PACIFIC EARTHQUAKE ENGINEERING
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Economic-Engineering Integrated Models for Earthquakes: Socioeconomic Impacts

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ABSTRACT

The core purpose of applied research in the earthquake mitigation field is to assist policymakers. What types of information are required for the creation of cost-effective policies? Much of the previous social-science-based research on earthquakes has focused on measuring the total economic impact of damage to structures and contents and, more recently, of business interruption.

How are people of all income strata impacted by a major earthquake? Displacement from housing is an obvious aspect, but less obvious is the distribution of job losses associated with earthquake damage and business interruption. This research deals with these latter, less obvious aspects, and, by extension, how members of different income groups might be affected by mitigation costs and benefits.

Because the impacts of earthquakes vary so widely by location, we explore the income distribution effects at the level of individual cities. The Southern California Planning Model-2 (SCPM-2) is used to model the economic impacts of a hypothetical earthquake on Los Angeles's Elysian Park fault, and census data on occupation are used to distribute these impacts across income groups within each city in the region. This permits the impacts of such an earthquake, and potential mitigation programs, to be assessed in terms of city-specific changes in income equity measures.

Keywords: Los Angeles, Gini coefficient, equity, income distribution.

ACKNOWLEDGMENT

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1 Introduction

1.1 THE IMPORTANCE OF NONSTRUCTURAL EARTHQUAKE COSTS

The seismic sensitivity of the Los Angeles metropolitan region is well known. Much of the previous social-science-based research on earthquakes has focused on measuring the total economic impact of damage to structures and contents and, more recently, of business interruption. In our previous research, we analyzed the geographical distribution of these impacts on individual cities and other small area zones (Cho, et al. 2000, 2001). However, we did not examine another important distributional question, that of the interpersonal income distribution.

How are people of all income strata impacted by a major earthquake? Displacement from housing is an obvious aspect, but less obvious is the distribution of job losses associated with earthquake damage and business interruption. This research deals with these latter, less obvious aspects and, by extension, how members of different income groups might be affected by mitigation costs and benefits. Because impacts vary so widely by location, we explore the income distribution effects at the level of individual cities.

The core purpose of applied research in the earthquake mitigation field is to assist policymakers. What types of information are required for creation of cost-effective policies? The large expenditures that are involved in many proposed mitigation programs suggest that a careful analysis of trade-offs is required. This means that the full costs and benefits of each mitigation option should be studied as completely as possible. The benefits of mitigation are the costs avoided by the particular measure. Yet a discussion of costs avoided depends on analysts' ability to determine full costs. Our own work on the business interruption effects of the 1994 Northridge earthquake indicates that an exclusive focus on structural damage ignores 25–30 percent of the full costs (Gordon, Richardson, and Davis 1996). In 1994, business interruption job losses were estimated to be 69,000 person-years of employment. About half of these were outside the area that experienced structural damage. Disregarding values of such magnitudes results in a serious underestimate of the full costs. Social science research can, therefore, make a substantial contribution by identifying expected full costs with and without various proposed mitigation.

1.2 PREVIOUS RESEARCH

Reporting less than two months after the 1994 Northridge earthquake, Kimbell and Bolton (1994) relied upon a "historical analogies approach." The nature of this approach is not made clear in their report except for their use of data on the effects of prior earthquakes and disasters, i.e., the Loma Prieta and Whittier earthquakes, the Oakland fires, and the Los Angeles riots. They reported immediate job losses for Los Angeles County of 29,300 with an additional 6,400 jobs lost outside the county. The authors reported net positive impacts from the event because of subsequent reconstruction in 1994. They reported, nevertheless, a long-term negative impact of 18,500 jobs lost.

Using a survey approach, Boarnet (1995) sought information on the impacts of freeway damage resulting from the Northridge earthquake. He found that 43 percent of all firms reporting any losses mentioned that some of these were because of transportation problems. Eguchi et al. (1996) report on their application of EQE International's Early Post-Earthquake Damage Assessment Tool (EPEDAT), a GIS-based model, to the problem of estimating Northridge earthquake losses. They calculated that these were in excess of $44 billion.

Chang (1995) introduced multivariate techniques for post-event assessments of lifeline-related losses versus those resulting from damage to other capital stocks. She applied these methods to an assessment of the economic effects of lifeline disruptions in the Hanshin earthquake. Railroad capacity losses were found to be more consequential than highway losses.

Rose and Benavides (1998) applied interindustry models as a method for measuring regional economic impact analysis. The authors traced and recorded all the intersectoral economic ripple effects associated with the full impacts of electricity disruptions expected from a hypothetical 7.5 M earthquake in the Memphis area. They forecasted a loss of seven percent of the gross regional product over the first 15 weeks after the event. Rose and Lim (1997) applied the same model to an analysis of the effects of the Northridge earthquake.

Cochrane (1997) elaborated the nature of indirect economic damages, including problems with representing backward and forward linkages. He also pointed out that the receipt of disaster assistance matters in a full accounting of regional impacts, even though these are simply transfers within the larger national economic context. In addition, any resulting indebtedness merely shifts earthquake losses to future generations. Cochrane also used the NIBS (National Institute of Building Standards) model to account for net regional losses and gains after all transfer payments and possible debt payments have been accounted for. Among other things, he found that nonstructural losses ("indirect losses," in Cochrane's nomenclature) are inversely proportional to the size of the sector subjected to the earthquake's economic shock.

Okuyama and his colleagues (1997) developed a closed interregional input-output model that emphasizes income distribution effects. The approach is also sequential and applicable to earthquakes and similar events in which there may be drastic quarter-to-quarter changes in demand and productive capacity. The model was applied to the 1995 Kobe earthquake. Four types of model coefficients were manipulated to simulate the disaster.

As this brief summary shows, there has been relatively little prior attention to the socioeconomic impacts of earthquakes. This reflects a lag in social science research in this area. Most of the relevant research on earthquakes has been in the engineering and geological fields. Progress from economic impact research is recent. Earthquake engineering is a challenging field, but it is even more difficult to explore the social impacts of earthquakes. Therefore, it is not surprising that there has been minimal research in this area.

2 Modeling Losses: Inputs and Outputs

2.1 IMPACT MODELS AND THE SOUTHERN CALIFORNIA PLANNING MODEL (SCPM-2)

The most widely used models of regional economic impacts are versions of interindustry models. These attempt to trace all intra- and interregional shipments, usually at a high level of industrial disaggregation. Being demand driven, interindustry models only account for losses via backward linkages, i.e., changes in production result from changes in demand.

The Southern California Planning Model-2 (SCPM-2) has been developed for the five-county Los Angeles metropolitan region and has the unique capability to allocate all economic impacts, in terms of jobs or the dollar value of output, to 308 subregional zones, mostly municipalities. This model integrates transportation network and regional economic models to estimate the costs of earthquakes. Politicians, understandably, care most about local impacts because they serve local constituencies. The SCPM-2 focus on municipal-level outcomes is important because, while not "all politics are local," almost all mitigation decisions are grounded on local concerns.

Our previous work on the 1994 Northridge earthquake utilized an earlier version of the model (SCPM-1). In that case, the model was driven by reduced demands on the part of damaged businesses, as ascertained in a survey of businesses. In the present work, we focus on a hypothetical earthquake, an M 7.1 event on the Elysian Park blind thrust fault. In this case, results of structural damage to businesses, as developed by EQE's EPEDAT model, are used to drive SCPM-2. EPEDAT predicts, among other values, the periods of time for which firms throughout the region will be nonoperational. This allows the calculation of exogenously prompted reductions in demand by these businesses. These are introduced into the interindustry model as declines in final demand.

2.2 THE ELYSIAN PARK SCENARIO

Ground motion, structural damage, and direct business interruption losses were estimated for a Maximum Credible Earthquake (M 7.1) on the Elysian Park thrust ramp (the "Elysian Park scenario"). This scenario was selected on the basis of its potential to cause major damage and casualties. Dubbed "the Big One," this earthquake is a credible representative of the dangerous set of events from which the real "Big One" will be drawn, but other potential earthquakes could also qualify for this description. Like the 1994 Northridge earthquake, the Elysian Park scenario occurs on a blind thrust fault. The maximum size of earthquakes that seismologists believe are possible on blind thrust faults is lower than those on, for example, the San Andreas fault; but blind thrust events have the potential to cause severe damage because of their proximity to metropolitan Los Angeles. The planar earthquake source representation for the Elysian Park scenario varies in depth from 11.0 to 16.0 km below the surface. The surface projection of this source includes a broad, densely populated area of central Los Angeles County, including downtown Los Angeles. This surface projection corresponds to the rectangle in Figure 2.1. Basic socioeconomic descriptors for the Southern California Association of Governments (SCAG) five-county metropolitan area appear in Table 2.1.

2.3 LOSSES BY LOCATION AND TYPE

EPEDAT is used to estimate regional ground motion and building damage patterns (Eguchi et al. 1997; Campbell 1997). Building damage causes direct loss in industrial production. In this case damage information is reported at the level of 1,527 traffic analysis zones (TAZs). To estimate this direct loss, a model was developed based on research completed for the Multidisciplinary Center for Earthquake Engineering Research (Shinozuka et al. 1997). SCPM-2 inputs are commercial and industrial building damage estimates produced by EPEDAT for the Elysian Park scenario, specifically the percent of structures in each of four damage states by use class and spatial zone. Total structural losses alone (including building contents) in the five-county region are estimated at $33.9 billion to $55.6 billion for the Elysian Park scenario.

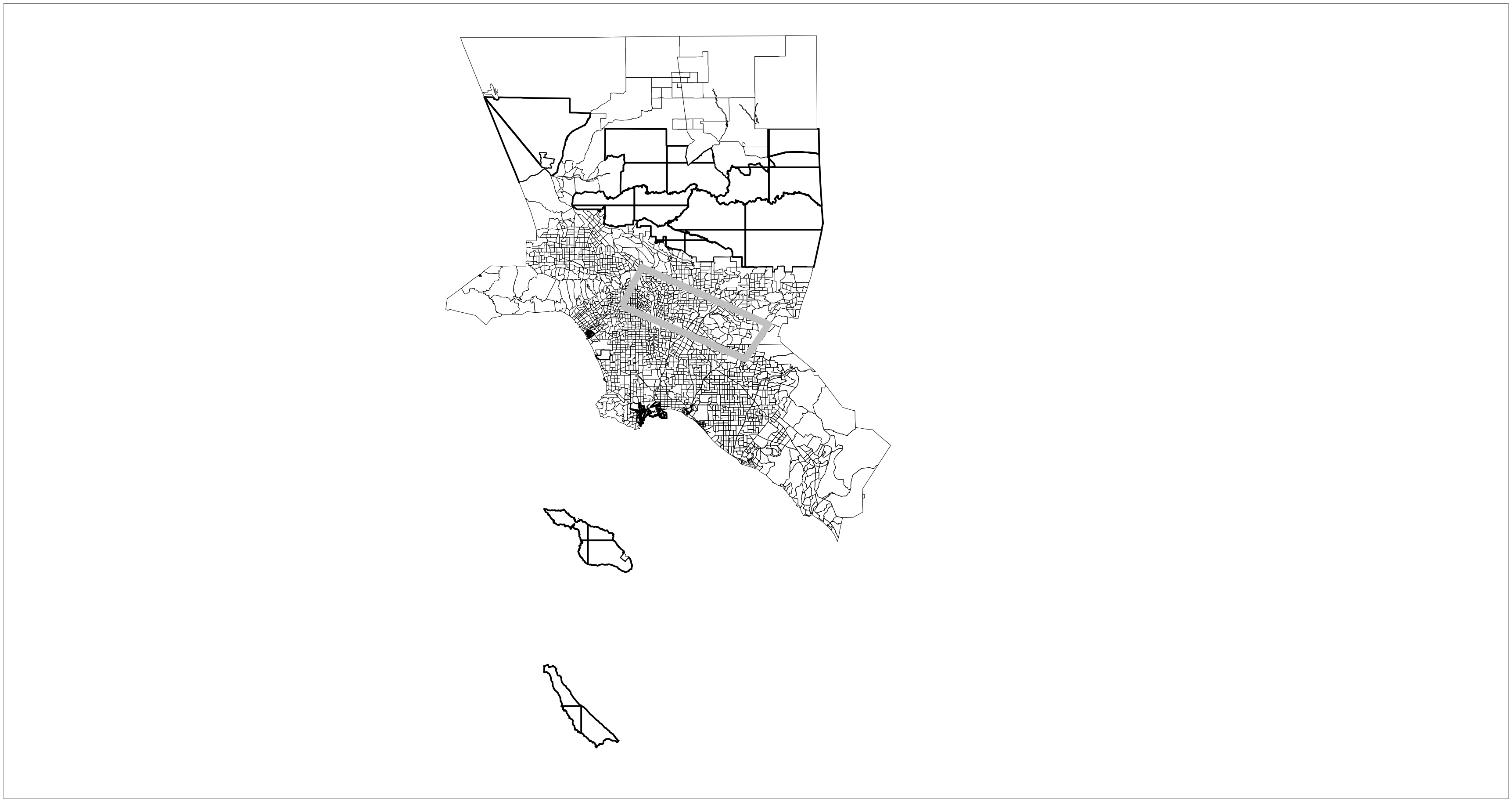

Fig. 2.1 Los Angeles and Orange counties by census tracts: The rectangle represents the physically impacted area based on the Elysian Park scenario

Table 2.1 Socioeconomic information for the Southern California five-county metropolitan area

SCAG County	Population (persons)	Ten Year Relative Population Growth	Employment (paid employees)	Total Income ($1000)	Per Capita Income ($)	Land Area (miles^2)
Year	2000	1990-2000	1997	1994	1994	1990
Los Angeles	9,519,338	7.4%	3,693,537	197,289,098	21,562	4,060
Orange	2,846,298	18.1%	1,212,689	64,892,666	25,516	790
Riverside	1,545,387	32.0%	319,904	25,086,809	18,543	7,208
San Bernardino	1,709,434	20.5%	406,859	26,477,943	17,043	20,062
Ventura	753,197	12.6%	211,591	15,899,444	22,625	1,846
Five County	16,373,645	12.7%	5,844,580	329,645,960	21,542	33,966

Source: U.S. Census Bureau (**http://www.census.gov/**)

Notes:
a. Values of employment (private nonfarm employment) and land area come from the People QuickFacts for each individual county.
b. Values of total personal income and per capita personal income come from the Local Area Personal Income data of Bureau of Economic Analysis (BEA).

Residential damage accounts for approximately two thirds of the total but is not included in this analysis. This analysis focuses on the fixed-site employment impacts. Some 72 percent of the structural damage is estimated to occur in Los Angeles County. The EPEDAT results are then mapped into the 308 SCPM-2 zones.

EPEDAT relates structural damage states to business closure times and direct business interruption (production) losses. Parameter estimates are based in part on data from the Northridge earthquake. EPEDAT outputs include estimates of direct business interruption loss for the region by industry, month by month, over the first year following the earthquake, and by SCPM-2 zone. As noted above, the economic impact model used in this research focuses only on business interruption associated with structural damage. The research calculations proceed from structural damage, to loss-of-function curves, to business interruption impacts.

In addition, we also examine the effects of the earthquake on the supply of services provided by the transportation network, particularly roads and bridges. This extension of our basic model distinguishes SCPM-2. When these latter effects are fully accounted for, the estimated impacts are different in terms of magnitude and location. In SCPM-1, the indirect impacts were allocated via a simplistic heuristic approach. More realistically, the changes in freight and travel costs that result from bridge damage and collapse alter the geographical distribution of the indirect and induced impacts by subjecting these impacts to distance decay influences modified by the transportation system disruptions. In this way, the transportation system is integrated and the flows are endogenized into the economic impact analysis.

In addition, damage to building contents will also produce business interruption effects. As a result of this last point, the zonal estimates reported here are lower bounds, and are better indicators of relative impacts than absolute impacts.

A major limitation of the research until now is that we do not address two major sources of income impacts: residential damage and the imputed welfare losses of higher personal travel costs. This last defect is potentially remediable in an approximate manner. The problem is how to allocate higher travel costs to municipal zones of the region given that much of the traffic traversing a zone is through traffic rather than local. One possibility is to calculate an index of changes in general accessibility for each municipality. This involves the following two steps (1) aggregate the TAZ-to-TAZ changes in travel costs to the municipal level and (2) calculate for each municipal zone the sum of changes in travel costs to all other places. Whether this is an important adjustment depends on the extent of bridge damage. If bridges are closed only when the Bridge Damage Index (BDI) > 0.75 (severe damage), the region-wide change in personal travel costs is quite modest ($1.134 billion), but if Caltrans is very conservative and closes bridges when BDI > 0.30 (moderate damage), then these travel-cost changes balloon to $35.01 billion, or 26 percent of the estimated full costs of the earthquake.

Simulation results describing the full costs of a magnitude 7.1 Elysian Park event are summarized in Table 2.2, and displayed graphically in Figures 2.2 through 2.4. Row A in Table 2.2 reflects the midpoint of the range of structural damage predicted by EPEDAT, $45.25 billion, including $29 billion in structural loss. Row B is the sum of direct, indirect, and induced losses computed by the input-output model of the five-county Los Angeles metropolitan area. This

Table 2.2 Total loss ($billions): Elysian Park magnitude 7.1 earthquake, maximum simulated disruption to baseline transportation (bridge closure at BDI ≥ 0.75)

Loss Type	Pre-event Baseline		Elysian Park Scenario: Conservative Bridge Closure Criterion	
A Structural Loss[a]			$ 45.250 billion (48.35% of total)	
Business Loss				
Direct Loss[b]			28.155	
Indirect Loss[c]			9.627	
Induced Loss[d]			8.955	
B Business Loss Subtotal			46.737 billion (49.95% of total)	
Network Costs[e]	PCU Minutes	$ Billions	PCU Minutes	$ Billions
Personal Travel Cost	85,396,813.	21.290	89,945,131.	22.424
Freight Cost	10,298,781.	4.550	10,966,123.	4.844
Total Travel Cost	95,695,594.	25.839	100,911,255.	27.268
Network Loss = Δ Network Costs			PCU Minutes	$ Billions
Δ Personal Travel Cost			4,548,318.	1.134
Δ Freight Cost			667,343.	0.295
C Δ Total Travel Cost			5,215,661.	1.429 (1.5% of total)
D Bridge Repair Cost (Excludes Delay Cost)			Median ($Billions)	Mean ($Billions)
			0.071	0.219
Loss Total = A + B + C +D			$ 93.487	$ 93.635

Notes:
a. Midpoint of interval an interval estimate.
b. EPEDAT, EQE International.
c. RSRI Model.
d. Difference between the RSRI solution with the processing sector closed with respect to labor and the RSRI solution with the processing sector open with respect to labor.
e. Network cost is the generalized total transportation cost associated with a simultaneous equilibrium across choice of destinations and routes. These estimates reflect 365 travel days per year, an average vehicle occupancy of 1.42 for passenger cars, 2.14 passenger car units per truck, a value of time for individuals of $6.5/hour, and $35/hr for freight.

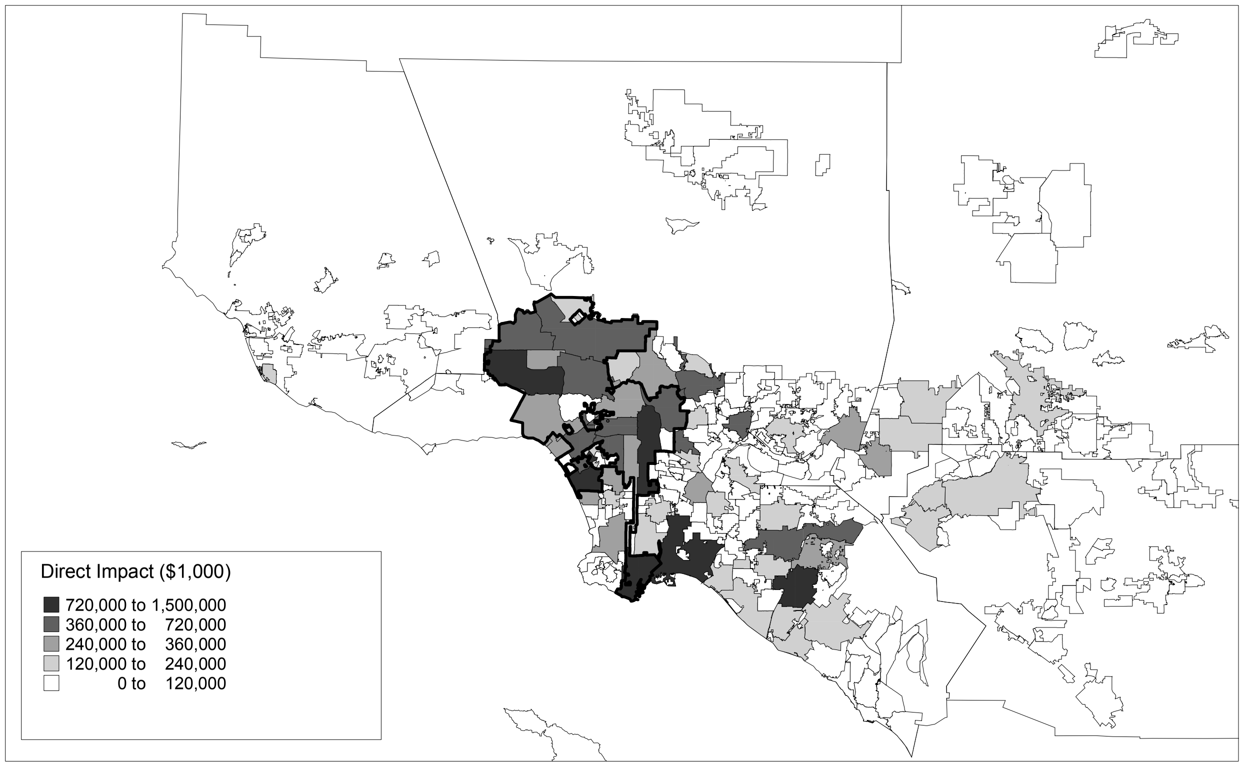

Fig. 2.2 Direct impact (opportunity cost of production, $1,000) by city, SCAG Planning Region

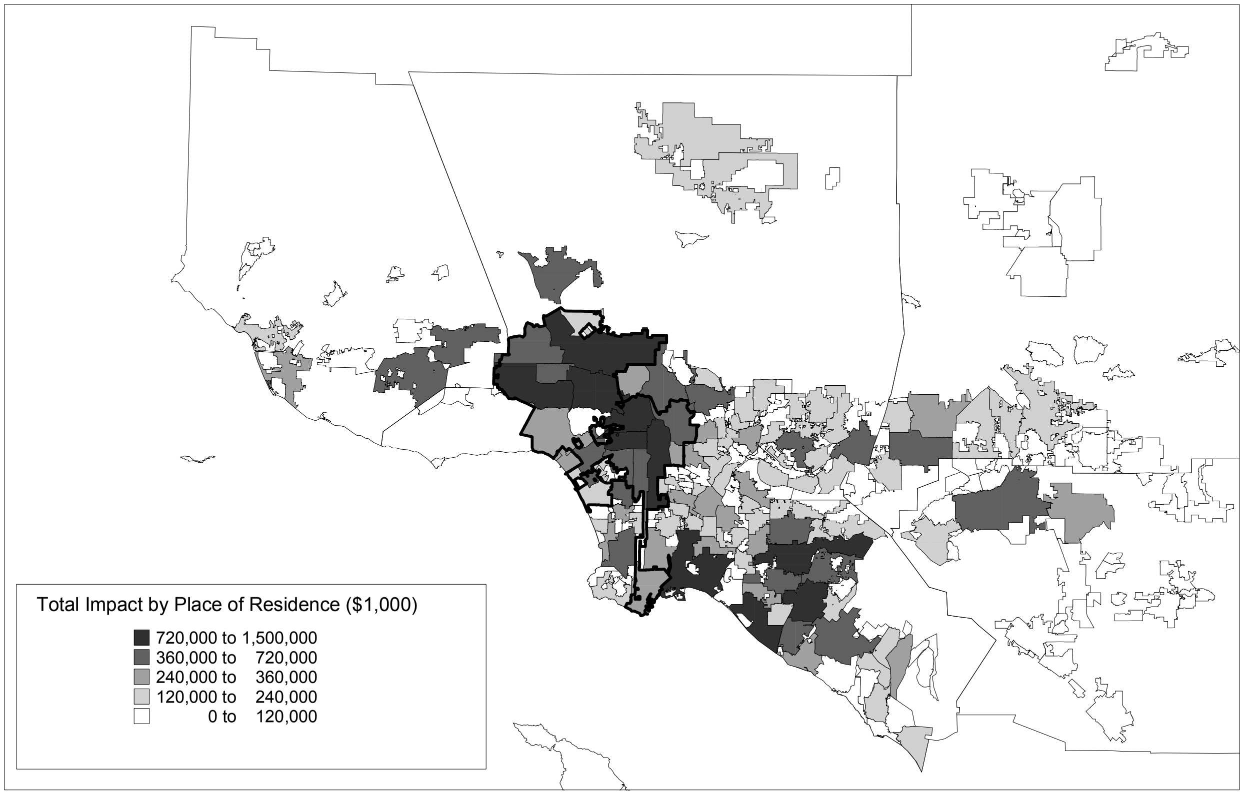

Fig. 2.3 Total impact ($1,000) by labor's city of residence, SCAG Planning Region

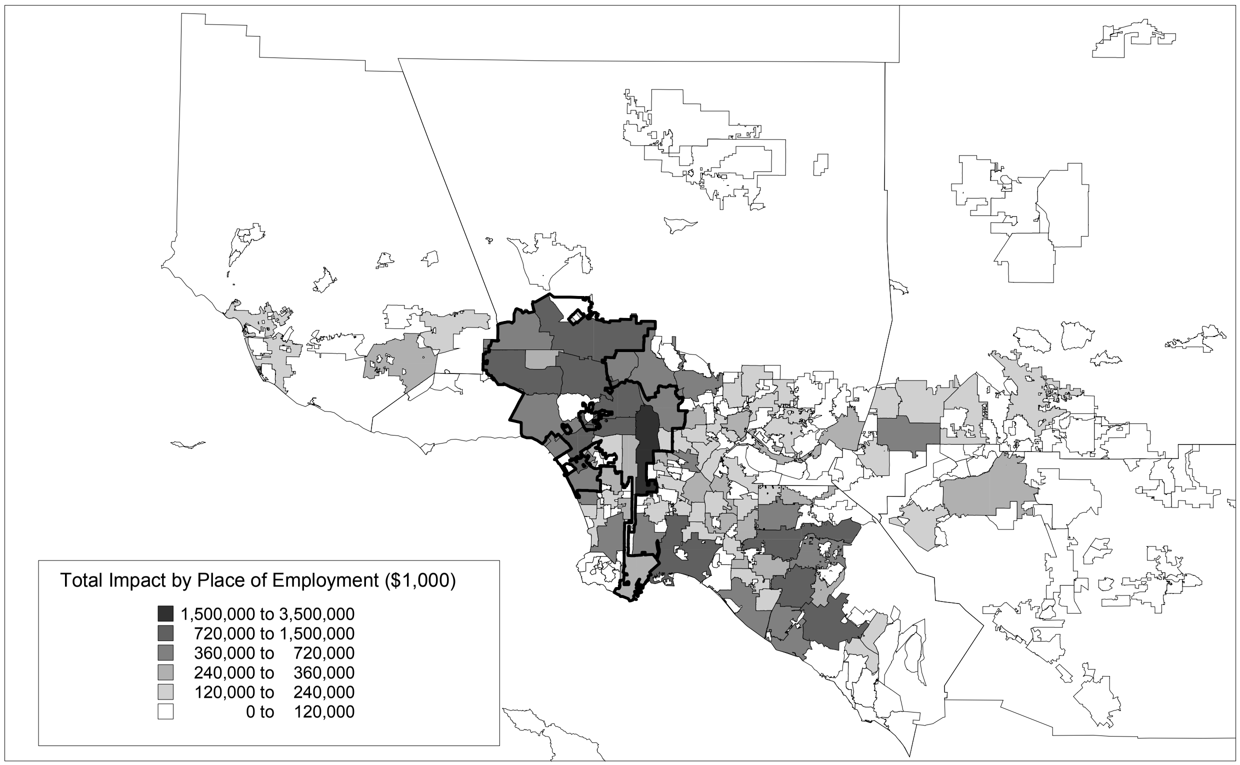

Fig. 2.4 Total impact ($1,000) by labor's city of employment, SCAG Planning Region

sum is $46.7 billion. These aggregate values are identical across all other simulations (Cho et al. 2001).

Row C summarizes the post-earthquake network equilibrium transportation costs in light of reduced production and reduced network capacity. These values vary across all simulations. Table 2.2 corresponds to median simulated disruption of baseline transportation combined with a risk-tolerant bridge closure criteria that leaves moderately damaged structures open to normal traffic. This results in a substantial retention of transportation network capacity, and a relatively small increase in transportation costs of almost $1.5 billion.

Row D includes preliminary bridge repair cost estimates based on a discriminate analysis of the Loma Prieta and Northridge earthquakes bridge damage states and estimated repair costs (Cho et al 2000). Mean and median costs are reported. The full costs of the earthquake are estimated to be almost $93.5 billion, close to 14 percent of the SCAG area's 1990 Gross Regional Product (GRP), although direct (business interruption) costs account for about seven percent. In this case, transportation costs account for a small share of the full cost of the earthquake. However, these costs include an optimistic assumption: None of the damaged bridges left open to traffic ever collapsed. Although these are regional totals, SCPM-2 produces data like these for all of the subareas of the region, that is, the spatial incidence of losses is predicted. While the spatial distribution of losses is important for a number of reasons, there will also be significant policy interest in how these losses are distributed in other dimensions.

2.4 INCOME DISTRIBUTION IMPACTS

A primary objective of this research is to begin the under-researched analysis of the income distribution effects resulting from earthquakes. It is arguable that these impacts may be random, depending on the earthquake site and its damage distribution effects. But unlike the case of air pollution, where knowledge of incidence has driven many high-income households to seek out clean-air locations (Bae, 1997a and b), households have minimal knowledge of where the most vulnerable faults lie, how earthquakes on these faults might translate into a distribution of damage zones, or what the probability of disruption on different fault lines is. Further, research has shown that in land markets air quality is likely to be priced (Heikkila et al. 1989). People must pay for good air; but because of information constraints, people are less likely to be required to pay to live on solid ground. However, what is clear is that in a post-earthquake situation, poor households have many fewer resources available for adjustment. Mitigation strategies should focus on how to prepare them for such an event.

Fortunately, SCPM-2's capacity to distribute the impacts over urban space at a subregional level makes it possible to extend the analysis to include socioeconomic impacts on the system. Figure 2.5 depicts our framework for the analysis of socioeconomic impacts. As indicated in Figure 2.5, the approach can be implemented using widely available public source data.

2.4.1 Descriptive socioeconomic analysis of affected cities

The U.S. Census definition of "place" is the most appropriate subregional level for socioeconomic analyses that is also consistent with the output from SCPM-2. "Place" includes cities and Census Designated Places (CDPs). The goal is to measure socioeconomic impacts by place of residence. The first step is to use SCPM2 to identify the cities most likely to be impacted by earthquake in terms of changes in output. The 1990 Census data describes the spatial distribution of residences and workplaces by traffic analysis zone and by major economic sector. These data were used to establish a baseline for the SCPM-2 outputs.

Once the affected cities are identified, the second step is to construct a set of indicators measuring social impacts for those cities. Public data sources such as the U.S. Census provide relevant socioeconomic variables at the local level. These include racial distribution (especially minority population shares), citizenship status, educational level, unemployment rates, income distribution measures, housing tenure, and property values. This analysis provides a first cut determination of whether the majority of the most impacted cities is likely to be rich or poor, as measured by standard indicators.

2.4.2 Identification of social subgroups using multiple socioeconomic variables

The third step is to further define subgroups by selecting combinations of socioeconomic variables. This makes it possible, for example, to investigate how the economic impacts in terms of jobs and income in one industry sector are distributed within different income groups or different ethnic groups. The use of various types of census information allows us to formulate cross-tabulations defining social subgroups of interest. For example, the Public Micro Sample (PUMS) data can be used to create frequency tables with detailed categories, depending on the need. We divide income groups into 25 strata, and categorize industrial sectors into the 17 conventionally reported by the Southern California Association of Governments. Using PUMS data, it is possible to create new variables by combining variables. Defining ethnic/racial groups is a good example. The Hispanic origin category is not identifiable via the race variable, but is identifiable via the ethnicity variable. Combining both variables makes it possible to categorize population into the most frequently identified racial groups. These are White, Black, Asian and Pacific Islander, Hispanic, and Others.

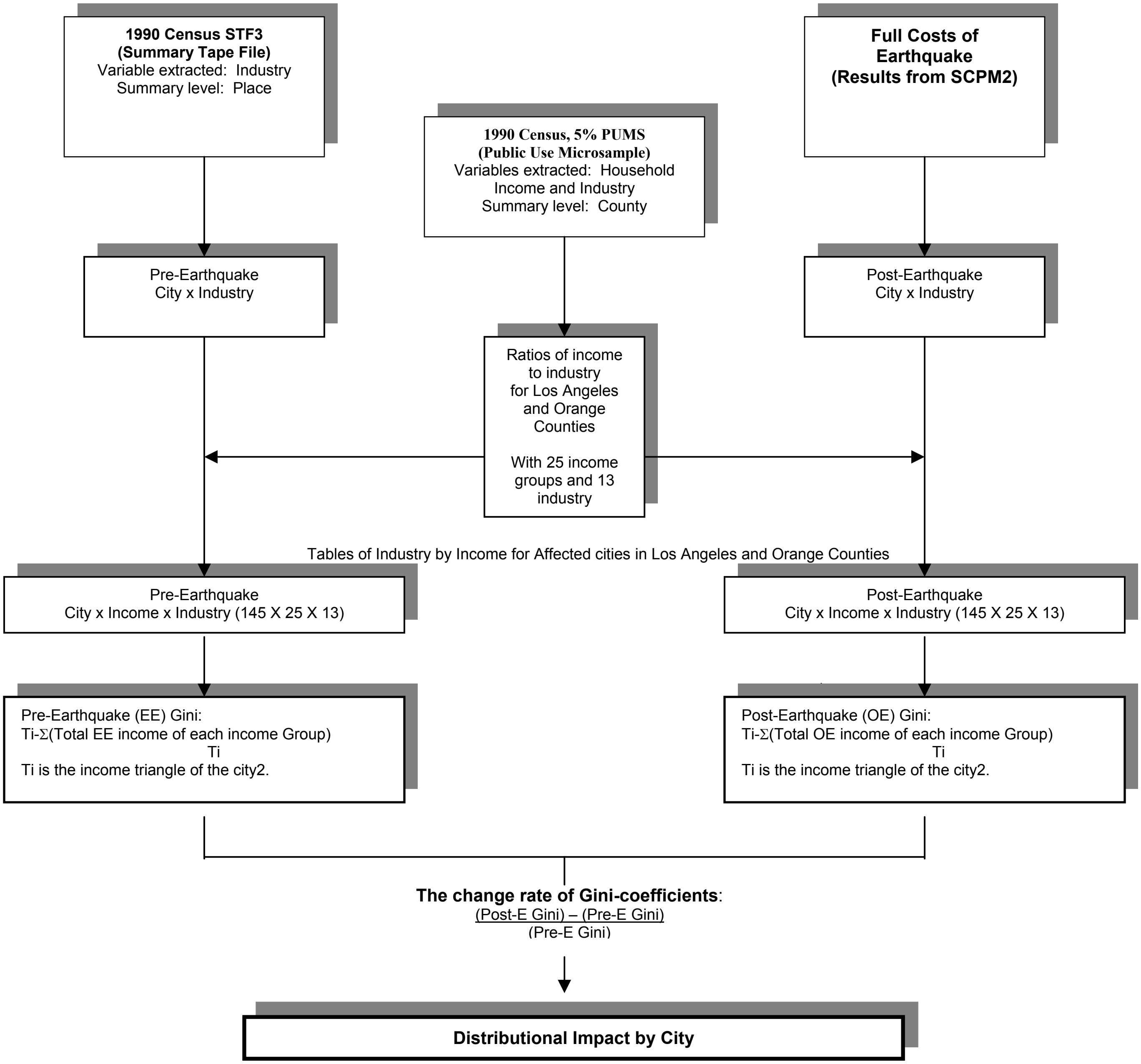

Fig. 2.5 Translating direct, indirect, and induced costs of an earthquake across income groups and municipal units

Cross-tabulation of two different variables, e.g., industry and income, is possible at the county level. Such cross-tabulations provide ratios between the two variables, e.g., the probability that each income group belongs to a given industry within the county. These types of frequency tables are not available at the city level. Consequently, we apply the county ratios to disaggregate to city-level data.

The results of these cross-tabulations are identification of socioeconomic subgroups, e.g., the number of jobs of an income group within an industry and within a city. The economic impact results from SCPM-2 are already distributed over cities. The current step distributes these local impacts further over various social subgroups. Analyzing societal impacts among various socioeconomic subgroups defined by relevant variables can be especially illuminating with respect to the distributional effects of mitigation policies.

2.4.3 Income distribution impact analysis: Gini coefficients

In addition to the descriptive results from the previous steps, we want to be more precise about income distribution effects. The fourth step is an analysis of interpersonal income distribution. Because the Elysian Park fault runs beneath downtown Los Angeles and other central city locations, and poor people tend to live within and near central city locations, we might expect a priori that such an earthquake would especially impact the poor. To test this, we have identified the most probable impact zones based on structural damage information, and have used the Gini coefficient to quantify the income distribution impact.

The equity of the income distribution of a city or region is conventionally characterized in terms of the distribution's divergence from a perfectly equal income distribution. If all residents have the same income, then the percent of total income with a city is proportional to the percent of households within the city. In reality, people earn different levels of income. The poorest group in a society usually represents a much lower proportion of aggregate societal income relative to their size.

In Figure 2.6 the cumulative frequency distribution of households (horizontal axis) is graphed against the cumulative frequency distribution of income (vertical axis), ranked from

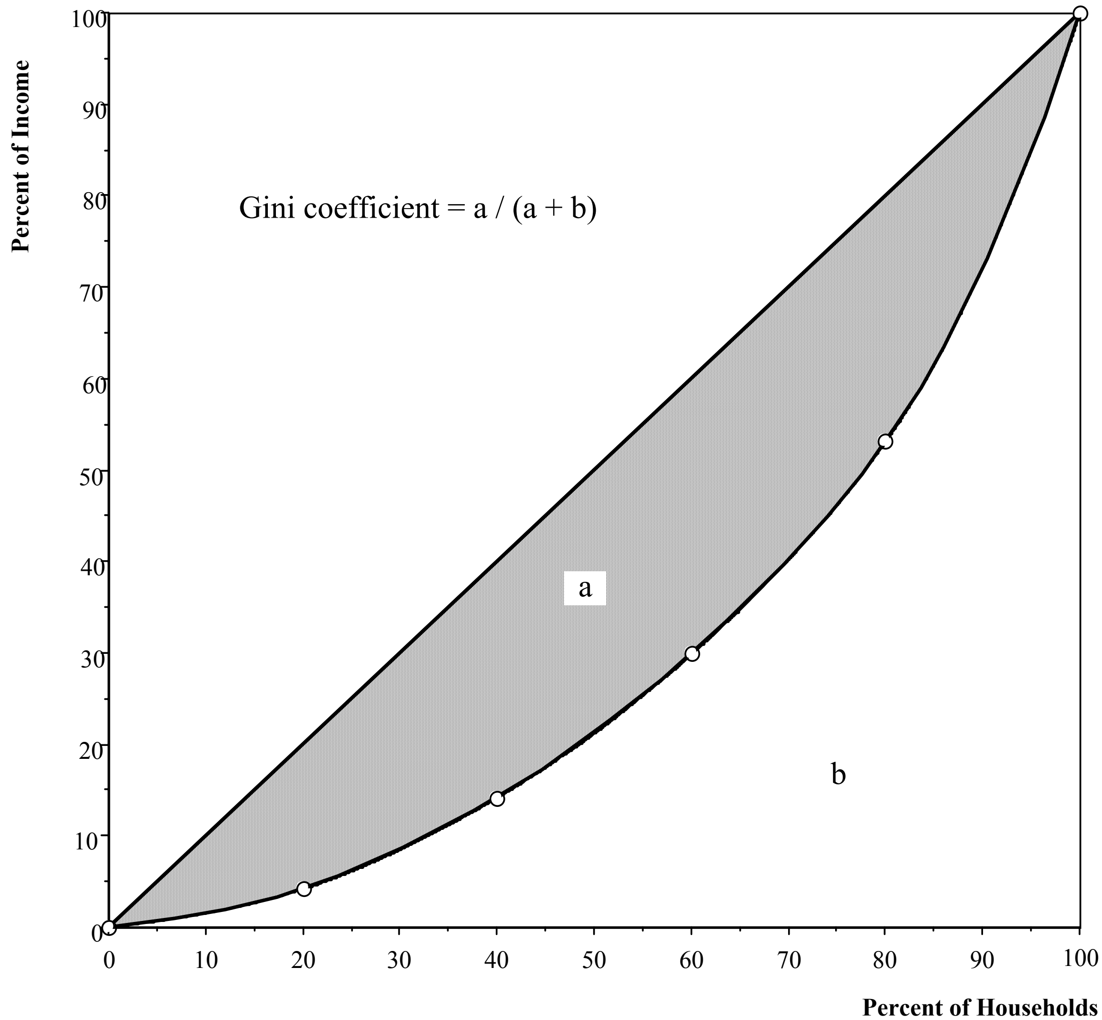

Fig. 2.6. The 1994 Lorenz curve for the United States
Source: *Statistical Abstract of The United States, 1996*, table 72.3.

poorest to richest. This yields a bowed-out curve below the diagonal, known as the Lorenz curve. The Gini coefficient is derived from the Lorenz curve. The equity of a society's income distribution can be measured by the gap between the linear and curvilinear lines. If the area between this curve and the diagonal is **a**, and the area outside this curve but between the two axes is **b**, then the

$$\text{Gini coefficient} = \mathbf{a} / (\mathbf{a} + \mathbf{b}). \tag{2.1}$$

The smaller the gap, the more equal is the income distribution. If everyone has the same income, G = 0. If one household has all the income, G = 1. Thus, the lower the value of G, the more equal the distribution of income. Declines in this coefficient following the earthquake would indicate that the equity position of poorer households improved (in relative terms). Increases in the Gini coefficient would suggest the opposite.

The key to computing Gini coefficients is the identification of different income groups. Thus, disaggregating jobs, both before and after the earthquake, into 25 income groups makes it possible to compute the pre- and post-earthquake Gini coefficients.

2.5 DESCRIPTIVE RESULTS

We have identified the municipal zones most likely to be impacted by an Elysian Park earthquake as measured by percentage changes in output and associated changes in income. Most of our previous earthquake research has focused on impacts measured at the workplace. However, the socioeconomic impacts could be distributed more widely because these are more correctly measured by place of residence.

The most impacted zones will be a combination of residential areas within the high peak ground acceleration (PGA) areas, and those outside these areas but linked to them by the journey-to-work. For example, we detect significant impacts in relatively high-income Santa Monica, which is quite far from the high-PGA zones. A probable explanation is that there are a significant number of people in that area who work in or near the downtown Los Angeles financial district, which would be directly impacted by the earthquake. For these cities, we have produced a list of indicators measuring social impacts, largely derived from publicly available sources such as census information. These provide a first-cut determination of whether the majority of the most impacted cities are likely to be poor or rich, as measured by these standard indicators. Linking SCPM-2 employment outputs and census occupation data permits us to access other variables of interest, and express results in terms of these measures. These include racial distribution (especially minority shares), citizen status, educational attainment, unemployment, income distribution measures, housing tenure, and property values.

We do not have complete information for all our 308 zones, because many of our zones are in unincorporated areas where the information is either missing or is unreliable due to small sample size. Also, even this pruned list of cities is too cumbersome to analyze. Thus, we have focused on the 55 most impacted cities. These are defined as those experiencing at least a 7.0 percent change in output (income). Table 2.3 shows the results for the 55 most impacted zones in terms of job losses. See the Appendix for corresponding results for all of the cities in Los Angeles and Orange counties ranked in terms of percent change in Gini coefficients. These zones include both high-income and low-income communities with large minority populations.

In addition to the descriptive results, we want to be more precise about the income distribution effects. We are measuring the transient effects of the earthquake impact from an income distribution perspective in two senses. First, are low-income zones disproportionately affected? And second, within each impact zone, is the change in the Gini coefficient, G, that is associated with the earthquake's job impacts positive or negative? The answer to these two questions sheds considerable light on the income distribution effects of a major Elysian fault earthquake and provides a comparative framework for examining the outcomes associated with other events.

The Gini coefficient declines, often modestly, in all but four of the 55 most impacted cities. The exceptions are Huntington Park, Mission Viejo, El Monte, and Diamond Bar (of which Huntington Park and El Monte are low-income communities). The largest relative drops in the Gini coefficient are found in Santa Monica (-0.20 percent), Arcadia (-0.18 percent), Pasadena (-0.16 percent), Burbank (-0.15 percent), Long Beach (-0.14 percent), Los Angeles (-0.12 percent), Inglewood (-0.12 percent), Gardena (-0.12 percent), Pomona (-0.12 percent), Hawthorne (-0.12 percent), Westminster (-0.12 percent), Downey (-0.11 percent), Redondo Beach (-0.11 percent), Buena Park (-0.11 percent), and Montebello (-0.11 percent). As suggested by the other socioeconomic data in Table 2.3, this list is a mix of high-, middle-, and low-income communities.

As noted above, all of the Gini coefficient calculations are based on income strata. These data were combined with cross-tabulations from the 1990 Census Public Use Micro Sample (PUMS) to translate impacts into socioeconomic categories. These include ethnicity, level of education, citizenship status, employment status, housing tenure, and other measures. *Policy makers interested in evaluating prospective earthquake mitigation and recovery measures now have the means to test how these programs and plans can be expected to impact various socio-economic groups.*

TABLE 2.3 INCOME DISTRIBUTION AND SOCIOECONOMIC IMPACTS IN THE 55 MOST AFFECTED CITIES IN LOS ANGELES AND ORANGE COUNTIES

Table 2.3.1 Cities ranked by absolute change in employment

Rank	City	County	Change in Employment ($1000)	Pre-Event Gini	Post-Event Gini	Change in Gini
1	Los Angeles	LA	130,056.9	0.3483	0.3479	-0.0004
2	Long Beach	LA	15,360.4	0.3527	0.3522	-0.0005
3	Anaheim	OR	11,014.0	0.2447	0.2446	-0.0001
4	Santa Ana	OR	10,736.4	0.2406	0.2404	-0.0001
5	Huntington Beach	OR	8,421.6	0.2424	0.2422	-0.0001
6	Glendale	LA	6,956.1	0.3455	0.3451	-0.0004
7	Torrance	LA	5,949.5	0.3547	0.3544	-0.0003
8	Garden Grove	OR	5,711.3	0.2432	0.2431	-0.0002
9	Pasadena	LA	5,567.7	0.3428	0.3422	-0.0006
10	Fullerton	OR	4,899.5	0.2436	0.2434	-0.0001
11	Orange	OR	4,810.4	0.2399	0.2397	-0.0002
12	Costa Mesa	OR	4,668.5	0.2405	0.2403	-0.0002
13	Irvine	OR	4,632.8	0.2386	0.2384	-0.0001
14	Inglewood	LA	4,428.2	0.3495	0.3491	-0.0004
15	Pomona	LA	4,335.5	0.3542	0.3538	-0.0004
16	West Covina	LA	4,252.2	0.3550	0.3548	-0.0003
17	Santa Clarita	LA	4,190.5	0.3508	0.3507	-0.0001
18	Santa Monica	LA	3,972.3	0.3463	0.3456	-0.0007
19	Burbank	LA	3,852.7	0.3434	0.3429	-0.0005
20	Downey	LA	3,846.3	0.3549	0.3545	-0.0004
21	El Monte	LA	3,827.3	0.3558	0.3558	0.0000
22	East Los Angeles CDP	LA	3,731.7	0.3520	0.3517	-0.0003
23	Norwalk	LA	3,697.9	0.3567	0.3565	-0.0003
24	Redondo Beach	LA	3,396.4	0.3539	0.3535	-0.0004
25	Whittier	LA	3,372.0	0.3569	0.3566	-0.0003
26	Carson	LA	3,355.3	0.3547	0.3544	-0.0003
27	Alhambra	LA	3,346.1	0.3491	0.3488	-0.0003
28	Hawthorne	LA	3,238.5	0.3527	0.3523	-0.0004
29	Westminster	OR	3,204.1	0.2438	0.2435	-0.0003
30	Lakewood	LA	3,169.6	0.3552	0.3549	-0.0003
31	South Gate	LA	3,087.8	0.3577	0.3576	-0.0001
32	Buena Park	OR	3,015.8	0.2460	0.2457	-0.0003
33	Newport Beach	OR	2,934.8	0.2374	0.2373	-0.0002
34	Mission Viejo	OR	2,818.7	0.2412	0.2412	0.0000
35	El Toro CDP	OR	2,752.3	0.2409	0.2407	-0.0002
36	Bellflower	LA	2,622.8	0.3555	0.3551	-0.0004

37	Baldwin Park	LA	2,599.7	0.3577	0.3577	-0.0001
38	Diamond Bar	LA	2,582.2	0.3543	0.3543	0.0000
39	Cerritos	LA	2,519.5	0.3561	0.3558	-0.0003
40	Compton	LA	2,488.1	0.3550	0.3546	-0.0004
41	Hacienda Heights CDP	LA	2,444.3	0.3574	0.3573	-0.0001
42	Yorba Linda	OR	2,416.8	0.2438	0.2438	0.0000
43	Fountain Valley	OR	2,385.6	0.2411	0.2410	-0.0001
44	La Habra	OR	2,353.8	0.2438	0.2436	-0.0002
45	Monterey Park	LA	2,341.0	0.3496	0.3493	-0.0003
46	Tustin	OR	2,316.2	0.2388	0.2386	-0.0002
47	Montebello	LA	2,267.0	0.3551	0.3546	-0.0004
48	Arcadia	LA	2,259.0	0.3479	0.3473	-0.0006
49	Glendora	LA	2,176.6	0.3549	0.3546	-0.0003
50	Gardena	LA	2,174.6	0.3551	0.3547	-0.0004
51	South Whittier CDP	LA	2,152.2	0.3572	0.3571	-0.0001
52	Pico Rivera	LA	2,137.4	0.3574	0.3572	-0.0002
53	Cypress	OR	2,069.7	0.2433	0.2432	-0.0001
54	Huntington Park	LA	2,059.5	0.3589	0.3589	0.0001
55	Covina	LA	2,000.7	0.3550	0.3548	-0.0002

Table 2.3.1 *continued.* Cities ranked by absolute change in employment

Rank	City	County	Percent Change in Gini	Persons	Households
1	Los Angeles	LA	-0.12%	3,485,398	1,219,770
2	Long Beach	LA	-0.14%	429,433	159,234
3	Anaheim	OR	-0.05%	266,406	87,224
4	Santa Ana	OR	-0.05%	293,742	71,860
5	Huntington Beach	OR	-0.05%	181,519	69,057
6	Glendale	LA	-0.12%	180,038	68,694
7	Torrance	LA	-0.09%	133,107	52,831
8	Garden Grove	OR	-0.07%	143,050	44,771
9	Pasadena	LA	-0.16%	131,591	50,409
10	Fullerton	OR	-0.06%	114,144	41,025
11	Orange	OR	-0.07%	110,658	36,839
12	Costa Mesa	OR	-0.08%	96,357	37,653
13	Irvine	OR	-0.06%	110,330	40,358
14	Inglewood	LA	-0.12%	109,602	36,399
15	Pomona	LA	-0.12%	131,723	36,566
16	West Covina	LA	-0.07%	96,086	30,105
17	Santa Clarita	LA	-0.02%	110,642	38,362
18	Santa Monica	LA	-0.20%	86,905	45,125
19	Burbank	LA	-0.15%	93,643	39,315

20	Downey	LA	-0.11%	91,444	33,003
21	El Monte	LA	0.00%	106,209	26,218
22	East Los Angeles CDP	LA	-0.08%	126,379	29,176
23	Norwalk	LA	-0.08%	94,279	26,279
24	Redondo Beach	LA	-0.11%	82,106	28,362
25	Whittier	LA	-0.08%	77,671	27,612
26	Carson	LA	-0.09%	83,995	23,786
27	Alhambra	LA	-0.09%	82,106	28,362
28	Hawthorne	LA	-0.12%	71,349	27,158
29	Westminster	OR	-0.12%	78,118	25,194
30	Lakewood	LA	-0.09%	73,557	26,202
31	South Gate	LA	-0.02%	86,284	22,194
32	Buena Park	OR	-0.11%	68,784	22,255
33	Newport Beach	OR	-0.06%	66,643	30,866
34	Mission Viejo	OR	0.01%	72,820	25,108
35	El Toro CDP	OR	-0.06%	62,685	21,887
36	Bellflower	LA	-0.10%	61,815	22,921
37	Baldwin Park	LA	-0.02%	69,330	16,606
38	Diamond Bar	LA	0.00%	53,672	16,886
39	Cerritos	LA	-0.08%	53,240	15,060
40	Compton	LA	-0.11%	90,454	22,330
41	Hacienda Heights CDP	LA	-0.03%	52,354	15,624
42	Yorba Linda	OR	-0.01%	52,422	16,915
43	Fountain Valley	OR	-0.04%	53,691	17,494
44	La Habra	OR	-0.10%	51,266	18,230
45	Monterey Park	LA	-0.08%	60,738	19,664
46	Tustin	OR	-0.10%	50,689	18,338
47	Montebello	LA	-0.11%	59,564	18,564
48	Arcadia	LA	-0.18%	48,290	18,336
49	Glendora	LA	-0.10%	47,828	16,343
50	Gardena	LA	-0.12%	49,847	18,078
51	South Whittier CDP	LA	-0.02%	49,514	14,317
52	Pico Rivera	LA	-0.06%	59,177	16,003
53	Cypress	OR	-0.05%	42,655	14,307
54	Huntington Park	LA	0.02%	56,065	14,048
55	Covina	LA	-0.05%	43,207	15,488

Table 2.3.1 *continued.* Cities ranked by absolute change in employment

Rank	Race									
	White	%	Black	%	Am In/ Eskimo	%	Asian	%	Other	%
1	1,845,133	52.9	485,949	13.9	14,919	0.4	341,986	9.8	797,411	22.9
2	251,022	58.5	58,831	13.7	2,732	0.6	58,389	13.6	58,459	13.6
3	190,881	71.7	6,671	2.5	1,436	0.5	25,892	9.7	41,526	15.6
4	200,118	68.1	7,594	2.6	1,369	0.5	28,466	9.7	56,195	19.1
5	156,184	86.0	1,853	1.0	1,406	0.8	14,997	8.3	7,079	3.9
6	133,744	74.3	2,030	1.1	561	0.3	25,471	14.1	18,232	10.1
7	97,538	73.3	1,684	1.3	506	0.4	29,105	21.9	4,274	3.2
8	96,289	67.3	2,193	1.5	880	0.6	29,479	20.6	14,209	9.9
9	75,183	57.1	24,985	19.0	804	0.6	10,733	8.2	19,886	15.1
10	85,571	75.0	2,168	1.9	716	0.6	13,849	12.1	11,840	10.4
11	92,040	83.2	1,609	1.5	594	0.5	8,604	7.8	7,811	7.1
12	81,371	84.4	1,178	1.2	477	0.5	6,258	6.5	7,073	7.3
13	85,952	77.9	2,001	1.8	258	0.2	19,935	18.1	2,184	2.0
14	19,148	17.5	56,943	52.0	358	0.3	2,693	2.5	30,460	27.8
15	75,400	57.2	18,963	14.4	656	0.5	8,825	6.7	27,879	21.2
16	57,704	60.1	8,170	8.5	342	0.4	16,535	17.2	13,335	13.9
17	96,666	87.4	1,714	1.5	698	0.6	4,575	4.1	6,989	6.3
18	72,116	83.0	3,973	4.6	458	0.5	5,468	6.3	4,890	5.6
19	77,533	82.8	1,510	1.6	521	0.6	6,373	6.8	7,706	8.2
20	66,470	72.7	3,001	3.3	569	0.6	8,037	8.8	13,367	14.6
21	66,468	62.6	898	0.8	445	0.4	12,404	11.7	25,994	24.5
22	53,381	42.2	1,822	1.4	521	0.4	1,583	1.3	69,072	54.7
23	52,682	55.9	3,097	3.3	749	0.8	11,687	12.4	26,064	27.6
24	52,439	87.2	839	1.4	276	0.5	4,050	6.7	2,563	4.3
25	57,135	73.6	963	1.2	379	0.5	2,707	3.5	16,487	21.2
26	29,161	34.7	22,033	26.2	459	0.5	21,007	25.0	11,335	13.5
27	33,690	41.0	1,573	1.9	253	0.3	31,519	38.4	15,071	18.4
28	30,165	42.3	20,237	28.4	299	0.4	7,817	11.0	12,831	18.0
29	54,540	69.8	838	1.1	505	0.6	17,604	22.5	4,631	5.9
30	59,724	81.2	2,658	3.6	535	0.7	6,875	9.3	3,765	5.1
31	35,968	41.7	1,361	1.6	467	0.5	1,321	1.5	47,167	54.7
32	48,922	71.1	1,633	2.4	410	0.6	10,026	14.6	7,793	11.3
33	63,771	95.7	181	0.3	203	0.3	1,937	2.9	551	0.8
34	65,793	90.4	570	0.8	242	0.3	4,680	6.4	1,535	2.1
35	53,837	85.9	1,063	1.7	244	0.4	5,755	9.2	1,786	2.8
36	43,349	70.1	3,865	6.3	560	0.9	6,214	10.1	7,827	12.7
37	38,764	55.9	1,678	2.4	399	0.6	8,470	12.2	20,019	28.9
38	34,252	63.8	3,036	5.7	162	0.3	13,372	24.9	2,850	5.3
39	22,607	42.5	3,964	7.4	160	0.3	24,094	45.3	2,415	4.5

40	9,566	10.6	49,806	55.1	485	0.5	1,628	1.8	28,969	32.0
41	31,001	59.2	1,215	2.3	275	0.5	14,284	27.3	5,579	10.7
42	44,942	85.7	484	0.9	350	0.7	5,273	10.1	1,373	2.6
43	42,025	78.3	415	0.8	314	0.6	9,600	17.9	1,337	2.5
44	39,346	76.7	386	0.8	350	0.7	2,209	4.3	8,975	17.5
45	16,247	26.7	400	0.7	184	0.3	34,977	57.6	8,930	14.7
46	37,155	73.3	2,944	5.8	342	0.7	5,316	10.5	4,932	9.7
47	28,198	47.3	470	0.8	241	0.4	9,186	15.4	21,469	36.0
48	34,552	71.6	318	0.7	179	0.4	11,368	23.5	1,873	3.9
49	42,342	88.5	548	1.1	285	0.6	2,696	5.6	1,957	4.1
50	16,124	32.3	11,655	23.4	305	0.6	16,565	33.2	5,198	10.4
51	33,270	67.2	704	1.4	281	0.6	2,140	4.3	13,119	26.5
52	34,926	59.0	382	0.6	350	0.6	1,776	3.0	21,743	36.7
53	33,753	79.1	845	2.0	258	0.6	5,781	13.6	2,018	4.7
54	17,499	31.2	600	1.1	154	0.3	1,126	2.0	36,686	65.4
55	34,836	80.6	1,731	4.0	172	0.4	3,336	7.7	3,132	7.2

Table 2.3.1 *continued.* Cities ranked by absolute change in employment

Rank	Education			Hispanic Origin		Citizenship					
	<9th	HS+ (inc BA+)	BA+	Persons	%	Native	%	Natural -ized	%	Non-citizen	%
1	18.4	67.0	23.0	1,370,476	39.3	2,148,733	61.6	339,922	9.8	996,743	28.6
2	11.5	75.5	23.2	99,878	23.3	325,283	75.7	29,381	6.8	74,769	17.4
3	12.0	75.4	18.8	82,453	31.0	190,672	71.6	20,896	7.8	54,838	20.6
4	33.1	49.7	10.6	189,967	64.7	144,297	49.1	26,144	8.9	123,301	42.0
5	3.8	89.2	32.1	19,828	10.9	154,486	85.1	11,138	6.1	15,895	8.8
6	11.5	77.2	28.6	36,225	20.1	98,686	54.8	21,445	11.9	59,907	33.3
7	3.8	87.6	31.2	13,179	9.9	103,591	77.8	10,720	8.1	18,796	14.1
8	11.3	74.4	16.1	32,549	22.8	99,442	69.5	12,266	8.6	31,342	21.9
9	11.4	77.5	36.3	35,400	26.9	95,364	72.5	9,905	7.5	26,322	20.0
10	8.0	82.7	29.8	23,908	20.9	87,163	76.4	9,211	8.1	17,770	15.6
11	8.1	81.7	25.6	24,782	22.4	88,380	79.9	5,886	5.3	16,392	14.8
12	7.4	83.5	27.3	19,205	19.9	75,570	78.4	6,208	6.4	14,579	15.1
13	1.4	95.1	52.8	6,818	6.2	85,701	77.7	10,257	9.3	14,372	13.0
14	17.2	66.0	14.9	41,553	37.9	77,932	71.1	6,673	6.1	24,997	22.8
15	21.7	59.6	13.1	66,589	50.6	90,134	68.4	8,387	6.4	33,202	25.2
16	6.6	80.6	20.2	32,873	34.2	71,795	74.7	9,251	9.6	15,040	15.7
17	3.8	87.9	25.9	14,564	13.2	97,924	88.5	5,598	5.1	7,120	6.4
18	5.5	87.5	43.4	11,842	13.6	64,915	74.7	9,598	11.0	12,392	14.3
19	8.4	79.7	22.9	20,670	22.1	69,553	74.3	8,363	8.9	15,727	16.8
20	9.0	76.3	16.3	29,249	32.0	67,732	74.1	8,584	9.4	15,128	16.5
21	31.9	44.3	6.0	76,740	72.3	54,785	51.6	10,036	9.4	41,388	39.0

22	45.8	30.3	3.4	119,418	94.5	64,391	51.0	10,251	8.1	51,737	40.9
23	16.2	64.7	9.9	44,697	47.4	67,644	71.7	7,749	8.2	18,886	20.0
24	2.7	90.4	40.4	7,013	11.7	52,695	87.6	3,222	5.4	4,250	7.1
25	7.8	79.7	20.8	29,944	38.6	65,236	84.0	3,703	4.8	8,732	11.2
26	12.8	71.4	17.1	23,027	27.4	61,314	73.0	9,712	11.6	12,969	15.4
27	14.6	72.1	22.9	29,260	35.6	43,592	53.1	12,535	15.3	25,979	31.6
28	10.9	73.9	15.7	21,492	30.1	50,422	70.7	6,477	9.1	14,450	20.3
29	10.1	75.1	18.1	14,323	18.3	55,366	70.9	7,448	9.5	15,304	19.6
30	5.5	81.4	17.7	10,526	14.3	64,038	87.1	4,158	5.7	5,361	7.3
31	36.2	40.9	5.3	71,740	83.1	43,744	50.7	8,401	9.7	34,139	39.6
32	8.1	76.7	15.9	16,480	24.0	53,202	77.3	4,697	6.8	10,885	15.8
33	1.1	95.3	50.3	2,671	4.0	60,598	90.9	3,024	4.5	3,021	4.5
34	1.4	93.7	39.1	5,462	7.5	63,692	87.5	4,161	5.7	4,967	6.8
35	2.2	91.7	35.6	6,431	10.3	53,544	85.4	3,921	6.3	5,220	8.3
36	8.9	72.3	12.0	14,381	23.3	50,074	81.0	3,782	6.1	7,959	12.9
37	27.3	50.5	9.7	48,794	70.4	39,520	57.0	7,210	10.4	22,600	32.6
38	2.6	90.6	37.0	8,839	16.5	39,867	74.3	5,806	10.8	7,999	14.9
39	3.6	89.2	37.0	6,312	11.9	33,890	63.7	10,083	18.9	9,267	17.4
40	25.4	51.2	6.2	38,316	42.4	66,215	73.2	6,097	6.7	18,142	20.1
41	6.8	83.0	28.5	16,328	31.2	36,141	69.0	5,557	10.6	10,656	20.4
42	2.0	92.9	37.0	4,860	9.3	46,116	88.0	3,462	6.6	2,844	5.4
43	3.8	88.7	31.3	4,161	7.7	43,252	80.6	4,918	9.2	5,521	10.3
44	10.0	76.3	18.4	17,170	33.5	41,083	80.1	3,057	6.0	7,126	13.9
45	16.2	70.0	22.4	18,465	30.4	29,261	48.2	10,944	18.0	20,533	33.8
46	5.4	86.0	25.5	10,285	20.3	39,725	78.4	3,621	7.1	7,343	14.5
47	20.3	60.8	14.6	39,910	67.0	36,309	61.0	7,226	12.1	16,029	26.9
48	4.7	88.9	36.4	4,629	9.6	34,963	72.4	4,752	9.8	8,575	17.8
49	4.5	83.7	22.2	6,988	14.6	41,841	87.5	2,859	6.0	3,128	6.5
50	10.1	73.4	16.5	11,348	22.8	35,280	70.8	4,166	8.4	10,401	20.9
51	14.2	67.8	10.4	25,315	51.1	38,003	53.6	24,475	34.5	8,481	12.0
52	22.1	52.3	6.1	48,891	82.6	41,841	70.7	4,904	8.3	12,432	21.0
53	3.4	87.5	26.6	5,869	13.8	36,068	84.6	3,073	7.2	3,514	8.2
54	46.4	30.6	5.3	51,066	91.1	22,766	40.6	5,830	10.4	27,469	49.0
55	5.4	82.5	16.4	10,990	25.4	36,330	84.1	2,270	5.3	4,607	10.7

Table 2.3.1 *continued.* Cities ranked by absolute change in employment

Rank	Unemployed (%) Age 16+	Household Income		Median HH Income	Housing Units	Tenure			Median Gross Rent ($/Month)	Median House Value
		% < 20K	% > 100K			Owners	%	Renters		
1	5.6	32.7	7.9	30,925	1,299,963	479,744	39.3	737,661	600	241,400
2	4.4	30.9	5.5	31,938	170,388	65,113	40.9	93,862	605	221,000
3	4.1	20.2	6.2	39,620	93,177	43,173	49.5	44,415	712	218,400
4	6.1	23.2	3.0	35,162	74,973	34,579	48.1	37,032	736	184,600
5	2.8	13.3	12.3	50,633	72,736	40,284	58.3	28,595	860	285,300
6	4.5	27.7	8.6	34,372	72,114	26,554	38.7	42,050	688	341,700
7	2.8	16.4	10.6	47,204	54,927	29,616	56.1	22,999	795	338,700
8	4.4	20.8	3.9	39,882	45,984	26,546	59.3	17,992	745	197,800
9	4.2	28.7	10.1	35,103	53,032	23,227	46.1	26,972	630	281,500
10	3.3	19.2	9.6	41,921	42,956	22,522	54.9	18,350	706	231,800
11	3.4	17.0	11.2	46,539	38,018	22,540	61.2	14,251	766	247,700
12	3.2	18.3	7.2	40,313	39,611	15,051	40.0	22,416	810	255,800
13	2.5	11.6	18.5	56,307	42,221	25,145	62.3	15,112	925	292,600
14	7.0	31.2	2.5	29,881	38,713	13,110	36.0	22,992	618	170,400
15	6.0	29.9	3.5	32,132	38,466	20,929	57.2	15,514	592	133,700
16	3.4	17.5	6.7	42,481	31,112	20,063	66.6	10,033	733	201,100
17	2.7	11.9	10.8	52,970	41,133	29,132	75.9	9,342	832	231,500
18	3.3	26.4	12.2	35,997	47,753	12,340	27.3	32,520	532	500,001
19	3.5	23.3	6.1	35,959	41,216	17,949	45.7	21,326	677	260,200
20	3.6	22.2	6.5	36,991	34,302	17,324	52.5	15,689	649	227,300
21	6.1	34.5	1.6	28,034	27,167	10,507	40.1	15,624	600	172,000
22	6.7	43.8	1.0	22,937	30,196	11,043	37.8	18,348	487	141,000
23	4.4	21.6	2.2	38,124	27,247	17,120	65.1	9,226	706	164,700
24	2.7	13.7	12.3	51,913	28,220	12,390	46.2	14,327	863	347,900
25	3.2	22.2	8.1	38,020	28,758	15,954	57.8	11,683	638	209,300
26	5.0	16.6	5.7	43,882	24,441	18,807	79.1	5,001	721	186,800
27	3.8	29.5	3.1	31,368	29,604	11,463	40.4	16,776	636	227,900
28	5.0	28.2	2.4	30,967	29,214	6,933	25.5	20,204	629	226,600
29	4.0	20.4	6.5	41,364	25,852	15,742	62.5	9,335	736	225,500
30	3.0	16.8	5.2	44,700	26,795	18,808	71.8	7,294	802	213,500
31	7.0	35.0	1.5	27,279	22,946	10,885	49.0	11,543	549	161,900
32	4.1	18.3	5.4	41,435	23,200	12,476	56.1	9,734	727	204,000
33	2.1	13.0	28.7	60,374	34,861	17,207	55.7	13,653	967	500,001
34	2.2	7.4	17.2	61,058	26,393	20,140	80.2	5,034	969	252,100
35	2.7	8.7	13.1	56,324	22,809	15,863	72.5	5,854	877	258,900
36	4.0	27.6	3.1	32,711	24,117	9,062	39.5	13,843	630	194,600

37	5.6	25.9	2.3	32,684	17,179	9,988	60.1	6,626	648	149,700
38	2.7	7.2	13.8	60,651	17,664	14,484	85.8	2,417	940	271,500
39	2.6	7.5	15.1	59,076	15,364	12,537	83.2	2,489	1,001	297,600
40	8.5	40.9	1.6	24,971	23,239	12,731	57.0	9,592	549	107,100
41	3.2	13.9	12.5	51,837	16,091	12,634	80.9	2,989	852	270,400
42	2.1	6.6	22.9	67,892	17,341	14,139	83.6	2,635	918	324,800
43	2.9	9.8	14.5	56,255	18,019	13,081	74.8	4,326	893	286,300
44	4.0	21.4	6.4	39,967	18,670	10,221	56.1	7,891	685	199,200
45	3.6	30.8	5.9	32,605	20,298	10,714	54.5	8,791	661	235,400
46	3.5	17.8	6.8	38,433	19,300	7,508	40.9	10,824	746	255,100
47	4.2	30.2	5.5	31,441	19,193	9,002	48.5	9,616	623	211,200
48	2.3	17.4	16.6	47,347	19,483	11,300	61.6	7,052	716	438,800
49	3.0	16.5	9.5	46,116	16,876	12,073	73.9	4,254	729	231,000
50	4.1	25.5	3.4	33,063	19,037	8,451	46.7	9,675	646	200,900
51	6.3	19.6	2.6	39,324	14,656	296	2.1	788	692	173,000
52	5.3	26.5	2.0	34,383	16,316	11,225	70.1	4,777	613	163,800
53	3.4	11.6	10.3	50,981	14,715	9,911	69.3	4,368	811	250,800
54	8.6	41.7	1.1	23,595	14,515	3,958	28.2	9,945	521	160,500
55	3.8	20.4	5.0	38,907	16,110	9,020	58.2	6,511	652	201,300

Table 2.3.2 Cities ranked by percent change in value of output

Rank	City	County	Percent Change in Value of Output ($1000)	Pre-Event Gini	Post-Event Gini	Change in Gini
1	Laguna Hills CDP	OR	14.22%	0.2395	0.2390	-0.0005
2	West Hollywood	LA	10.77%	0.3470	0.3462	-0.0008
3	Covina	LA	10.49%	0.3550	0.3548	-0.0001
4	Santa Monica	LA	10.18%	0.3463	0.3456	-0.0007
5	Arcadia	LA	9.83%	0.3479	0.3472	-0.0008
6	Whittier	LA	9.75%	0.3569	0.3566	-0.0003
7	San Clemente	OR	8.87%	0.2444	0.2443	0.0000
8	Altadena CDP	LA	8.80%	0.3415	0.3407	-0.0008
9	Costa Mesa	OR	8.65%	0.2405	0.2403	-0.0002
10	Pasadena	LA	8.44%	0.3428	0.3422	-0.0006
11	Glendale	LA	8.38%	0.3455	0.3451	-0.0004
12	Long Beach	LA	8.38%	0.3527	0.3522	-0.0005
13	Gardena	LA	8.37%	0.3551	0.3547	-0.0004
14	Garden Grove	OR	8.30%	0.2432	0.2431	-0.0002
15	Torrance	LA	8.15%	0.3547	0.3544	-0.0003
16	Downey	LA	8.14%	0.3549	0.3545	-0.0004
17	Bellflower	LA	8.03%	0.3555	0.3551	-0.0003
18	Culver City	LA	7.98%	0.3482	0.3478	-0.0005
19	Fullerton	OR	7.93%	0.2436	0.2434	-0.0001
20	Newport Beach	OR	7.90%	0.2374	0.2372	-0.0002
21	Alhambra	LA	7.89%	0.3491	0.3488	-0.0004
22	Buena Park	OR	7.86%	0.2460	0.2457	-0.0003
23	Los Angeles	LA	7.85%	0.3483	0.3479	-0.0004
24	Glendora	LA	7.81%	0.3549	0.3546	-0.0003
25	Burbank	LA	7.76%	0.3434	0.3429	-0.0005
26	Orange	OR	7.74%	0.2399	0.2398	-0.0002
27	Monterey Park	LA	7.66%	0.3496	0.3493	-0.0004
28	Lakewood	LA	7.61%	0.3552	0.3549	-0.0003
29	Pico Rivera	LA	7.52%	0.3574	0.3572	-0.0002
30	Montebello	LA	7.47%	0.3551	0.3546	-0.0004
31	El Toro CDP	OR	7.39%	0.2409	0.2407	-0.0002
32	Norwalk	LA	7.39%	0.3567	0.3565	-0.0002
33	Huntington Beach	OR	7.38%	0.2424	0.2422	-0.0001
34	Cypress	OR	7.38%	0.2433	0.2432	-0.0001
35	Westminster	OR	7.37%	0.2438	0.2435	-0.0003
36	Inglewood	LA	7.28%	0.3495	0.3491	-0.0004
37	Irvine	OR	7.24%	0.2386	0.2384	-0.0002
38	Anaheim	OR	7.22%	0.2447	0.2446	-0.0001

39	Redondo Beach	LA	7.19%	0.3539	0.3535	-0.0004
40	Hawthorne	LA	7.16%	0.3527	0.3523	-0.0004
41	Fountain Valley	OR	7.15%	0.2411	0.2410	-0.0001
42	Pomona	LA	7.14%	0.3542	0.3539	-0.0004
43	La Habra	OR	7.09%	0.2438	0.2436	-0.0002
44	West Covina	LA	7.01%	0.3550	0.3548	-0.0003
45	Compton	LA	6.94%	0.3550	0.3546	-0.0004
46	East Los Angeles CDP	LA	6.90%	0.3520	0.3517	-0.0003
47	Lancaster	LA	6.83%	0.3538	0.3533	-0.0005
48	South Gate	LA	6.53%	0.3577	0.3576	-0.0001
49	Cerritos	LA	6.43%	0.3561	0.3558	-0.0003
50	Baldwin Park	LA	6.38%	0.3577	0.3576	-0.0001
51	Tustin	OR	6.30%	0.2388	0.2386	-0.0003
52	El Monte	LA	6.21%	0.3558	0.3558	0.0000
53	Carson	LA	6.18%	0.3547	0.3544	-0.0003
54	Santa Ana	OR	6.12%	0.2406	0.2404	-0.0002
55	Santa Clarita	LA	3.26%	0.3508	0.3507	-0.0001

Table 2.3.2 *continued.* Cities ranked by percent change in value of output

Rank	City	County	Percent Change in Gini	Persons	Households
1	Laguna Hills CDP	OR	-0.19%	46,731	22,371
2	West Hollywood	LA	-0.22%	36,118	22,502
3	Covina	LA	-0.04%	43,207	15,488
4	Santa Monica	LA	-0.20%	86,905	45,125
5	Arcadia	LA	-0.22%	48,290	18,336
6	Whittier	LA	-0.08%	77,671	27,612
7	San Clemente	OR	-0.01%	41,100	16,809
8	Altadena CDP	LA	-0.24%	42,658	14,570
9	Costa Mesa	OR	-0.10%	96,357	37,653
10	Pasadena	LA	-0.17%	131,591	50,409
11	Glendale	LA	-0.12%	180,038	68,694
12	Long Beach	LA	-0.14%	429,433	159,234
13	Gardena	LA	-0.11%	49,847	18,078
14	Garden Grove	OR	-0.07%	143,050	44,771
15	Torrance	LA	-0.09%	133,107	52,831
16	Downey	LA	-0.10%	91,444	33,003
17	Bellflower	LA	-0.10%	61,815	22,921
18	Culver City	LA	-0.13%	38,793	16,149
19	Fullerton	OR	-0.05%	114,144	41,025
20	Newport Beach	OR	-0.08%	66,643	30,866
21	Alhambra	LA	-0.10%	82,106	28,362

22	Buena Park	OR	-0.11%	68,784	22,255
23	Los Angeles	LA	-0.12%	3,485,398	1,219,770
24	Glendora	LA	-0.09%	47,828	16,343
25	Burbank	LA	-0.15%	93,643	39,315
26	Orange	OR	-0.07%	110,658	36,839
27	Monterey Park	LA	-0.10%	60,738	19,664
28	Lakewood	LA	-0.08%	73,557	26,202
29	Pico Rivera	LA	-0.07%	59,177	16,003
30	Montebello	LA	-0.13%	59,564	18,564
31	El Toro CDP	OR	-0.08%	62,685	21,887
32	Norwalk	LA	-0.07%	94,279	26,279
33	Huntington Beach	OR	-0.06%	181,519	69,057
34	Cypress	OR	-0.04%	42,655	14,307
35	Westminster	OR	-0.11%	78,118	25,194
36	Inglewood	LA	-0.11%	109,602	36,399
37	Irvine	OR	-0.08%	110,330	40,358
38	Anaheim	OR	-0.03%	266,406	87,224
39	Redondo Beach	LA	-0.11%	60,167	26,804
40	Hawthorne	LA	-0.11%	71,349	27,158
41	Fountain Valley	OR	-0.06%	53,691	17,494
42	Pomona	LA	-0.11%	131,723	36,566
43	La Habra	OR	-0.10%	51,266	18,230
44	West Covina	LA	-0.07%	96,086	30,105
45	Compton	LA	-0.11%	90,454	22,330
46	East Los Angeles CDP	LA	-0.08%	126,379	29,176
47	Lancaster	LA	-0.14%	97,291	33,112
48	South Gate	LA	-0.01%	86,284	22,194
49	Cerritos	LA	-0.08%	53,240	15,060
50	Baldwin Park	LA	-0.03%	69,330	16,606
51	Tustin	OR	-0.12%	50,689	18,338
52	El Monte	LA	-0.01%	106,209	26,218
53	Carson	LA	-0.08%	83,995	23,786
54	Santa Ana	OR	-0.06%	293,742	71,860
55	Santa Clarita	LA	-0.02%	110,642	38,362

Table 2.3.2 *continued.* Cities ranked by percent change in value of output

Rank	Race									
	White	%	Black	%	Am In/ Eskimo	%	Asian	%	Other	%
1	42,313	90.5	379	0.8	256	0.5	2,975	6.4	808	1.7
2	32,607	90.3	1,307	3.6	89	0.2	1,107	3.1	1,008	2.8
3	34,836	80.6	1,731	4.0	172	0.4	3,336	7.7	3,132	7.2
4	72,116	83.0	3,973	4.6	458	0.5	5,468	6.3	4,890	5.6
5	34,552	71.6	318	0.7	179	0.4	11,368	23.5	1,873	3.9
6	57,135	73.6	963	1.2	379	0.5	2,707	3.5	16,487	21.2
7	37,663	91.6	226	0.5	300	0.7	1,141	2.8	1,770	4.3
8	20,856	48.9	16,596	38.9	256	0.6	1,741	4.1	3,209	7.5
9	81,371	84.4	1,178	1.2	477	0.5	6,258	6.5	7,073	7.3
10	75,183	57.1	24,985	19.0	804	0.6	10,733	8.2	19,886	15.1
11	133,744	74.3	2,030	1.1	561	0.3	25,471	14.1	18,232	10.1
12	251,022	58.5	58,831	13.7	2,732	0.6	58,389	13.6	58,459	13.6
13	16,124	32.3	11,655	23.4	305	0.6	16,565	33.2	5,198	10.4
14	96,289	67.3	2,193	1.5	880	0.6	29,479	20.6	14,209	9.9
15	97,538	73.3	1,684	1.3	506	0.4	29,105	21.9	4,274	3.2
16	66,470	72.7	3,001	3.3	569	0.6	8,037	8.8	13,367	14.6
17	43,349	70.1	3,865	6.3	560	0.9	6,214	10.1	7,827	12.7
18	26,899	69.3	4,042	10.4	167	0.4	4,673	12.0	3,012	7.8
19	85,571	75.0	2,168	1.9	716	0.6	13,849	12.1	11,840	10.4
20	63,771	95.7	181	0.3	203	0.3	1,937	2.9	551	0.8
21	33,690	41.0	1,573	1.9	253	0.3	31,519	38.4	15,071	18.4
22	48,922	71.1	1,633	2.4	410	0.6	10,026	14.6	7,793	11.3
23	1,845,133	52.9	485,949	13.9	14,919	0.4	341,986	9.8	797,411	22.9
24	42,342	88.5	548	1.1	285	0.6	2,696	5.6	1,957	4.1
25	77,533	82.8	1,510	1.6	521	0.6	6,373	6.8	7,706	8.2
26	92,040	83.2	1,609	1.5	594	0.5	8,604	7.8	7,811	7.1
27	16,247	26.7	400	0.7	184	0.3	34,977	57.6	8,930	14.7
28	59,724	81.2	2,658	3.6	535	0.7	6,875	9.3	3,765	5.1
29	34,926	59.0	382	0.6	350	0.6	1,776	3.0	21,743	36.7
30	28,198	47.3	470	0.8	241	0.4	9,186	15.4	21,469	36.0
31	53,837	85.9	1,063	1.7	244	0.4	5,755	9.2	1,786	2.8
32	52,682	55.9	3,097	3.3	749	0.8	11,687	12.4	26,064	27.6
33	156,184	86.0	1,853	1.0	1,406	0.8	14,997	8.3	7,079	3.9
34	33,753	79.1	845	2.0	258	0.6	5,781	13.6	2,018	4.7
35	54,540	69.8	838	1.1	505	0.6	17,604	22.5	4,631	5.9
36	19,148	17.5	56,943	52.0	358	0.3	2,693	2.5	30,460	27.8
37	85,952	77.9	2,001	1.8	258	0.2	19,935	18.1	2,184	2.0

38	190,881	71.7	6,671	2.5	1,436	0.5	25,892	9.7	41,526	15.6
39	52,439	87.2	839	1.4	276	0.5	4,050	6.7	2,563	4.3
40	30,165	42.3	20,237	28.4	299	0.4	7,817	11.0	12,831	18.0
41	42,025	78.3	415	0.8	314	0.6	9,600	17.9	1,337	2.5
42	75,400	57.2	18,963	14.4	656	0.5	8,825	6.7	27,879	21.2
43	39,346	76.7	386	0.8	350	0.7	2,209	4.3	8,975	17.5
44	57,704	60.1	8,170	8.5	342	0.4	16,535	17.2	13,335	13.9
45	9,566	10.6	49,806	55.1	485	0.5	1,628	1.8	28,969	32.0
46	53,381	42.2	1,822	1.4	521	0.4	1,583	1.3	69,072	54.7
47	76,974	79.1	7,225	7.4	1,158	1.2	3,692	3.8	8,242	8.5
48	35,968	41.7	1,361	1.6	467	0.5	1,321	1.5	47,167	54.7
49	22,607	42.5	3,964	7.4	160	0.3	24,094	45.3	2,415	4.5
50	38,764	55.9	1,678	2.4	399	0.6	8,470	12.2	20,019	28.9
51	37,155	73.3	2,944	5.8	342	0.7	5,316	10.5	4,932	9.7
52	66,468	62.6	898	0.8	445	0.4	12,404	11.7	25,994	24.5
53	29,161	34.7	22,033	26.2	459	0.5	21,007	25.0	11,335	13.5
54	200,118	68.1	7,594	2.6	1,369	0.5	28,466	9.7	56,195	19.1
55	96,666	87.4	1,714	1.5	698	0.6	4,575	4.1	6,989	6.3

Table 2.3.2 *continued.* Cities ranked by percent change in value of output

Rank	Education			Hispanic Origin		Citizenship					
	<9th	HS+ (inc BA+)	BA+	Persons	%	Native	%	Natural-ized	%	Non-citizen	%
1	2.9	90.8	33.9	2,635	5.6	39,473	84.5	4,681	10.0	2,577	5.51
2	6.0	84.9	37.4	3,020	8.4	23,836	66.0	5,419	15.0	6,863	19.0
3	5.4	82.5	16.4	10,990	25.4	36,330	84.1	2,270	5.3	4,607	10.7
4	5.5	87.5	43.4	11,842	13.6	64,915	74.7	9,598	11.0	12,392	14.3
5	4.7	88.9	36.4	4,629	9.6	34,963	72.4	4,752	9.8	8,575	17.8
6	7.8	79.7	20.8	29,944	38.6	65,236	84.0	3,703	4.8	8,732	11.2
7	3.3	90.4	32.4	5,181	12.6	36,106	87.9	1,828	4.5	3,166	7.7
8	6.6	83.6	33.3	5,880	13.8	35,994	84.4	2,325	5.5	4,339	10.2
9	7.4	83.5	27.3	19,205	19.9	75,570	78.4	6,208	6.4	14,579	15.1
10	11.4	77.5	36.3	35,400	26.9	95,364	72.5	9,905	7.5	26,322	20.0
11	11.5	77.2	28.6	36,225	20.1	98,686	54.8	21,445	11.9	59,907	33.3
12	11.5	75.5	23.2	99,878	23.3	325,283	75.8	29,381	6.8	74,769	17.4
13	10.1	73.4	16.5	11,348	22.8	35,280	70.8	4,166	8.4	10,401	20.9
14	11.3	74.4	16.1	32,549	22.8	99,442	69.5	12,266	8.6	31,342	21.9
15	3.8	87.6	31.2	13,179	9.9	103,591	77.8	10,720	8.0	18,796	14.1
16	9.0	76.3	16.3	29,249	32.0	67,732	74.1	8,584	9.4	15,128	16.5
17	8.9	72.3	12.0	14,381	23.3	50,074	81.1	3,782	6.1	7,959	12.9
18	6.3	84.1	35.0	7,528	19.4	29,672	76.5	3,862	10.0	5,259	13. 6
19	8.0	82.7	29.8	23,908	20.9	87,163	76.4	9,211	8.1	17,770	15.6

20	1.1	95.3	50.3	2,671	4.0	60,598	90.9	3,024	4.5	3,021	4.5
21	14.6	72.1	22.9	29,260	35.6	43,592	53.1	12,535	15.3	25,979	31.6
22	8.1	76.7	15.9	16,480	24.0	53,202	77.4	4,697	6.8	10,885	15.8
23	18.4	67.0	23.0	1,370,476	39.3	2,148,733	61.7	339,922	9.8	996,743	28.60
24	4.5	83.7	22.2	6,988	14.6	41,841	87.5	2,859	6.00	3,128	6.54
25	8.4	79.7	22.9	20,670	22.1	69,553	74.3	8,363	8.9	15,727	16.79
26	8.1	81.7	25.6	24,782	22.4	88,380	79.9	5,886	5.3	16,392	14.81
27	16.2	70.0	22.4	18,465	30.4	29,261	48.2	10,944	18.0	20,533	33.81
28	5.5	81.4	17.7	10,526	14.3	64,038	87.1	4,158	5.7	5,361	7.29
29	22.1	52.3	6.1	48,891	82.6	41,841	70.7	4,904	8.3	12,432	21.01
30	20.3	60.8	14.6	39,910	67.0	36,309	61.0	7,226	12.1	16,029	26.91
31	2.2	91.7	35.6	6,431	10.3	53,544	85.4	3,921	6.3	5,220	8.33
32	16.2	64.7	9.9	44,697	47.4	67,644	71.8	7,749	8.2	18,886	20.03
33	3.8	89.2	32.1	19,828	10.9	154,486	85.1	11,138	6.1	15,895	8.76
34	3.4	87.5	26.6	5,869	13.8	36,068	84.6	3,073	7.2	3,514	8.24
35	10.1	75.1	18.1	14,323	18.3	55,366	70.9	7,448	9.5	15,304	19.59
36	17.2	66.0	14.9	41,553	37.9	77,932	71.1	6,673	6.1	24,997	22.81
37	1.4	95.1	52.8	6,818	6.2	85,701	77.7	10,257	9.3	14,372	13.03
38	12.0	75.4	18.8	82,453	31.0	190,672	71.6	20,896	7.8	54,838	20.58
39	2.7	90.4	40.4	7,013	11.7	52,695	87.6	3,222	5.4	4,250	7.06
40	10.9	73.9	15.7	21,492	30.1	50,422	70.7	6,477	9.1	14,450	20.25
41	3.8	88.7	31.3	4,161	7.7	43,252	80.6	4,918	9.2	5,521	10.28
42	21.7	59.6	13.1	66,589	50.6	90,134	68.4	8,387	6.4	33,202	25.21
43	10.0	76.3	18.4	17,170	33.5	41,083	80.1	3,057	6.0	7,126	13.90
44	6.6	80.6	20.2	32,873	34.2	71,795	74.7	9,251	9.6	15,040	15.65
45	25.4	51.2	6.2	38,316	42.4	66,215	73.2	6,097	6.7	18,142	20.06
46	45.8	30.3	3.4	119,418	94.5	64,391	51.0	10,251	8.1	51,737	40.94
47	5.8	80.3	16.2	14,711	15.1	88,392	90.9	3,684	3.8	5,215	5.36
48	36.2	40.9	5.3	71,740	83.1	43,744	50.7	8,401	9.7	34,139	39.57
49	3.6	89.2	37.0	6,312	11.9	33,890	63.7	10,083	18.9	9,267	17.41
50	27.3	50.5	9.7	48,794	70.4	39,520	57.0	7,210	10.4	22,600	32.60
51	5.4	86.0	25.5	10,285	20.3	39,725	78.4	3,621	7.1	7,343	14.49
52	31.9	44.3	6.0	76,740	72.3	54,785	51.6	10,036	9.45	41,388	38.97
53	12.8	71.4	17.1	23,027	27.4	61,314	73.0	9,712	11.6	12,969	15.44
54	33.1	49.7	10.6	189,967	64.7	144,297	49.1	26,144	8.9	123,301	41.98
55	3.8	87.9	25.9	14,564	13.2	97,924	88.5	5,598	5.1	7,120	6.44

Table 2.3.2 *continued.* Cities ranked by percent change in value of output

	Unemployed (%) Age 16+								Median Gross Rent ($/Month)	
Rank		Household Income		Median HH Income	Housing Units	Tenure				Median House Value
		% < 20K	% > 100K			Owners	%	Renters		
1	1.3	20.3	12.3	40,489	24,057	18,663	83.4	3,638	919	239,300
2	4.9	33.3	6.4	29,314	23,821	5,029	22.3	17,539	608	347,600
3	3.8	20.4	5.0	38,907	16,110	9,020	58.2	6,511	652	201,300
4	3.3	26.4	12.2	35,997	47,753	12,340	27.3	32,520	532	500,001
5	2.3	17.4	16.6	47,347	19,483	11,300	61.6	7,052	716	438,800
6	3.2	22.2	8.1	38,020	28,758	15,954	57.8	11,683	638	209,300
7	2.6	17.3	12.1	46,374	18,726	9,785	58.2	6,916	774	306,400
8	4.5	18.8	9.9	44,072	15,164	10,782	74.0	3,874	680	238,500
9	3.2	18.3	7.2	40,313	39,611	15,051	40.0	22,416	810	255,800
10	4.2	28.7	10.1	35,103	53,032	23,227	46.1	26,972	630	281,500
11	4.5	27.7	8.6	34,372	72,114	26,554	38.7	42,050	688	341,700
12	4.4	30.9	5.5	31,938	170,388	65,113	40.9	93,862	605	221,000
13	4.1	25.5	3.4	33,063	19,037	8,451	46.7	9,675	646	200,900
14	4.4	20.8	3.9	39,882	45,984	26,546	59.3	17,992	745	197,800
15	2.8	16.4	10.6	47,204	54,927	29,616	56.1	22,999	795	338,700
16	3.6	22.2	6.5	36,991	34,302	17,324	52.5	15,689	649	227,300
17	4.0	27.6	3.1	32,711	24,117	9,062	39.5	13,843	630	194,600
18	2.9	18.5	8.7	42,971	16,943	8,977	55.6	7,189	788	329,400
19	3.3	19.2	9.6	41,921	42,956	22,522	54.9	18,350	706	231,800
20	2.1	13.0	28.7	60,374	34,861	17,207	55.7	13,653	967	500,001
21	3.8	29.5	3.1	31,368	29,604	11,463	40.4	16,776	636	227,900
22	4.1	18.3	5.4	41,435	23,200	12,476	56.1	9,734	727	204,000
23	5.6	32.7	7.9	30,925	1,299,963	479,744	39.3	737,661	600	241,400
24	3.0	16.5	9.5	46,116	16,876	12,073	73.9	4,254	729	231,000
25	3.5	23.3	6.1	35,959	41,216	17,949	45.7	21,326	677	260,200
26	3.4	17.0	11.2	46,539	38,018	22,540	61.2	14,251	766	247,700
27	3.6	30.8	5.9	32,605	20,298	10,714	54.5	8,791	661	235,400
28	3.0	16.8	5.2	44,700	26,795	18,808	71.8	7,294	802	213,500
29	5.3	26.5	2.0	34,383	16,316	11,225	70.1	4,777	613	163,800
30	4.2	30.2	5.5	31,441	19,193	9,002	48.5	9,616	623	211,200
31	2.7	8.7	13.1	56,324	22,809	15,863	72.5	5,854	877	258,900
32	4.4	21.6	2.2	38,124	27,247	17,120	65.1	9,226	706	164,700
33	2.8	13.3	12.3	50,633	72,736	40,284	58.3	28,595	860	285,300
34	3.4	11.6	10.3	50,981	14,715	9,911	69.3	4,368	811	250,800
35	4.0	20.4	6.5	41,364	25,852	15,742	62.5	9,335	736	225,500
36	7.0	31.2	2.5	29,881	38,713	13,110	36.0	22,992	618	170,400

37	2.5	11.6	18.5	56,307	42,221	25,145	62.3	15,112	925	292,600
38	4.1	20.2	6.2	39,620	93,177	43,173	49.5	44,415	712	218,400
39	2.7	13.7	12.3	51,913	28,220	12,390	46.2	14,327	863	347,900
40	5.0	28.2	2.4	30,967	29,214	6,933	25.5	20,204	629	226,600
41	2.9	9.8	14.5	56,255	18,019	13,081	74.8	4,326	893	286,300
42	6.0	29.9	3.5	32,132	38,466	20,929	57.2	15,514	592	133,700
43	4.0	21.4	6.4	39,967	18,670	10,221	56.1	7,891	685	199,200
44	3.4	17.5	6.7	42,481	31,112	20,063	66.6	10,033	733	201,100
45	8.5	40.9	1.6	24,971	23,239	12,731	57.0	9,592	549	107,100
46	6.7	43.8	1.0	22,937	30,196	11,043	37.8	18,348	487	141,000
47	4.6	23.3	4.1	38,388	36,217	20,753	62.7	12,148	610	133,800
48	7.0	35.0	1.5	27,279	22,946	10,885	49.0	11,543	549	161,900
49	2.6	7.5	15.1	59,076	15,364	12,537	83.2	2,489	1,001	297,600
50	5.6	25.9	2.3	32,684	17,179	9,988	60.1	6,626	648	149,700
51	3.5	17.8	6.8	38,433	19,300	7,508	40.9	10,824	746	255,100
52	6.1	34.5	1.6	28,034	27,167	10,507	40.1	15,624	600	172,000
53	5.0	16.6	5.7	43,882	24,441	18,807	79.1	5,001	721	186,800
54	6.1	23.2	3.0	35,162	74,973	34,579	48.1	37,032	736	184,600
55	2.7	11.9	10.8	52,970	41,133	29,132	75.9	9,342	832	231,500

3 Conclusions and Policy Implications

The principal finding of this research is that low-income communities and low-income households would not be disproportionately adversely affected by a major earthquake on the Elysian Park fault. This is, of course, not a conclusion about earthquakes in general. Some of the zones suffering damage were in the San Gabriel Valley (e.g., Pasadena) where many of the cities are quite well off, though there are exceptions such as El Monte and Huntington Park. More distant zones that were indirectly impacted, such as Santa Monica, suffered because of job interruptions in the downtown financial district and other workplace locations with a high-income labor force. Moreover, job losses appear to be skewed toward high-income occupations, so that income equality in most cities increased during the post-earthquake impact period.

An interesting point is that this is not usually the case with some other kinds of natural disasters, such as floods, or major negative externalities, such as air pollution. The reason is the information base. People know that it is risky to live on a floodplain and unpleasant to live in areas with poor air quality. Therefore, as a generalization, households who can afford to, *ceteris paribus*, avoid such areas, so that we observe an income stratification of neighborhoods according to the quality of environmental attributes. Knowledge about the relative risks of earthquakes at specific locations, certainly within the Los Angeles metropolitan region, is so limited that it is very difficult to identify earthquake-safe neighborhoods.

However, South Central Los Angeles and parts of the San Fernando Valley are more at risk because of liquefaction problems in the soil; this observation is not specific to an individual earthquake. Furthermore, it is likely that many neighborhoods are unsafe because most of the region is subject to liquefaction, and not all the faults are known. A possible exception is hillside structures that are built on solid rock, although these are subject to mudslides and fires. The Northridge earthquake occurred on an unknown fault, and new faults are discovered periodically.

Any discussion of the social impacts of an earthquake are bound to be earthquake specific because, unlike other environmental risks, information gaps about earthquake risk mean that rich and poor households are not stratified into low-risk and high-risk areas. Nevertheless, it is important to be able to identify the more probable earthquake scenarios and the range of socioeconomic impacts associated with them. The incentives to do so consist of earthquake preparedness and mitigation strategies.

If poor people are more likely to be affected, and given the very limited personal resources available to them, then the programs to help them must be in place before an earthquake. Otherwise, the result will be a much more extreme version of what happened in the case of Northridge, with hundreds — if not thousands — of households camping out in local parks. In addition, the scale of damage, especially the preventable component of business interruption and the structural and bridge damage that might be avoided by seismic retrofitting, provides some guidance with respect to the appropriate level of mitigation spending.

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Appendix: Cities in Los Angeles and Orange Counties Ranked by Change in Percent Change in Gini Coefficient

County	City	Pre-Earthquake Gini	Post-Earthquake Gini	Δ Gini	Percent Δ Gini
LA	Industry	0.3647	0.3753042	0.0106	2.90%
	Walnut Park CDP	0.3573	0.358148	0.0008	0.23%
	East Compton CDP	0.3568	0.3575384	0.0008	0.22%
	La Habra Heights	0.3561	0.3567085	0.0006	0.16%
	Point Dume CDP	0.3500	0.3505365	0.0005	0.16%
	West Athens CDP	0.3527	0.3532095	0.0005	0.15%
	South San Gabriel CDP	0.3517	0.3520959	0.0004	0.12%
	North El Monte CDP	0.3510	0.3513138	0.0003	0.09%
	Acton CDP	0.3507	0.3510	0.0003	0.09%
	Hidden Hills	0.3496	0.3497771	0.0002	0.06%
	Avocado Heights CDP	0.3577	0.3578577	0.0002	0.06%
	Valinda CDP	0.3573	0.3574326	0.0002	0.04%
	Huntington Park	0.3589	0.3589837	0.0001	0.03%
	Westlake Village	0.3484	0.3485136	0.0001	0.03%
	Desert View Highlands CDP	0.3533	0.3533981	0.0001	0.02%
	Maywood	0.3610	0.3610444	0.0001	0.02%
	Val Verde CDP	0.3517	0.351712	0.0000	0.01%
	Bradbury	0.3535	0.3535189	0.0000	0.01%
	Vincent CDP	0.3547	0.3547568	0.0000	0.01%
	Bell	0.3592	0.3591576	0.0000	0.00%
	Mayflower Village CDP	0.3507	0.3507144	0.0000	0.00%
	Rolling Hills Estates	0.3543	0.3543147	0.0000	0.00%
	Diamond Bar	0.3543	0.3543225	0.0000	0.00%
	Avalon	0.3699	0.369916	0.0000	0.00%
	La Mirada	0.3589	0.3589164	0.0000	-0.01%
	Cudahy	0.3582	0.3581811	0.0000	-0.01%
	El Monte	0.3558	0.3557726	0.0000	-0.01%

	South Gate	0.3577	0.357639	-0.0001	-0.01%
	Alondra Park CDP	0.3551	0.3550381	-0.0001	-0.02%
	Santa Clarita	0.3508	0.3507279	-0.0001	-0.02%
	South Whittier CDP	0.3572	0.3570987	-0.0001	-0.02%
	La Puente	0.3610	0.3609454	-0.0001	-0.02%
	Citrus CDP	0.3560	0.3558903	-0.0001	-0.02%
	Vernon	0.3656	0.3655626	-0.0001	-0.02%
	Littlerock CDP	0.3551	0.3550124	-0.0001	-0.02%
	Del Aire CDP	0.3525	0.3524312	-0.0001	-0.02%
	Palmdale	0.3527	0.3526285	-0.0001	-0.03%
	Baldwin Park	0.3577	0.357636	-0.0001	-0.03%
	Bell Gardens	0.3575	0.3573998	-0.0001	-0.03%
	Paramount	0.3590	0.3589004	-0.0001	-0.03%
	West Puente Valley CDP	0.3585	0.3583469	-0.0001	-0.03%
LA	Irwindale	0.3553	0.3551913	-0.0001	-0.04%
	Hacienda Heights CDP	0.3574	0.3573116	-0.0001	-0.04%
	San Fernando	0.3540	0.3538855	-0.0001	-0.04%
	Covina	0.3550	0.3548253	-0.0001	-0.04%
	West Whittier-Los Nietos CDP	0.3581	0.3580005	-0.0001	-0.04%
	Quartz Hill CDP	0.3547	0.3545443	-0.0002	-0.04%
	Commerce	0.3566	0.3564149	-0.0002	-0.05%
	La Verne	0.3540	0.353822	-0.0002	-0.05%
	Rolling Hills	0.3559	0.355731	-0.0002	-0.06%
	Willowbrook CDP	0.3541	0.3538486	-0.0002	-0.06%
	Lynwood	0.3562	0.3559803	-0.0002	-0.07%
	Pico Rivera	0.3574	0.3571817	-0.0002	-0.07%
	Norwalk	0.3567	0.3564962	-0.0002	-0.07%
	Palmdale East CDP	0.3546	0.3543337	-0.0002	-0.07%
	Lomita	0.3544	0.3541689	-0.0002	-0.07%
	Rowland Heights CDP	0.3575	0.357254	-0.0003	-0.07%
	Rancho Palos Verdes	0.3530	0.3527323	-0.0003	-0.07%
	West Covina	0.3550	0.3547848	-0.0003	-0.07%
	Artesia	0.3561	0.3558777	-0.0003	-0.07%
	West Carson CDP	0.3536	0.3533399	-0.0003	-0.08%
	Cerritos	0.3561	0.3557907	-0.0003	-0.08%
	Lakewood	0.3552	0.3548996	-0.0003	-0.08%
	Lawndale	0.3541	0.3538192	-0.0003	-0.08%
	Walnut	0.3553	0.3550493	-0.0003	-0.08%
	Carson	0.3547	0.3544453	-0.0003	-0.08%
	Whittier	0.3569	0.3565934	-0.0003	-0.08%
	East Los Angeles CDP	0.3520	0.3516928	-0.0003	-0.08%
	Palos Verdes Estates	0.3544	0.3541227	-0.0003	-0.09%

	Glendora	0.3549	0.3546357	-0.0003	-0.09%
	Torrance	0.3547	0.3543909	-0.0003	-0.09%
	Rosemead	0.3510	0.3506756	-0.0003	-0.09%
	Agoura Hills	0.3501	0.3497931	-0.0003	-0.10%
	Bellflower	0.3555	0.3551363	-0.0003	-0.10%
	San Dimas	0.3542	0.3538813	-0.0004	-0.10%
	Monterey Park	0.3496	0.3492689	-0.0004	-0.10%
	Downey	0.3549	0.3545258	-0.0004	-0.10%
	Alhambra	0.3491	0.3487678	-0.0004	-0.10%
	Redondo Beach	0.3539	0.3535065	-0.0004	-0.11%
	Lake Los Angeles CDP	0.3527	0.3522917	-0.0004	-0.11%
	Signal Hill	0.3534	0.3530446	-0.0004	-0.11%
	La Canada Flintridge	0.3465	0.346168	-0.0004	-0.11%
	Compton	0.3550	0.3546058	-0.0004	-0.11%
	San Gabriel	0.3510	0.3506513	-0.0004	-0.11%
	Gardena	0.3551	0.3547331	-0.0004	-0.11%
	Inglewood	0.3495	0.3491476	-0.0004	-0.11%
	Pomona	0.3542	0.3538526	-0.0004	-0.11%
	Hawthorne	0.3527	0.352289	-0.0004	-0.11%
	Temple City	0.3497	0.3493013	-0.0004	-0.12%
	Glendale	0.3455	0.3451222	-0.0004	-0.12%
	Manhattan Beach	0.3525	0.3520549	-0.0004	-0.12%
	Los Angeles	0.3483	0.3478774	-0.0004	-0.12%
	Beverly Hills	0.3463	0.345889	-0.0004	-0.13%
	Montebello	0.3551	0.3546066	-0.0004	-0.13%
	Azusa	0.3571	0.3566447	-0.0005	-0.13%
	Florence-Graham CDP	0.3546	0.3541216	-0.0005	-0.13%
	Culver City	0.3482	0.347776	-0.0005	-0.13%
	La Crescenta-Montrose CDP	0.3473	0.3468175	-0.0005	-0.14%
	South El Monte	0.3591	0.3586344	-0.0005	-0.14%
	Lancaster	0.3538	0.3533144	-0.0005	-0.14%
	Long Beach	0.3527	0.3522162	-0.0005	-0.14%
	South Pasadena	0.3458	0.3452963	-0.0005	-0.14%
	Hermosa Beach	0.3528	0.3523179	-0.0005	-0.14%
	Santa Fe Springs	0.3601	0.3595818	-0.0005	-0.15%
	Burbank	0.3434	0.3429287	-0.0005	-0.15%
	Charter Oak CDP	0.3541	0.3535763	-0.0005	-0.15%
	Lennox CDP	0.3509	0.3503567	-0.0005	-0.15%
	Monrovia	0.3503	0.3497401	-0.0006	-0.17%
	El Segundo	0.3493	0.348696	-0.0006	-0.17%
	East La Mirada CDP	0.3577	0.357101	-0.0006	-0.17%
	Pasadena	0.3428	0.3421719	-0.0006	-0.17%

	San Marino	0.3471	0.3464549	-0.0006	-0.18%
	Duarte	0.3494	0.3487759	-0.0007	-0.19%
	Santa Monica	0.3463	0.3456193	-0.0007	-0.20%
	View Park-Windsor Hills CDP	0.3488	0.3481206	-0.0007	-0.20%
	Marina del Rey CDP	0.3492	0.3484527	-0.0007	-0.21%
	East Pasadena CDP	0.3461	0.3453903	-0.0007	-0.21%
	Claremont	0.3504	0.349627	-0.0008	-0.22%
	West Hollywood	0.3470	0.3462468	-0.0008	-0.22%
	Hawaiian Gardens	0.3570	0.3562603	-0.0008	-0.22%
	Arcadia	0.3479	0.3471552	-0.0008	-0.22%
	South San Jose Hills CDP	0.3615	0.3606807	-0.0008	-0.22%
	Sierra Madre	0.3462	0.3453643	-0.0008	-0.23%
	Westmont CDP	0.3508	0.3500209	-0.0008	-0.23%
	Altadena CDP	0.3415	0.3407366	-0.0008	-0.24%
	East San Gabriel CDP	0.3491	0.3482597	-0.0008	-0.24%
	Ladera Heights CDP	0.3472	0.3462117	-0.0010	-0.29%
LA	West Compton CDP	0.3538	0.3527618	-0.0011	-0.30%
Orange	Coto De Caza CDP	0.2413	0.2418572	0.0006	0.23%
	Portola Hills CDP	0.2414	0.2418754	0.0005	0.22%
	Aliso Viejo CDP	0.2396	0.239853	0.0003	0.12%
	Tustin Foothills CDP	0.2394	0.2396163	0.0002	0.10%
	Brea	0.2409	0.2411365	0.0002	0.09%
	Rancho Santa Margarita CDP	0.2404	0.2405446	0.0002	0.07%
	Mission Viejo	0.2412	0.2412056	0.0000	0.00%
	Yorba Linda	0.2438	0.2437837	0.0000	0.00%
	Trabuco Highlands CDP	0.2402	0.240215	0.0000	0.00%
	San Clemente	0.2444	0.244346	0.0000	-0.01%
	Anaheim	0.2447	0.2445979	-0.0001	-0.03%
	La Palma	0.2432	0.2431005	-0.0001	-0.04%
	Dana Point	0.2446	0.2445495	-0.0001	-0.04%
	Cypress	0.2433	0.243197	-0.0001	-0.04%
	Rossmoor CDP	0.2401	0.2399955	-0.0001	-0.05%
	Fullerton	0.2436	0.2434399	-0.0001	-0.05%
	San Juan Capistrano	0.2456	0.2455238	-0.0001	-0.05%
	Fountain Valley	0.2411	0.240979	-0.0001	-0.06%
	Huntington Beach	0.2424	0.2422217	-0.0001	-0.06%
	Santa Ana	0.2406	0.2404031	-0.0002	-0.06%
	Orange	0.2399	0.239767	-0.0002	-0.07%
	Garden Grove	0.2432	0.2430775	-0.0002	-0.07%
	Placentia	0.2439	0.2437436	-0.0002	-0.07%
	El Toro CDP	0.2409	0.2406968	-0.0002	-0.08%
	Irvine	0.2386	0.2383965	-0.0002	-0.08%

	Laguna Niguel	0.2392	0.2389526	-0.0002	-0.08%
	Newport Beach	0.2374	0.2372037	-0.0002	-0.08%
	Stanton	0.2454	0.2451587	-0.0002	-0.09%
	El Toro Station CDP	0.2365	0.236257	-0.0002	-0.10%
	La Habra	0.2438	0.2436117	-0.0002	-0.10%
	Costa Mesa	0.2405	0.2402851	-0.0002	-0.10%
	Westminster	0.2438	0.2434842	-0.0003	-0.11%
	Buena Park	0.2460	0.2457487	-0.0003	-0.11%
	Tustin	0.2388	0.2385626	-0.0003	-0.12%
	Laguna Beach	0.2419	0.2415724	-0.0003	-0.14%
	Villa Park	0.2417	0.2413903	-0.0003	-0.14%
	Los Alamitos	0.2409	0.2404902	-0.0004	-0.15%
	Laguna Hills CDP	0.2395	0.2390368	-0.0005	-0.19%
	Seal Beach	0.2408	0.2401074	-0.0007	-0.29%

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