strata that were not sampled, including strata with insignificant numbers of zip codes and strata that did not meet the threshold for percentage of land in hazard zones. One of every 9 observations was sampled from the remaining cells, yielding 63 sample zip codes. Figure 1 shows the location of sample zip codes. This sampling method firstly ensured that there would be enough housing transactions from areas with hazard zones; even with this oversampling of hazardous zip codes, only roughly 1 in 5 properties was located in a statutory hazard zone. Secondly, it ensured that heterogeneous neighborhoods would be included, across the spectrum of housing values and population density.

Once sample zip codes were chosen, individual property transaction records were obtained for the period starting 18 months before the implementation of the law to 19 months after it. Both vacant and developed parcel transactions were downloaded[ix], but only the results of regressions on developed properties are discussed here.[x] These property points were address geocoded using Arc View software. A variety of structural, locational, demographic, school and market variables were coded for each property point as control variables.[xi] A price adjustment factor, varying by quarter was also included. Variable names, descriptions, count proportions and means values are given in Table 2. The key variable discussed in this paper is location in FEMA SFHA flood zones.[xii]

After all variables were coded, tier two sampling began. Property records were stratified by zip code and by hazard (or no-hazard) zone.[xiii] Since there were 63 zip codes and three hazard categories—fire, flood or no hazard (properties in both zones were so rare as to be insignificant)—this resulted in a total of 189 cells. A sampling algorithm was created that oversampled cells (i.e. groups of properties of a given hazard status within a given zip code) with low populations and undersampled cells with high populations, at a rate of $s_{ih} = \left( \frac{1}{\log(n_{ih})} \right)^{j_{(h)}}$ where $s_{ih}$ is the number of samples in the cell

corresponding to zip code *i* and hazard type *h,* $n_{ih}$ is the number of observations in that cell and $j_{(h)}$ is an exponent that varies with hazard zone type. $J_{(h)}$ was then adjusted so that the combined number of non-hazard zone samples was set to only twice that of combined flood and fire zone samples.[xiv] Since non-hazard zone properties are over five times as prevalent as combined flood and fire zone properties overall within the 63 zip codes, this served to oversample hazard zone properties. Samples were assigned a different sampling weight by cell, for use in weighted least square estimation, equal to the inverse of the sampling rate for that cell. The sample included 2,840 records in flood zones (about 62% of all flood zone records), 4,258 from fire zones (54%) and 14,478 from no-hazard zones (38%), all of which were randomly sampled by stratum and assigned sampling weights.

Data were regressed using a semi-log functional form.[xv] One property of this functional form is ease of interpretation; coefficients can be interpreted as percentage changes in the response due to a marginal increase in an attribute. Quadratic terms were also included for most distance and size variables, where significant. A total of 41 variables were used. While more variables had been coded that could have been used, they were not included because they resulted in only minute gains to model fit at the expense of model parsimony. The models given here had significantly higher F-statistics those with far more control variables. Both weighted and unweighted least squares regressions were run. While unweighted models fit the data slightly better, core results were robust to inclusion or exclusion of weights, with only slight variations in magnitude. Results of both are given here. Attempts were also made to separately estimate equations stratified by time before or after AB 1195 as opposed to the pooled model where time before or after was coded as a dummy variable (AFTER). The utility of stratification could be rejected flat-out without conducting Chow tests or F-tests since the combined residual errors of the stratified models was far greater than the residual errors for the pooled model.

Two regression models were used to assess the effects of flood disclosure. Model 1 looks at the overall effect of flood disclosure without interaction. It includes the terms FLOOD, representing the price effect of flood location before AB 1195 and FLOOD:AFTER, representing the effect of flood location after AB 1195. Model 2 includes the interaction term FLOOD:AFTER:PHISP, representing how the price effect of flood disclosure varies with percentage of Hispanic residents in a census tract. When the three way term was added, none of the constituent two-way terms (FLOOD:AFTER, FLOOD:PHISP, AFTER:PHISP, FLOOD:AFTER) were significant at the 90% confidence level and so were dropped. Other three way interactions were tested between disclosure and factors including income, housing market metrics, employment metrics and other demographic metrics. While some were significant, all lost significance when FLOOD:AFTER:PHISP was added, strongly indicating that that term was describing a dominant relationship.

## Analysis of Price Data

Regression results for Model 1 (see table 4 for full results, table 3 for summary) indicate that prior to AB 1195 floodplain homes sold for more than comparable non-floodplain homes, *ceteris paribus* and that disclosure reduced this positive premium. In this model, FLOOD (representing the floodplain premium before AB 1195) is positive and significant, with a value of .055 (unweighted) and .066 (weighted). FLOOD:AFTER (representing the change in floodplain premium after AB 1195) is negative and significant, with a value of -.039. This indicates that prior to AB 1195, floodplain homes sold for 5.5 to 6.6% more than comparable non-floodplain homes, while after the law, they sold for only about 1.5 to 2.5% more than comparable non-floodplain homes. R-squared values were .793 (F statistic of 2064) for the weighted model and .804 (F statistic of 2210) for the unweighted model. Most control variables had expected signs.

The positive coefficient on FLOOD prior to AB 1195 is somewhat counterintuitive, since the mean price for a floodplain home from the data set was nearly $50,000 less than a non-floodplain home.[xvi] A variety of control variables, including Percent Hispanic (HISP), mean school test scores (API.AVG), proximity to employment centers (CBDIND2) and median price by city (MEDPRCTY) all appeared to be correlated with FLOOD and to account for the negative variance in price that FLOOD (in the BEFORE stratum) would have accounted for were they not included. The inclusion of any one of nearly 15 control variables was sufficient to turn the coefficient on FLOOD (in the BEFORE stratum) from negative to positive, suggesting that the lower average property values in California floodplains are related more to these associated control attributes than to the actual costs of living in a statutory floodplain.

The effects of flood disclosure are socially selective. While there is no significant interaction between flood disclosure and income or housing market segment, the interaction term in Model 2 (see table 5 for full results, table 3 for summary) indicates that the negative capitalization caused by flood disclosure is mainly accounted for by neighborhoods with a higher than average proportion of Hispanic residents. When the effect of flood disclosure in Hispanic neighborhoods is adjusted for through the term FLOOD:AFTER:PHISP, FLOOD:AFTER is no longer significant (even at the 75% confidence level) and so is dropped from the model. Regressions fail to indicate that there was an interaction between the PHISP variable and FLOOD before AB 1195; the term PHISP:FLOOD is insignificant at the 90% confidence level and so is dropped from Model 2 as is PHISP:AFTER. However, the significance of the three-way term is an indication that the reduction in floodplain prices brought about by AB 1195 were increasingly pronounced with increasing percentage of Hispanic residents in a neighborhood; in a census tract with 10 % Hispanic population, floodplain properties sold for –1.5 % to -1.6% less than comparable floodplain homes in the same census tract selling before AB 1195. A home selling

after AB 1195 in a tract that is 50% Hispanic (of which there are many in the data set) could therefore see an 8% reduction in that home's value relative to comparable homes in the same neighborhood selling before the law. In model 2, the coefficient on FLOOD stays roughly the same, between .055 and .065, indicating that AB 1195 had no significant effect on largely non-Hispanic neighborhoods and that the positive premium associated with floodplain location arises mostly from those neighborhoods.

## The Price Effects of Flood Disclosure Under AB 1195

With interaction not included, disclosure under AB1195 appears to have lowered consumer willingness to pay for property in statutory flood zones. Before AB 1195, floodplain properties sold for roughly 6% more on average than comparable non-floodplain properties, holding other attributes constant. AB 1195 reduced that to about a 2% positive premium, meaning that a floodplain home sold after the law for about 4% less than the same floodplain home before the law. The regression equation was solved for different combinations of FLOOD and AFTER, using the mean attribute values, to derive an actual price effect due to disclosure. Table 6 summarizes predicted sales price for the four possible combinations, and gives the positive cross-sectional differential between flood zone and non-flood zone properties before the law ($11,384) and the same differential after the law ($4,844). The longitudinal effect, or net change in differentials due to the law, is -$6,540. That there is a significant negative change in the flood zone premium after the law strongly suggests that disclosure did not occur in many transactions prior to AB 1195.

This study differs from the previous literature in that it finds that houses in floodplains sell for slightly more than comparable houses outside floodplains. This may be explained by the fact that this is the first major study of floodplain capitalization in California. Not only do housing markets differ in much of California, with demand considerably outstripping supply, relative to many of the

Southern and Midwestern markets discussed in the literature, but Western watercourses present a different type of hydrology that may affect consumers differently. Not only are many statutory floodplains in the West situated around intermittent watercourses, some that may only see water for a few days a year, but the small size of California watersheds (relative to, say, that of the Mississippi River), means that what seem like diminutive and benign watercourses can pose severe and "flashy" flooding threats that consumers may be unable to perceive. Eastern Rivers, on the other hand, while they fluctuate through the year, are much more constant, and because of this, consumers are likely much more aware of the hazards they face. The positive premium may also have been related to low rates of NFIP insurance purchase in California floodplains relative to other parts of the country. Finally, it may relate to the fact that this study has included a greater series of control variables than most studies. It is possible that in many cases, poorer, less desirable housing ends up sited in floodplains and that apparently lowered property values are due not to added expenses from floodplain living, but to the other characteristics of neighborhood that make the area less desirable to buyers. When these characteristics are adjusted for then, the net effect of floodplain location no longer appears negative.

AB 1195 reduces prices in floodplains relative to before AB 1195, but Hispanic neighborhoods account for most of the negative variance. This is a significant result not only because the mean value for PHISP is 18.5%, but also because, as the histogram in Figure 3 shows, a large proportion of floodzone transactions in the sample are in tracts with a very large percentage of Hispanic residents. When this interaction effect is accounted for, disclosure under AB 1195 has no further effect. That is, AB 1195 significantly changed floodplain sale prices in heavily Hispanic neighborhoods, but its effects were decreasingly felt with increasingly non-Hispanic neighborhoods. Two possible explanations are put forward to explain this effect. The first explains this partly as a result of differences in the mechanisms of disclosure before and after the law. These difference may

have meant that flood disclosure was occurring less often in Hispanic neighborhoods than in non-Hispanic neighborhoods previous to AB 1195 (that is, under the NFIP) and that AB 1195 served to equalize the frequency of disclosure between predominantly Hispanic and predominantly non-Hispanic neighborhoods. AB 1195 would appear to disproportionately affect Hispanic neighborhoods because it corrected this previous discrepancy in disclosure. If, as the histograms in Figures 2 and 3 suggest, Hispanics disproportionately live in floodplains (in the data set, the average percentage of Hispanics for the tracts to which non-floodzone properties belong is 17.5%, while for floodzone properties that number is 31%), then most of the variance in floodplain capitalization would be accounted for by Hispanic neighborhoods. The combination of Hispanics not getting disclosed to prior to AB 1195 and their large population share of floodplain properties may then help explain why AB 1195 appears to have reduced prices in floodplains when interaction is excluded.

The mechanism of that discrepancy may have to do with sources of financing. It is possible that homebuyers in heavily Hispanic areas disproportionately obtain financing from unregulated sources, such as federally unregulated mortgage companies or through self-financing and intra-family financing. FEMA requires regulated lenders (banks, S&Ls, credit unions, etc.) to make flood determinations, but only requires mortgage companies to make determinations when they sell investment grade mortgage portfolios to FNMA and FHMC; it is possible that many new home purchases in Hispanic neighborhoods fell through the legislative cracks and were not subject to disclosure or were subject to disclosure after transaction.[xvii] It may also be that mortgage companies that originate loans to a largely Hispanic clientele do not sell mortgage portfolios as often on the secondary market.

Despite the reduction in sales price of floodplain homes in Hispanic neighborhoods relative to before AB 1195, the fact that the FLOOD coefficient stays positive in Model 1 is an indication that many

floodplain homes in Hispanic neighborhoods sell for more post-AB 1195 than comparable non-floodplain homes. It is only when the negative effect of the three-way term exceeds the positive effect of FLOOD that a cross-sectional negative price effect appears—this is, where prices of floodplain homes in Hispanic neighborhoods begin to be worth less than comparable homes outside of the floodplain. This equalization occurs roughly the 40-45% level for the PHISP variable, depending on whether weighted results are used. Hence floodplain properties selling in a neighborhood with 60% population post-AB 1195 will sell for about 3% less than comparable non-floodplain properties, in addition to selling for about 9.5% less than a comparable floodplain property selling in a comparable census tract before the law. If then, a large number of Hispanic properties do not receive the positive capitalization experienced by other floodzone properties, and if Hispanics are disproportionately located in flood zones, then it is possible that different types of floodzones exist, with heavily Hispanic neighborhoods disproportionately occupying one type. While the SFHA designation given by FEMA to different floodplains may represent the same statistical probability of flooding, it seems likely that all floodplains are far from substitutable. Two general types of floodplains are posited here. First are those that occur around smaller watercourses, take up relatively small amounts of land and are proximate to much larger amounts of flood-free land. This might include SFHA zones in more affluent river- and stream-side communities, within canyons, along small streams in suburban areas, or intermittent watercourses in semi-arid locations. All of these landscapes are types that are desirable for suburban living in terms of aesthetics and natural appeal, and psychologically they may convey less of a threat because of their intermittent hydrology and because of the proximity of flood free land. Also, for many of these properties, only part of the parcel may be within the floodplain. Because of the high demand relative to supply for these “urban-fringe” properties, it is likely that many buyers are willing to overlook or discount statutory floodplain location.

In contrast are the extremely large, homogeneous SFHA zones located in California's agriculturally important Central Valley, where floodplains are very large, natural amenities are fewer, flood-free land is less available and parcels are likely to be entirely within the SFHA. Those who live in the first type, if aware of the floodplain designation, do so as a choice, because it offers ex-urban amenities and because the flood threat may appear manageable, while those who live in the latter may do so out of necessity, in particular to be proximate to agricultural employment, which is often found around large floodplains. Visual map analysis suggests that the smaller localized type of floodzone is found in mostly white areas, while large-scale floodplains appear to be quite common in heavily Hispanic areas. In other words, after the various demographic and market variables that explain low prices in the second type of floodplain have been factored out, it is possible that the FLOOD variable may proxy various omitted and difficult to quantify attributes associated with amenity-rich ex-urban locations in the first type.

The second explanation hypothesizes that the PHISP variable is merely a proxy for an omitted structural variable with which the true causal relationship exists. For instance, the variable may proxy housing quality, an attribute for which no data were available. According to Milgram (1988) and Krivo (1995) Hispanics, especially recent immigrants, tend to get lower quality housing for a given amount of money relative to whites because of factors including real estate steering practices (Ondrich 1998) and language barriers that give sellers a distinct advantage over some Hispanic buyers. Hispanic immigrant households frequently choose to cluster densely in the same neighborhood, which also makes Hispanic buyers willing to pay more for what is often substandard housing and gives non-Hispanic sellers another advantage. If this were the case in general, then the Hispanic variable may actually be a proxy for housing quality, since price, in these neighborhoods does not adequately reflect quality. In this case, the negative interaction between disclosure and Hispanic population indicates that disclosure's effects are particularly felt for low quality houses; it

may be that lower quality houses are more expensive to insure adequately because they may lack floodproofing and structure elevation and have substandard basements.

Because these data indicate a positive premium for floodplain properties prior to AB 1195 and a reduced but still positive premium after AB 1195, it is impossible to determine the extent to which post-AB 1195 property values capitalize the present value of flood-related costs, because no basis exists for cross-sectional comparison. However, the change in value in floodplain homes due to AB 1195 can be thought of as an indicator of the increased internalization of costs associated with floodplain location. It is impossible to use a comparison of the capitalized value of those costs and the longitudinal differential to deduce the extent of disclosure previous to AB 1195 with certainty because the existence and magnitude of an option price is unknown. But the closer that differential is to the capitalized value of insurance costs, the more it indicates that disclosure prior to AB 1195 was insufficient to internalize those costs. The mean assessed structure value for houses in the data set was $90,000. Assuming full coverage of the structure, no elevation or basement, construction before issuance of the FIRM map and $20,000 in contents coverage, the premium on this house would be approximately $590 per year.[xviii] At a 5% discount rate, the present value of these payments would be $11,800, which is considerably more than the $6,540 loss in floodplain property value under Model 1. However, solving the Model 2 regression equation for a neighborhood that is 50% Hispanic indicates that in such a neighborhood, post-AB 1195 floodplain properties sell for $14,000 less than comparable pre-AB 1195 properties. Hence, in heavily Hispanic neighborhoods, AB 1195's price effects include the full capitalized costs of insurance plus a $2,200 option price. Regardless, both models suggest that prior to AB 1195, land markets poorly internalized the costs of floodplain location, likely due to a lack of information.

## Policy Implications

Across the state, hazard disclosure is happening with more frequency and with more effectiveness than prior to AB 1195. A possible reason for the success of this law is that it relies upon incentives that are of great importance to REALTORS®, namely the transference of liability from sellers and agents to third party disclosure companies. Given the importance of housing transactions, and the gravity of potential liability, it is not surprising that this mechanism for encouraging disclosure would work well. This approach to disclosure could serve as a useful template for other states that wish to enact similar legislation.

AB 1195 appears to be much more effective in the California context than previous disclosure requirements under the NFIP. Disclosure under the NFIP is problematic because it relies on mortgage originators to ensure flood designations and disclosures. Those who self finance or finance through non-federally regulated mortgage companies frequently never get disclosed to at all. Many who finance through mortgage companies only get disclosed to long after time of transaction, when mortgage portfolios are sold on the secondary market. Because significant differences in methods of financing may exist between racial or ethnic groups, it would not be surprising if these regulatory peculiarities are at least partly responsible for the racial selectivity of disclosure under AB 1195. It is recommended that FEMA conduct further studies throughout the country to determine the frequency of housing transactions where flood designations and disclosure either did not occur or did not occur until after transaction. Moreover, it is suggested that they investigate whether the frequency varies with different racial and ethnic groups.

Further investigations are also merited into why the price effects of disclosure in California are so conditioned on ethnicity. In particular, real estate steering, insurance redlining and unfair home selling practices should be investigated. Because of federal oversight of the NFIP and its Write

Your Own policy program, it is unlikely that the private agents who write policies are employing redlining practices in Hispanic areas. However, “steering” to certain neighborhoods by real estate could contribute. Hispanics may be paying more for insurance and suffering more flood damage because they are being "steered" disproportionately to flood zone properties, and within those zones, to lower quality homes with substandard floodproofing. Fair housing audits are recommended to determine if such practices are occurring in these neighborhoods.

This study also shows that disclosure is critical in the Western U.S. context. This study found a positive premium associated with transaction in a floodplain prior to AB 1195. This contrasts with the previous studies on this subject, most of which look at Eastern and Midwestern housing markets, and which found a negative premium instead. This suggests that many more Western floodplain dwellers (pre-1998) were unaware of the fact they were living in floodplains than Eastern floodplain dwellers, even though both groups were regulated under the NFIP. While the strength of California housing markets, in particular, may obscure the added costs of flood location, differences in hydrology make the nature of the flood threat less immediately apparent to those dwelling around California rivers. FEMA should determine whether systematic differences exist in awareness of floodplain location in the East and West and, if they do, special efforts should be made towards strengthening and enforcing disclosure requirements in areas where homebuyers lack that awareness.

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# TABLES AND FIGURES

TABLE 1. NUMBER OF ZIP CODES CATEGORIZED BY POPULATION DENSITY AND PRICE

| hazard=just flood | | | | | | hazard= just fire | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | population density | | | | | | population density | | | |
| | | 60-1000 | 1000-5000 | 5000+ | | | | 60-1000 | 1000-5000 | 5000+ | |
| **House** | <150K | 49 | 50 | 20 | total | **House** | <150K | 48 | 14 | 6 | total |
| **price** | 150-250k | 13 | 28 | 24 | 239 | **price** | 150-250k | 55 | 32 | 17 | 303 |
| **1999** | 250k+ | 4 | 22 | 29 | | **1999** | 250k+ | 49 | 63 | 19 | |
| **hazard=both** | | | | | | **hazard=none** | | | | | |
| | | population density | | | | | | population density | | | |
| | | 60-1000 | 1000-5000 | 5000+ | | | | 60-1000 | 1000-5000 | 5000+ | |
| **House** | <150K | 43 | 10 | 0 | total | **House** | <150K | 35 | 22 | 80 | total |
| **price** | 150-250k | 16 | 15 | 1 | 120 | **price** | 150-250k | 3 | 36 | 98 | 403 |
| **1999** | 250k+ | 15 | 20 | 0 | | **1999** | 250k+ | 3 | 43 | 83 | |
| Cells in gray represent strata that were not sampled | | | | | | | | | | | |

FIGURE 1 SAMPLE ZIP CODES SELECTED FOR FIRST STAGE SAMPLING

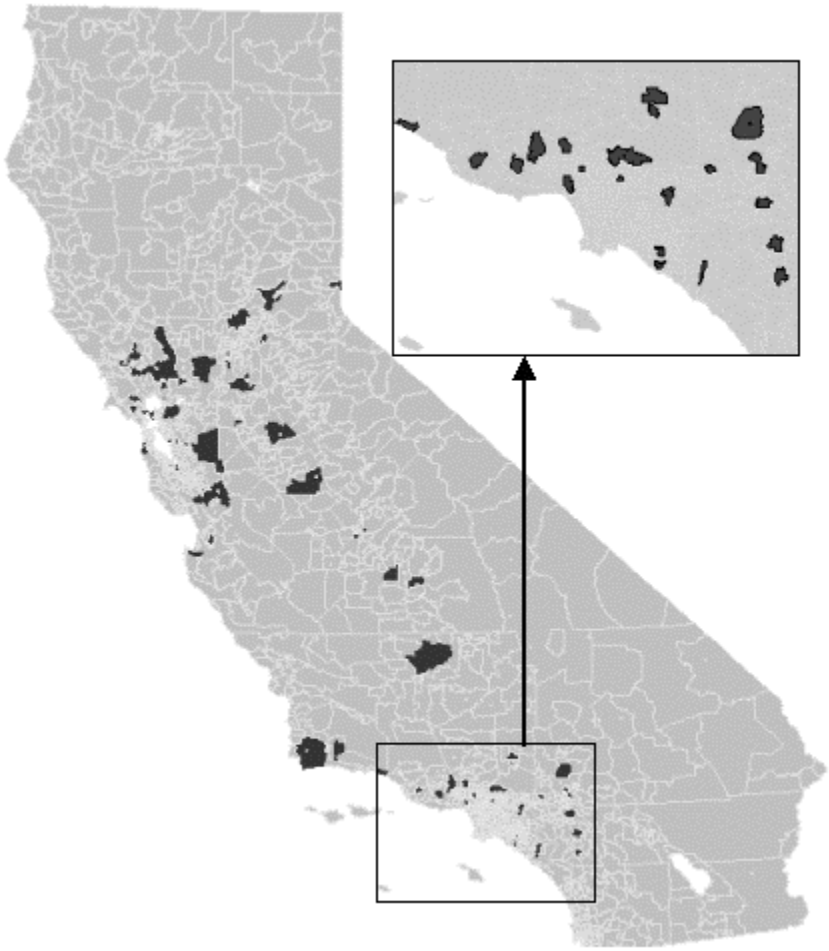

TABLE 2. VARIABLE NAMES, DESCRIPTIONS, MEANS AND COUNT PROPORTIONS

| Variable | Description | mean | count proportions | Non-normalized means |
|---|---|---|---|---|
| PRICE | Transacted selling price of property | $234,474 | | |
| FLOOD | 1= in the FEMA Class A Flood Zone; 0= not in that zone | | 0.13276172 | |
| AFTER | 1= transacted after June 1998; 0= June 1998 or before | | 0.54321671 | |
| PHISP | Projected 1997 percentage Hispanic population by tract, based on 1990 census | 18.54% | | |
| ASSDSTCT | Assessed value of structure, normalized by mean | 1.00 | | $115,393 |
| BATH | Number of bathrooms | 2.10 | | |
| BED | Number of bedrooms | 3.11 | | |
| POOL | 1= pool, 0=no pool | | 0.12 | |
| SIZE | Total structure square meters | 151.89 | | |
| LOT | Lot size, hectares | 0.16 | | |
| NEW | 1=house less than 10 years old | | 0.08 | |
| D2HAWST | Distance (km) to nearest hazardous waste site | 5.24 | | |
| D2INDTRY | Distance (km) to nearest municipal industrial facility, stadium or treatment plant | 8.89 | | |
| D2SHOPCNT | Distance (km) to nearest shopping center | 8.26 | | |
| D2STAR | Distance (km) to nearest Starbucks ™ | 10.00 | | |
| API.AVG | School Academic Performance Index (1-800), normalized by mean, averaged for high school and elementary school districts | 1.00 | | 665.78 |
| AGE | Projected 1997 median age by tract | 35.00 | | |
| PBLK | Projected 1997 percentage African American population by tract | 5.09% | | |
| PASIAN | Projected 1997 percentage Asian-American population by tract | 9.40% | | |
| PUNIV | Projected 1997 percentage university educated population by tract | 61.80% | | |
| PUNEMP | Projected 1997 percentage unemployment by tract | 5.05% | | |
| PEXEC | Projected 1997 percentage of executive level workers by tract | 14.73% | | |
| PPROF | Projected 1997 percentage of professional workers by tract | 16.70% | | |
| MHHINC | Projected 1997 median household income by tract, normalized by mean | 1.00 | | $56,366 |
| CBDIND2 | logged Central Business District Index* | 1.65 | | |
| D2CBDA | Normalized distance(km) to nearest "A" business district | 1.00 | | 62.05 |
| D2COAST | Distance(km) to nearest coastline | 50.60 | | |
| D2HIWAY | Distance (km)to nearest highway | 1.82 | | |
| PPSQFT | Median price per square foot, by zip code | 142.83 | | |
| SDIND1 | Number of transaction by zip code over the population by year | 0.02 | | |
| SDIND3 | SDIND1 / similar index at the state level | 1.43 | | |
| MEDPRCTY | Median home price by city, normalized by mean | 1.00 | | $198,408 |
| PRRATIO | Ratio of median zip code price to median state price | 1.13 | | |
| PADJ | Percentage change in medprCty by quarter from first quarter price | 1.15 | | |
| WEIGHT | Regression weights | | | |
| FLOOD:AFTER | Homes in floodplain that transacted after AB 1195 | | 0.073 | |

*The Central Business District Index was taken by dividing up the business districts within commuting distance of the sample zip codes into A, B, and C districts, based on density of employment and amount of revenue produced by companies headquartered in those districts, with A districts representing the highest density relative to revenue.
CBDIND2= log(Ra/Da+Rb/Db+Rc/Dc), where Ra = revenue of nearest A district and Da= distance to the nearest A district, Rb= revenue of nearest B district and Rc = revenue of nearest C district.

FIGURE 2. HISTOGRAM OF FREQUENCY OF TRANSACTIONS BY PERCENT HISPANIC FOR NON-FLOOD PROPERTIES

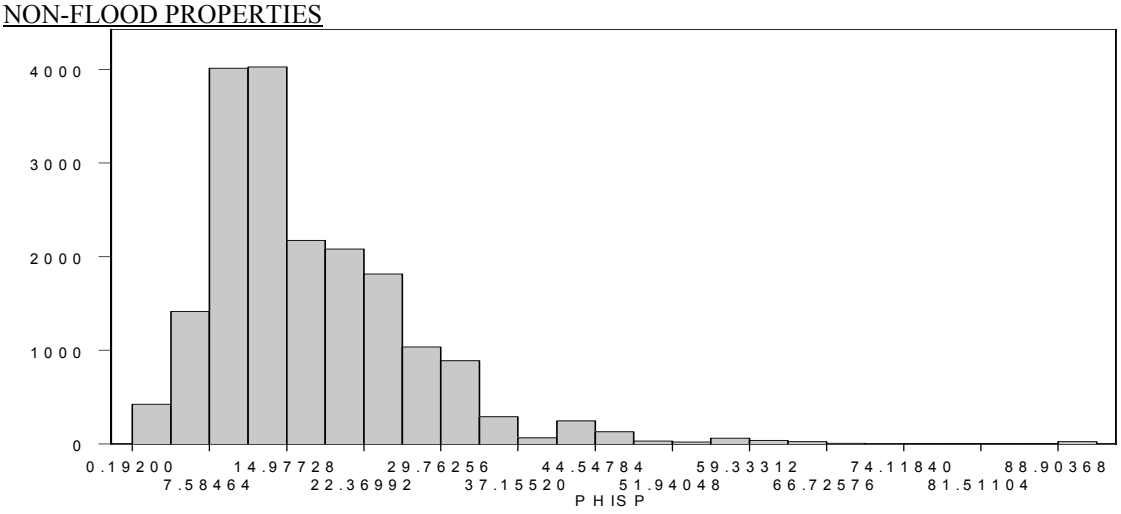


FIGURE 3. HISTOGRAM OF FREQUENCY OF TRANSACTIONS BY PERCENT HISPANIC FOR FLOOD ZONE PROPERTIES

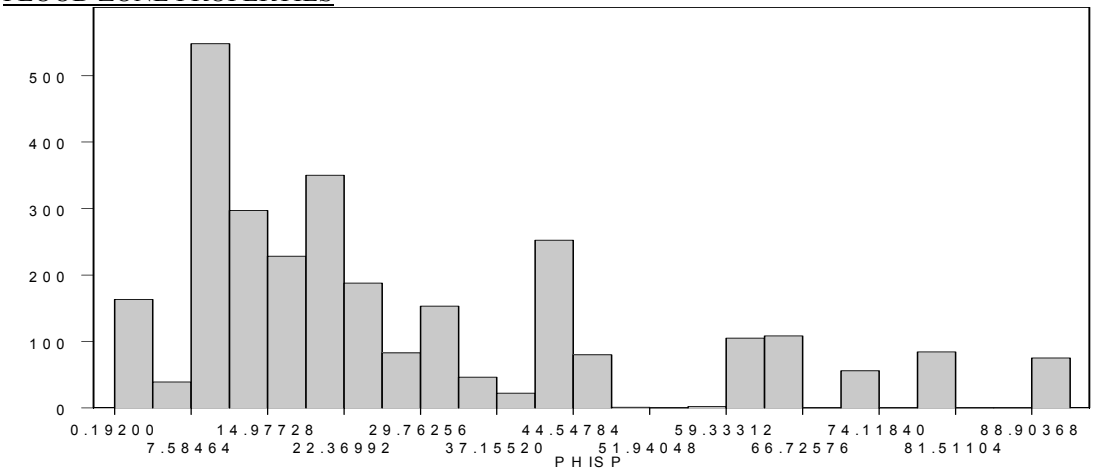


TABLE 3. SUMMARY OF REGRESSION RESULTS

| Model | weights | $R^2$ | F Stat | FLOOD coefficient | FLOOD:AFTER coefficient | FLOOD:AFTER: PHISP coefficient |
|---|---|---|---|---|---|---|
| 1 | yes | 0.793 | 2064 | 0.0662(5.81)** | -0.0389 (-2.63)** | |
| 1 | no | 0.804 | 2214 | 0.0586(6.28)** | -0.0386(-3.24)** | |
| 2 | yes | 0.793 | 2066 | 0.0658(7.01)** | TD | -0.00159(-4.34)** |
| 2 | no | 0.804 | 2213 | 0.0551 (7.40)** | TD | -0.00149(-5.16)** |

* Significant at the 95% confidence level
** Significant at the 99% confidence level
t statistics in parentheses
TD: term dropped because insignificant at the 90% confidence level

TABLE 4. FULL MODEL 1 REGRESSION RESULTS

| | M1-weights | | M1-no weights | |
|---|---|---|---|---|
| **Variable** | **Value** | **t value** | **Value** | **t value** |
| (Intercept) | 9.5885509 | 85.58031 ** | 9.8213823 | 93.13058 ** |
| FLOOD | 0.0662756 | 5.818015 ** | 0.0586395 | 6.28844 ** |
| AFTER | 0.0528458 | 9.963498 ** | 0.0548239 | 10.1519 ** |
| ASSDSTC | 0.2622699 | 55.22217 ** | 0.2556415 | 56.56996 ** |
| BATH | 0.0389349 | 9.288153 ** | 0.0437893 | 10.48363 ** |
| BED | 0.0351345 | 11.78853 ** | 0.0335969 | 11.58574 ** |
| POOL | 0.032932 | 4.888765 ** | 0.0436643 | 6.596744 ** |
| SIZE | 0.0017768 | 29.89102 ** | 0.001658 | 30.12636 ** |
| LOT | 0.0608488 | 17.96696 ** | 0.0570375 | 17.10672 ** |
| NEW | 0.0398286 | 5.300935 ** | 0.0341727 | 4.312079 ** |
| D2STAR | -0.0059718 | -11.6553 ** | -0.0064671 | -12.19764 ** |
| D2INDTRY | 0.0008275 | 2.626516 ** | 0.0007225 | 2.33324 * |
| D2SHOPCNT | 0.0014791 | 7.629661 ** | 0.0013526 | 7.324316 ** |
| D2HAZWST | -0.0003589 | -1.69702 | -0.0003311 | -1.576371 |
| API.AVG | 0.1152613 | 4.215024 ** | 0.0932422 | 3.667626 ** |
| AGE | 0.0418973 | 7.295289 ** | 0.0307834 | 5.783991 ** |
| PBLK | -0.0075143 | -17.328 ** | -0.0075442 | -17.41181 ** |
| PHISP | -0.000191 | -0.68661 | -0.0005851 | -2.273606 * |
| PUNIV | 0.0035832 | 8.451083 ** | 0.0033718 | 8.152766 ** |
| PUNEMP | -0.0085545 | -7.72859 ** | -0.0093061 | -8.543724 ** |
| PEXEC | -0.0081974 | -8.31092 ** | -0.0075867 | -7.878553 ** |
| PPROF | 0.0029926 | 4.110872 ** | 0.0036795 | 5.300959 ** |
| MHHINC | 0.0412395 | 3.15852 ** | 0.0638522 | 5.220272 ** |
| D2CBDA | -0.1025296 | -12.1421 ** | -0.1035903 | -12.65826 ** |
| CBDIND2 | -0.0078505 | -3.05371 ** | -0.0036937 | -1.443076 |
| D2COAST | -0.0034834 | -18.1367 ** | -0.0033807 | -17.81258 ** |
| D2HIWAY | 0.0265363 | 9.286563 ** | 0.0328082 | 11.4855 ** |
| PPSQFT | 0.0008588 | 17.85906 ** | 0.0008796 | 18.37046 ** |
| SDIND1 | -29.572603 | -8.66782 ** | -24.216974 | -6.949253 ** |
| SDIND3 | 0.2896603 | 7.782437 ** | 0.2321458 | 6.150406 ** |
| PRRATIO | 0.1372559 | 16.54168 ** | 0.1275344 | 16.7039 ** |
| MEDPRCTY | 0.1021662 | 9.387573 ** | 0.0915597 | 9.340644 ** |
| PADJ | 0.4322113 | 18.78783 ** | 0.4395491 | 19.80265 ** |
| I(LOT^2) | -0.0005337 | -14.464 ** | -0.0004938 | -14.08378 ** |
| I(AGE^2) | -0.0004186 | -5.29277 ** | -0.0002766 | -3.808558 ** |
| I(SIZE^2) | -0.0000002 | -38.5519 ** | -0.0000001 | -39.16404 ** |
| I(D2COAST^2) | 0.0000141 | 12.82801 ** | 0.0000126 | 11.51927 ** |
| I(BATH^2) | -0.0040295 | -26.6921 ** | -0.0041571 | -26.66896 ** |
| I(D2STAR^2) | 0.0000755 | 8.762624 ** | 0.0000895 | 10.13713 ** |
| I(D2HIWAY^2) | -0.002843 | -9.43541 ** | -0.0031859 | -10.35431 ** |
| FLOOD:AFTER | -0.0389951 | -2.63563 ** | -0.0386119 | -3.241737 ** |

| | M1 weights | M1 no weights |
|---|---|---|
| **$R^2$** | 0.793 | 0.804 |
| **F stat.** | 2064 | 2210 |
| **DF** | 21610 | 21610 |

* significant at the 95% confidence level **significant at the 99% confidence level

TABLE 5.FULL MODEL 2 REGRESSION RESULTS

| | M2 weights | | M2-no weights | |
|---|---|---|---|---|
| **Variable** | **Value** | **t value** | **Value** | **t value** |
| (Intercept) | 9.57680 | 85.48 ** | 9.81473 | 93.1 ** |
| FLOOD | 0.06584 | 7.017 ** | 0.05689 | 7.405 ** |
| AFTER | 0.05299 | 10.17 ** | 0.05511 | 10.5 ** |
| ASSDSTC | 0.26225 | 55.24 ** | 0.25562 | 56.59 ** |
| BATH | 0.03919 | 9.35 ** | 0.04409 | 10.56 ** |
| BED | 0.03505 | 11.77 ** | 0.03346 | 11.55 ** |
| POOL | 0.03308 | 4.912 ** | 0.04375 | 6.612 ** |
| SIZE | 0.00177 | 29.85 ** | 0.00166 | 30.1 ** |
| LOT | 0.06080 | 17.96 ** | 0.05700 | 17.1 ** |
| NEW | 0.04028 | 5.362 ** | 0.03479 | 4.391 ** |
| D2STAR | -0.00594 | -11.6 ** | -0.00644 | -12.1 ** |
| D2INDTRY | 0.00076 | 2.407 * | 0.00066 | 2.129 * |
| D2SHOPCNT | 0.00147 | 7.599 ** | 0.00134 | 7.232 ** |
| D2HAZWST | -0.00041 | -1.94 | -0.00037 | -1.77 |
| API.AVG | 0.11641 | 4.258 ** | 0.09352 | 3.68 ** |
| AGE | 0.04167 | 7.258 ** | 0.03027 | 5.689 ** |
| PBLK | -0.00755 | -17.4 ** | -0.00760 | -17.5 ** |
| PHISP | 0.00016 | 0.561 | -0.00018 | -0.67 |
| PUNIV | 0.00366 | 8.637 ** | 0.00345 | 8.339 ** |
| PUNEMP | -0.00858 | -7.75 ** | -0.00931 | -8.55 ** |
| PEXEC | -0.00840 | -8.51 ** | -0.00778 | -8.07 ** |
| PPROF | 0.00279 | 3.834 ** | 0.00347 | 4.989 ** |
| MHHINC | 0.04593 | 3.508 ** | 0.06833 | 5.576 ** |
| D2CBDA | -0.10121 | -12 ** | -0.10195 | -12.5 ** |
| CBDIND2 | -0.00734 | -2.85 ** | -0.00315 | -1.23 |
| D2COAST | -0.00351 | -18.3 ** | -0.00341 | -18 ** |
| D2HIWAY | 0.02704 | 9.459 ** | 0.03331 | 11.66 ** |
| PPSQFT | 0.00086 | 17.87 ** | 0.00088 | 18.39 ** |
| SDIND1 | -29.54212 | -8.66 ** | -24.21433 | -6.95 ** |
| SDIND3 | 0.28878 | 7.761 ** | 0.23137 | 6.133 ** |
| PRRATIO | 0.13666 | 16.47 ** | 0.12715 | 16.66 ** |
| MEDPRCTY | 0.10301 | 9.468 ** | 0.09272 | 9.462 ** |
| PADJ | 0.43289 | 18.83 ** | 0.43987 | 19.83 ** |
| I(LOT^2) | -0.00053 | -14.5 ** | -0.00049 | -14.1 ** |
| I(AGE^2) | -0.00041 | -5.21 ** | -0.00027 | -3.66 ** |
| I(SIZE^2) | 0.00000 | -38.5 ** | 0.00000 | -39.1 ** |
| I(D2COAST^2) | 0.00001 | 12.91 ** | 0.00001 | 11.56 ** |
| I(BATH^2) | -0.00403 | -26.7 ** | -0.00416 | -26.7 ** |
| I(D2STAR^2) | 0.00008 | 8.754 ** | 0.00009 | 10.13 ** |
| I(D2HIWAY^2) | -0.00287 | -9.53 ** | -0.00322 | -10.5 ** |
| FLOOD:PHISP:AFTER | -0.00160 | -4.34 ** | -0.00150 | -5.17 ** |

FLOOD:AFTER, FLOOD:PHISP and PHISP:AFTER all insignificant at the 90% confidence level when 3 way term included

| | M2-weights | M2-no weights |
|---|---|---|
| **$R^2$** | 0.79273 | 0.80378 |
| **F stat.** | 2066 | 2213 |
| **DF** | 21610 | 21610 |

* significant at the 95% confidence level **significant at the 99% confidence level

TABLE 6: PRICE DIFFERENTIALS: BEFORE AND AFTER, FLOODPLAIN AND NON-FLOODPLAIN

| time | zone | price | |
|---|---|---|---|
| before | flood | $177,528 | **price differential-before:** $11,384 |
| before | no-flood | $166,144 | |
| | | | |
| after | flood | $180,004 | **price differential-after:** $4,844 |
| after | no-flood | $175,160 | |
| **Change in price differentials due to AB 1195: $**11384 - $4844=$6,540 | | | |

# Endnotes

[i] This study looked at the effects of flood and wildfire disclosure under AB 1195 on housing prices, but only the effects of flood disclosure are discussed in this paper.

[ii] Small, seasonal floodplains do exist East of the Great Plains and large, perennial floodplains do exist in the West, but, on average, Western watercourses tend to be smaller, more seasonal and more "flashy" in their hydrology because the West is drier, and because watersheds are generally much smaller.

[iii] To participate in the NFIP, communities agree to adopt and enforce certain floodplain management ordinances to reduce the probability of future flood damage to new buildings in the SFHA. In return, the community becomes eligible for federal disaster assistance and homeowners become eligible for flood insurance as a financial protection against flood losses.

[iv] The SFHA is defined as an area that has a one percent or greater chance in any given year of flooding. The 100 year floodplain, or class A zone, falls under this designation.

[v] Information given here on AB 1195 was obtained from personal communications in 1998 and 1999 with Peter Detwiler (Staff Director CA Senate local government committee and former Staff Director of CA Senate Committee on Housing and Land Use), and communications in 1999 with Julie Snyder (aid to state representative Hannah Beth Jackson), both of whom who were involved in drafting the law. Information also came from Detwiler's 1998 article.

[vi] This includes three previously existing but rarely enforced state level disclosure requirements, two of which were for seismic hazards and one of which was for wildfire hazards.

[vii] See section §1102.4(a) of the California Civil Code. The third party designator is defined by the Code as "a licensed engineer, land surveyor, geologist....or other expert, dealing with matters within the scope of the professional's license."

[viii] The hazard categories were only flood zones present, only fire zones present, both present and neither present. Threshold values for flood and urban fire zones (VHFHSZs) were 5% and 25% for wildland fire hazard areas. Because of the low number of hazard zone properties relative to non-hazard zone properties, zip codes belonging to the nine cells of the "no hazard present" group were dropped, leaving 27 cells in the matrix.

[ix] Property transaction records were downloaded from Metroscan, an online property transaction database.

[x] The results given here are for developed property only. While separate regressions were run on transactions for vacant land, this study was unable to derive any significant results about how hazard disclosure is affecting those parcels. The data were too poor and too few, with few hazard zone observations and not enough records from both before and after the law. Moreover, vacant land transactions tend to be rife with confounding factors that distort market transactions, such as speculation, tax considerations, absentee corporate ownership, local politics, land use regulation and non-market transfers. Analysis of vacant parcels is also confounded by the fact that many are large and include both flood-prone and flood-free land.

[xi] Demographic data was obtained from the 1990 Census and from Claritas' 1997 projections of that data, while market data came from a variety of sources, included the California Association REALTORS® and the Rand Corporation. Demographic data was at the tract level, while market data were at both the zip code and city level. Market data varied by time period, in some cases by quarter and in some cases by year.

[xii] SFHA data came from the FEMA Q3 digital data set.

[xiii] They were not stratified by transaction after the law because of the extreme complexity of adding a third stratification factor and because roughly 54% of transactions were from after the law and 46% from before.

[xiv] In the initial sample they were set equal to each other, and regressions were run on this data. But, because of the extreme weighting of certain strata under this situation, the weighted regression results proved to be significantly different from the non-weighted results, a sign of bias in the sampling process. This was corrected by setting the number of hazard samples equal to half the number of non-hazard samples.

[xv] The semi-log functional form resulted in increased model fit over the linear model and remediated the non-constant variance in the residual plots of the linear model.

[xvi] Prior to AB 1195 a floodplain home sold for $41,000 less, while after it sold for $60,000 less.

[xvii] Mortgage companies that do sell investment grade mortgage portfolios to Fannie Mae or Freddie Mac are required to make flood designations on all properties, but designations often do not occur until well into the term of a mortgage, meaning that the information is not capitalized in the form of a lowered purchase price.

[xviii] The yearly rate was determined by multiplying the Pre-FIRM (built before the was created Flood Insurance Rate Map) rate of 68 cents per $100 of basic coverage by the basic coverage limit of $50,000, plus the rate of 23 cents per additional $100 coverage times $40,000 of additional coverage, plus the contents coverage rate of 79 cents per $100 times $20,000 of contents coverage. These rates assume a house in the A zone with no basement or structural elevation and construction before the creation of the FIRM.