THE ECONOMIC IMPACTS OF A TERRORIST ATTACK ON THE DOWNTOWN LOS ANGELES FINANCIAL DISTRICT

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Introduction

This paper is one of a series of studies from the Economic Modeling Group at CREATE (Center for Risk and Economic Analysis for Terrorism Events) at the University of Southern California. We have explored several possible attacks such as radiological bombs at the Ports of Los Angles and Long Beach combined with conventional bomb attacks on access bridges, the airline system via a rocket attack, and conventional bomb attacks on the nation's theme parks. This study mirrors the 9/11 World Trade Center attack in some respects in that it is an attack on a major downtown office building, in Los Angeles not New York. However, the mechanism is different, not an airplane but a radiological bomb. We chose a radiological bomb for our scenario because we have some experience with this type of attack and because we wanted to explore the impacts somewhat less localized than that of a conventional bomb attack. We do not specify the individual building, only a major office building within the core TAZ (Traffic Analysis Zone) in the Financial District. A radiological bomb will generate effects within an extensive radiation plume that will require evacuation of a wide area. We divide the plume area into two zones, an Inner and an Outer Zone with the evacuation times varying in the two zones. We examine two limiting cases:

first, an exit scenario where firms disappear (either close down or move out of town); second, a relocation scenario where all the evacuating firms relocate to other subcenters within the five-county metropolitan region. These are limiting cases, so we also report a hybrid scenario where the Inner Zone firms exit and the Outer Zone firms relocate. These are just three of an almost limitless set of scenarios, and they are all based on the assumptions of a one-year evacuation of the Inner Zone and a one-month evacuation of the Outer Zone. These time periods are based on discussions with experts on radiological contamination, but alternative time periods are easily substitutable.

This paper focuses on business interruption effects only. We make no attempt to estimate accurately the number of deaths and injuries and their costs. Also, we do not estimate the costs of physical damage to the attacked building and other nearby buildings. Furthermore, we do not estimate the economic and social costs of the closure for a year of the Los Angeles Central Library which is located in the Inner Zone.

We have a well-established model to measure economic impacts, called SCPM (the Southern California Planning Model). It is a metropolitan input-output model in the Garin-Lowry tradition that is very spatially disaggregated (with more than 3,000 zones [TAZs, or Traffic Analysis Zones]), to which we add a highway network with endogenously determined loadings, including freight and passenger flows. It enables us to estimate the geographical output and job impacts of a variety of exogenous shocks, including policies, projects and plans. In this case, of course, the exogenous shock was a terrorist attack.

The Attack

We chose to simulate a radiological rather than a conventional bomb attack because we were interested in examining non-localized attacks. The extent of disruption may depend on the size of the bombs. As planners/economists we are not concerned with the technical aspects of radiation contamination and exposure, but only with how these translate into disruption of downtown activities. Hypothetically, we assumed the explosion of a 50lb. bomb, the maximum portable without requiring a vehicle as the delivery instrument. Blast damage would be quite limited, with deaths and serious injuries within a range of perhaps 50 meters and with moderate damage to physical infrastructure, except at ground zero. The outer evacuation zone would include all areas with exposure > 1 REM. We assume a hypothetical radiation plume, a long narrow rectangle 4 kilometers long and more than 200 meters wide with an inner and more contaminated zone of about 100 meters radius (an area of 0.03 km^2), an oversimplification of plume representations that are not open source. The critical early phase of exposure lasts about 4 days (EPA guidelines); the time frame for intermediate and later phases is variable and subjective (weeks, months, even years). We assume a one-year evacuation in the Inner Zone, and a one-month evacuation in the Outer Zone. With respect to the Outer Zone, this may be conservative because some firms may trickle back with a lag after given permission to return. Health factors will dictate an immediate evacuation, but because the health effects are long-term, the decision to allow a return will be determined by political rather than scientific considerations.

The Southern California Planning Model (SCPM)

Interindustry models are among the most widely used models to measure regional economic impacts. They attempt to trace all the impacts,

including those of intra- and inter- regional shipments, usually at a high level of sectoral disaggregation. Being demand driven, they account primarily for losses via backward linkages.

The Southern California Planning Model version 1 (SCPM1) was developed for the five-county Los Angeles metropolitan region, and has the unique capability to allocate all impacts, in terms of jobs or the dollar value of output, to 308 sub-regional zones, mainly individual municipalities. This is the result of an integrated modeling approach that incorporates two fundamental components: input-output and spatial allocation. The approach allows the representation of estimated spatial and sectoral impacts corresponding to any vector of changes in final demand. Exogenous shocks treated as changes in final demand are fed through an input-output model to generate sectoral impacts that are then introduced into the spatial allocation model.

The first model component is built upon the well known IMPLAN input-output model which has a high degree of sectoral disaggregation (509 sectors). The second basic model component is used for allocating sectoral impacts across the 308 geographic zones in Southern California. The key is to adapt a Garin-Lowry style model for spatially allocating the induced impacts generated by the input-output model. The building blocks of the SCPM1 are the metropolitan input-output model, a journey-to-work matrix, and a journey-to-nonwork-destinations matrix. This is a journey-to-services matrix that is more restrictively described as a "journey-to-shop" matrix in the Garin-Lowry model.

The journey-to-services matrix includes any trip associated with a home-based transaction other than the sale of labor to an employer. This includes retail trips and other transaction trips, but excludes non-transaction-

based trips such as trips to visit friends and relatives. Data for the journey-to-services matrix include all trips classified by the Southern California Association of Governments as home-to-shop trips, and a subset of the trips classified as home-to-other and other-to-other trips.

The key innovation associated with SCPM1 is to incorporate the full range of multipliers obtained via input-output techniques to obtain detailed economic impacts by sector and by submetropolitan zone. The SCPM1 follows the principles of the Garin-Lowry model by allocating sectoral output (or employment) to zones via a loop that relies on the trip matrices. Induced consumption expenditures are traced back from the workplace to the residential site via a journey-to-work matrix and from the residential site to the place of purchase and/or consumption via a journey-to-services matrix (see Richardson *et al.* (1993) for a further summary of SCPM1).

Incorporating the Garin-Lowry approach into spatial allocation makes the transportation flows in SCPM1 exogenous. These flows are also relatively aggregated compared with transportation models, defined primarily at the level of political jurisdictions (most transportation models use Traffic Analysis Zones [TAZs] which are much smaller). However, with no explicit representation of the transportation network, SCPM1 has no means to account for the economic impact of changes in transportation supply. Terrorist attacks, especially against the transportation system, may induce such changes, including capacity losses that will contribute to reductions in network level service and increases in travel delays. SCPM1 does not account for such changes in transportation costs, underestimating the costs of any exogenous shock.

We focus on a representative terrorist attack on the financial district in downtown Los Angeles, aimed at a prominent building that is not specified.

Our field of research does not focus on deaths and/or injuries but on business interruption. The health costs of a radiological attack stretch out over a long time, but the immediate toll might be 20 deaths and 200 hospital-related injuries, a blind guess, nothing more. The duration of the disruption determines the length of time for which firms throughout the region will be non-operational or operating below normal levels of service. 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. The I/O model translates this production shock into direct, indirect, and induced costs. The indirect and induced costs are spatially allocated over the 3,000-plus zones in terms consistent with the endogenous transportation behavior of firms and household.

Implementing this approach is a data-intensive effort that builds on the data resources assembled for SCPM1. In this case, the results of an interruption in downtown businesses are used to drive SCPM2. SCPM2 is a more advanced version of the Southern California Planning Model that endogenizes traffic flows including freight deliveries and, therefore, indirect interindustry effects by including an explicit representation of the transportation network. SCPM2 results are computed at the level of the Southern California Association of Governments (SCAG) 3,127 traffic analysis zones, and then aggregated to the level of the 308 political jurisdictions defined for SCPM1. These jurisdictional boundaries routinely cross traffic analysis zones. Results for traffic analysis zones crossed by jurisdictional boundaries are allocated in proportion to area. Like SCPM1, SCPM2 aggregates to 17 the 509 sectors represented in the IMPLAN I-O model. However, the version of the model used in this paper is more sectorally disaggregated with 47 sectors. We call these the USC sectors

because they have been constructed to reconcile various databases and to integrate SCPM with a national model, NIEMO (National Interstate Economic Model; see Park *et al*., 2006, for a description). This disaggregation is one part of a major update of SCPM, called SCPM2005. This paper uses SCPM2005; however, the components of the data base are derived from several recent years with subsequent adjustments to update.

Treating the transportation network explicitly endogenizes otherwise exogenous Garin-Lowry style matrices describing the travel behavior of households, achieving consistency across network costs and origin-destination requirements. SCPM2 makes distance decay and congestion functions explicit. This allows us to endogenize the spatial allocation of indirect and induced economic losses by endogenizing choices of route and destination. This better allocates indirect and induced economic losses over zones in response to direct losses in trade, employment and transportation accessibility (see Cho *et al.* [2001] for a more detailed summary of SCPM2). As pointed out above, this paper uses the SCPM2005 USC sectors and includes more up-to-date data and other refinements beyond SCPM2.

Also, the analysis in this paper makes use of 2005 Freight Model estimates. In general, freight flows are more difficult to estimate than passenger flows, so it was quite important to obtain external validation for the accuracy of these estimates. To test this, we compared our 2005 estimates with the SCAG (Southern California Association of Governments) 2003 Annual Average Weekday Truck Traffic Counts (SCAG/LAMTA, 2004). Under a variety of assumptions about PCEs (Passenger Car Equivalents), we plotted estimated against actual freight flows, and obtained R^2s in the 0.67-0.80 range.

Although our study takes account of transportation networks, the transportation repercussions of a downtown closure are relatively modest. First, there are no freeways in the inner zone. Second, as a major service center, downtown attracts fewer deliveries and pick-ups than the rest of the metropolitan region. Our data show only a 2 percent PCE (passenger cars equivalent) truck flow rather than the 7 percent regionwide. Third, only 9,500 jobs are affected, a drop in the bucket compared with the 9 million jobs in the region. Fourth, and more important, most trips downtown are through downtown rather than with origins and/or destinations downtown. Our analysis assumes that if motorists roll up their windows and keep the air conditioning off that they can pass through the plume area in relative safety. If the authorities mandate a different and more coercive procedure, the transportation impacts would be magnified. As it is, the network effects in this particular case study are so small that they are not worth reporting.

New York

The 9/11 attack provides a precedent for comparison with an attack on downtown Los Angeles. Such a comparison must be made with extreme care, however. First, the 9/11 attack was relatively localized, not affecting a 4 kilometer plume area. Second, the attack by planes was much more damaging; the business losses in this case are primarily because of evacuation because of contamination risks not physical damage to buildings and infrastructure. Third, Figure 1 shows the employment growth path in New York before and after 9/11. It shows that after growing more slowly than the country as a whole throughout most of the 1990s, employment in the New York CMSA mirrored the nation between 1999 and 2003. However, New York City employment peaked in 2000 before 9/11, and then fell sharply but bottomed out after a year, and then recovered although

failing to reach positive territory in 2003. This gives some cover for our assumption of a one-year evacuation from the Inner Zone after the radiological bomb attack.

Scenarios

We assume a radiological bomb attack on a major office building in the Financial District of downtown Los Angeles. We further assume that the bomb would be about 50 lb, about the largest which could be carried without using a vehicle to carry the bomb until detonation. This could do a moderate amount of physical damage with perhaps as many as 200 deaths and hundreds of injuries, depending on time of day and specific location. The most dangerous effect, however, is the creation of a radioactive plume that will require an evacuation of a significant area in downtown for a considerable period. For how long is shrouded in uncertainty. As a working assumption, we evacuate a small Inner Zone (100 meters from Ground Zero) for one year, and we evacuate the rest of the plume area (a rectangular area four kilometers long and 200 meters) for one month. Other scenarios are easy to construct.

The scale of the impacts depends on what happens to the dislocated firms. Again, there are many alternatives, but we analyze only three. The first we call the Exit Scenario, the second the Relocation Scenario, and the third the Hybrid Scenario (a blend of the first two). In the Exit Scenario, we model the departure of all firms and households from both zones for the assumed periods. In this admittedly limiting case, we assume that the firms affected either leave the region or close down. In the Relocation Scenario, we assume that the firms relocate elsewhere in the region. Where? We assume that the firms relocate to major subcenters in proportion to the number of office vacancies at these sites (some of the firms, especially in the

outer zone, are outside the office sector, but the allocation algorithm is probably not far off the mark as a rationale for subsector assignment). The Hybrid Scenario assumes Exit from the Inner Zone and Relocation from the outer Zone.

Data

Table 1 shows the estimates for jobs and households impacted by the radioactive plume after the bomb attack. They are based on the 1997 SCAG (Southern California Association of Governments) Employment Data and the Census 2000 Summary File. No more recent data are available in the geographical and sectoral data required, so these are probably underestimates; however, there has been no significant new office development in the Inner Zone since then. The 1997 data set used the SIC codes in place at that time; these have been converted into our own USC sectors. One result is very minor adjustments to the totals (see n. 1 and 2 to Table 1). There are 7,843 jobs and no households affected in the Inner Zone for a one-year evacuation period. There are more than 18,000 jobs and 60,000 people in the Outer Zone, but because the evacuation period is only one month and the model is run as an annual model, the model input is 1,535 jobs and 2,361 households. Despite the absence of households, the economic impacts of evacuation in the Inner Zone are much larger than those in the Outer Zone (the economic impact from a lost job is greater than that from a lost household, by a factor of more than three).

Exit Scenario

The Exit Scenario is a limiting case, but it is nevertheless not the most extreme estimate of the economic impacts because we model these only for the evacuation periods (one year in the Inner Zone, and one month in the Outer Zone). However, if firms and households exit from the region, they

are gone forever, so the true regional economic impact is the discounted value of the stream of future output and job losses. Thus, the Exit Scenario is merely a measure of the losses during the evacuation periods under the assumption that there are no regional offsets in the form of positive relocation impacts.

The results are shown on Tables 2-4. Although impacts that distinguish between the Inner and the Outer Zones have been estimated for all scenarios, we report such results only for the Exit Scenario. The Inner Zone impacts were much larger ($5.624 billion of output and 38,000 jobs; Tables 2 and 3) than those in the Outer Zone ($0.459 billion of output and 4,340 jobs; Tables 2 and 3) for a total of $6.089 billion of output and 42,340 jobs (Table 4). As a generalization, one-half of the overall impacts (indirect and induced as well as direct) occur in the City of Los Angeles (of course, all the direct impacts are in the City), and about two-thirds occur in Los Angeles County. Regional leakages (i.e. spillovers in the indirect and induced effects) are small ($0.758 billion of output and 5,749 jobs); this reflects the fact that the local component of the financial and office sectors is very high, with minimal reliance on imports from outside the region (such as computing, other information technology equipment, materials and supplies). Overall, however, the indirect and induced effects are larger than the direct effects, implying a sizeable output multiplier (2.27) and an even larger employment multiplier (4.48), reflecting highly paid workers in the Financial District that generate above-average consumption (and induced jobs in the retail and service sectors).

Relocation Scenario

Introduction

The Relocation Scenario is the most complex of the scenarios examined because it requires a procedure for relocating both firms and households out of downtown and the outer zone which stretches north of downtown. As stated earlier, the Inner Zone is assumed to have an impact duration of one year while the Outer Zone has a one month impact. People and businesses in the impact zones (Inner and Outer) are relocated elsewhere, primarily in Los Angeles County with a modest number in the other four counties.

The Relocation of Households

Households were relocated using an empirically estimated distance-decay function with a negative exponential formula. According to a study by Clark *et al.* (2001) on the association between residential changes and commuting behavior in the Greater Seattle area, the mean move distance was 6.28 miles. Using this as template, the probability distribution function (PDF) for household relocation is as follows:

$$F_X(x) = 1 - e^{-x/6.28}, \; x \geq 0,$$

This function is used to randomly generate moving distances for the households. The final destinations of a relocating household are locations close to the estimated moving distance with similar median housing rents/prices to the origin locations. Some of the relocating households were owners, others were renters. Not knowing which members of which tenure group moved where, we assumed that rent/price functions conformed to economic practice, and used Census 2000 (Summary File) data on household

income and house price data (combined with the relocation distance assumptions) to identify the probable destinations.

There were no households living in the inner zone in the year of the database (it is believed that as a result of new residential construction there is now a small residential population; to take account of this is the future research plan), but there are 2,361 households in the outer areas. All these 2,361 households are relocated over the Five-County Los Angeles region, but all but 40 relocated within Los Angeles County, with most of the rest in Orange County (Table 5). Finally, Census 2000 blocks with the moving-in households are further aggregated into the SCAG 1999 TAZs for modeling purposes. Household consumption at the new locations is calculated by using the average propensity to consume from the Consumer Expenditure Survey for Los Angeles.

Relocation of Businesses

Businesses moving out from the inner and outer impact zones of Downtown Los Angeles are relocated in the region basing on the job vacancy and job distribution by sector in the business submarkets.

Based on the second quarter office vacancy report in the MarketBeat Mid-Year 2005 by Cushman & Wakefield (2005), there are over 50 submarkets with an average 14 percent of vacancy rate in Los Angeles North, Southern, Central, West, and the Tri-Cities Offices sub-regions. After the development of a correspondence table between submarkets and TAZs, the office vacancy rates are recalculated from submarkets to TAZs.

SCAG 1999 TAZs with the 3000-plus internal zones are used as a base for business relocation. SCAG 1997 employment by business establishment by SIC code is translated into employment by USC sector and finally aggregated into SCAG TAZs. The jobs moving out of the inner and

out impact areas are relocated into these TAZs based on the vacancy rate and the job distribution by sector in the TAZs. The results of relocated jobs are shown in Table 6; most, but not all, of the jobs relocate within Los angeles County. The move-in jobs are converted into dollar values of output by applying the dollars per job ratio obtained from region input-output model.

Results

Although the total impacts on the region in the relocation scenario are close to zero, the spatial distribution of negative impacts from moving out households and businesses and positive impacts from moving in households and businesses are significantly unbalanced at county, city and more disaggregated TAZ level. Because the very small number of households in the Inner Zone is ignored, the impact analysis on the Inner Zone only looks at business relocation. In the Outer Zone, both firms and households relocate, but to different sites. The office activities move to subcenters where office space is available, and it is assumed, in the absence of more detailed knowledge and a rational methodology, that personal services (and even industrial establishments, if any) relocate to the same subcenters. Households move to closer-in locations because of the assumption that their relocation is subject to distance decay. For space reasons, we do not display all the tables for businesses, households, the Innner Zone and the Outer Zone, but present only the summary tables, Tables 7 and 8 show the output and employment effects of relocating businesses and households from both zones at the county level, while Tables 9 and 10 display the results for Los Angeles County cities.

Overall, the Relocation Scenario is a wash with minimal changes at the County level (a decline of $78 million of output and 230 jobs in Los Angeles County relocated to Ventura County; Tables 7 and 8). The major

impacts take place at the city level, especially in Los Angeles (a net loss of $1.613 billion [an outward movement of $3.018 billion and an inward movement of $1.406 billion) and 5,817 jobs [14,268 jobs out and 8,651 in]; Tables 9 and 10). The major gainers were Torrance, Industry, El Monte, Glendale and Pasadena in terms of output (Table 9) and Torrance, El Segundo, Pasadena, Glendale, Beverly Hills and Santa Monica in terms of jobs (Table 10). All of the top 25 gainers (in terms of output and job gains) were in Los Angeles County with the exception of Thousand Oaks (in Ventura County). Figure 2 shows the spatial distribution of the relocated jobs throughout the region; it illustrates their wide geographical dispersion, with concentrations at subcenters derived from the submarket analysis.

The Hybrid Scenario

The Exit Scenario does not seem plausible for activities in the Outer Zone if the information they receive is that evacuation would last for only a few weeks. So we developed the Hybrid Scenario where Inner Zone firms exited while Outer Zone firms and households temporarily relocated. The numbers in the Hybrid Scenario are a modified version of the Exit Scenario, reflecting the dominance of Inner Zone impacts. They total $5.624 billion of output and 38,000 jobs (Table 11). One half of the output losses and almost three-fifths of the job losses occur in Los Angeles County. Table 12 shows the relocation impacts from the Outer Zone. The numbers are quite small. The City of Los Angeles experiences a modest output loss of $103 million and a job loss of 930 jobs. The main cities gaining from relocation are El Segundo, Torrance, Glendale, Pasadena, Beverly Hills, Commerce and Santa Monica in that order.

Conclusions

This paper has examined the scenario of a plausible radiological bomb attack on Los Angeles' Downtown Financial District. Because of the nature of the attack, the impacted area is quite large because the bomb generates a sizeable radioactive plume that extends several kilometers to the north east. However, the impacts in the Outer Zone are quite modest because we assume an evacuation period of one month compared with one year in the Inner Zone. We examined three scenarios (Exit, Relocation and Hybrid). The aggregate impacts in the Exit Scenario are $6.08 billion of output and 42,340 jobs, somewhat less in the Hybrid Scenario ($5.624 billion and 38,000 jobs). The Relocation Scenario is neutral from a regional perspective, although direct losses in the impacted zones are 9,439 jobs and $2.686 billion of output. The City of Los Angeles is the main loser, with a net output loss of $1.613 billion and a net job loss of 8,651 jobs. The County changes are insignificant with a small loss in Los Angeles County balancing an equivalent increase in Ventura County (the City of Thousand Oaks). Otherwise, jobs decentralize to major subcenters in Los Angeles County.

Of course, there are several qualifications to these research results. For example, there will be some relocation costs associated with the Relocation and Hybrid Scenarios, but we made no attempt to estimate these. The plume map is an approximate representation and the evacuation periods assumptions are arbitrary, relying more on scientific evidence than the political factors that would be decisive in a real world case. Nevertheless, the scenarios examined here probably present a reasonable ballpark estimate. This would be a $6 billion event. If a similar attack were mounted in more CBD-oriented metropolitan areas (such as New York, Chicago or San Francisco), the economic impacts would be much larger. Also, this is by no means the worst terrorist attack, even with radiological bombs, that might

take place in Los Angeles. For example, in a study of radiological bombs planted at the twin ports of Los Angeles-Long Beach, we estimated that the business interruption impacts might reach $38 billion (Gordon *et al*., 2005). Of course, the explanation is that the economic disruptions resulting from closure of America's largest port complex (in terms of $ of trade) would be far greater than a disruption to Los Angeles' financial and office sector.

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Table 1: Employment, Population and Households in the Impact Area

Inner Zone (1 Year)			Outer Zone (1 Month)		
Jobs[*1]	**Population**	**Households[3]**	**Jobs [2]**	**Population**	**Households**
7,843	**0**	**0**	**1,535**	**5,064**	**2,361**

Sources: 1997 SCAG Employment Data and 2000 Census Summary File 1

Notes: 1. 1997 SCAG Employment Data reports 7852 jobs by SIC code in the inner zone converted to 7843 jobs by USC sector.

2.1997 SCAG Employment Data reports 18523 jobs by SIC code in the outer zone, equal to a loss of 1544 jobs in one month. The 1544 jobs by SIC code are converted to 1535 jobs by USC sector.

3. There was no median household income and housing price information for the inner impact zone and only 3 households with 5 people living there. We consider this so small that we decided to ignore it. By 2005, there may some households there as a result of new residential construction in the Financial District (this will be explored in future research).

Table 2: Economic Impact of a Terrorist Attack on Downtown LA, Exit Scenario, for Businesses Moving out of the Inner Zone

	Output ($1,000s)				Jobs			
	Direct	Indirect	Induced	Total*	Direct	Indirect	Induced	Total*
City of Los Angeles	2,220,044	130,270	478,036	2,828,351	6,643	907	4,953	12,503
County of Los Angeles	2,220,044	347,420	1,245,170	3,812,634	6,643	2,283	12,906	21,832
County of Orange	0	111,077	439,692	550,770	0	814	4,559	5,373
County of Ventura	0	23,138	102,648	125,785	0	162	1,063	1,226
County of Riverside	0	35,045	193,485	228,531	0	262	2,012	2,274
County of San Bernardino	0	42,746	207,124	249,869	0	298	2,154	2,452
Sum of Five Counties	2,220,044	559,426	2,188,119	4,967,589	6,643	3,820	22,694	33,157
Regional Leakages	284,059	70,813	301,237	656,109	1,200	544	3,101	4,843
Total	2,504,103	630,239	2,489,356	5,623,698	7,843	4,363	25,795	38,000

Source: Authors' calculations

Table 3: Economic Impact of a Terrorist Attack on Downtown LA, Exit Scenario, for both Businesses and Households Moving out of the Outer Zone

	Output ($1,000s)				Jobs			
	Direct	Indirect	Induced	Total*	Direct	Indirect	Induced	Total*
City of Los Angeles	140,916	11,284	37,473	189,672	1,284	98	382	1,765
County of Los Angeles	140,916	27,152	97,601	265,669	1,284	236	996	2,517
County of Orange	0	10,047	34,464	44,510	0	90	352	441
County of Ventura	0	1,974	8,047	10,020	0	17	82	99
County of Riverside	0	2,801	15,159	17,961	0	26	155	181
County of San Bernardino	0	3,154	16,228	19,383	0	29	166	195
Sum of Five Counties	140,916	45,127	171,499	357,543	1,284	398	1,752	3,434
Regional Leakages	40,935	13,986	46,610	101,531	312	120	475	906
Total	181,851	59,113	218,109	459,074	1,596	518	2,227	4,340

Source: Authors' Calculations

Table 4: Economic Impact of a Terrorist Attack on Downtown LA, Exit Scenario, for All Businesses and Households Moving out of the Inner and Outer Zones

	Output ($1,000s)				Jobs			
	Direct	Indirect	Induced	Total*	Direct	Indirect	Induced	Total*
City of Los Angeles	2,360,961	141,554	515,509	3,018,023	7,927	1,005	5,336	14,268
County of Los Angeles	2,360,961	374,571	1,342,771	4,078,303	7,927	2,519	13,903	24,349
County of Orange	0	121,124	474,156	595,280	0	904	4,910	5,814
County of Ventura	0	25,111	110,694	135,805	0	180	1,145	1,325
County of Riverside	0	37,846	208,645	246,491	0	288	2,168	2,456
County of San Bernardino	0	45,900	223,352	269,252	0	327	2,320	2,647
Sum of Five Counties	2,360,961	604,553	2,359,618	5,325,131	7,927	4,218	24,446	36,591
Regional Leakages	324,994	84,799	347,847	757,640	1,511	664	3,577	5,749
Total	2,685,954	689,352	2,707,465	6,082,771	9,439	4,881	28,023	42,340

Source: Authors' calculations

Table 5: Comparison of Out and In Relocating Households, Los Angeles Five-County Region

COUNTY	OUT	IN	NET
LOS ANGELES	2361	2321	-40
ORANGE	0	33	33
SAN BERNADINO	0	5	5
VENTURA	0	2	2
RIVERSIDE	0	0	0
SUM	2361	2361	0

Table 6: Relocated Jobs to Submarkets from the Inner and Outer Zones

Submarkets	Inner Jobs	Outer Jobs	Total Jobs
190th Street Corridor	355	42	396
Agoura Hills	155	22	177
Alhambra/Monterey Park	270	47	318
Arcadia/Monrovia/W Covina	392	98	491
Beverly Hills	297	78	376
Brentwood	236	22	257
Burbank City Center	38	11	49
Burbank Media District	97	29	126
Calabasas	42	9	51
Canoga Park/Chatsworth	183	26	209
Central Torrance	443	71	514
Century City	56	13	69
Cerritos	100	29	129
City of Commerce	203	61	264
City of Industry/Diamond Bar	409	53	462
Culver City/Westchester	86	26	112
El Monte	220	26	246
El Segundo/Manhattan Beach	768	206	974
Encino	70	15	85
Glendale	442	104	546
Hollywood	17	6	23
Little Tokyo/China Town	410	23	432
Long Beach Freeway Corridor	1	0	1
Los Angeles Airport Area	470	99	568
Marina Del Rey	13	4	17
Mid Wilshire	4	1	6
Miracle Mile	35	11	46
North Hollywood	331	17	349
Northridge/Reseda	11	4	15
Pacific Palisades	36	9	45
Pan City/Granada Hills/Mission Hills	22	7	29
Park Mile	7	3	10
Pasadena	213	31	244
Pasadena East	308	81	389
San Pedro	29	8	37
Santa Monica	205	41	246
Sherman Oaks	26	6	32
Simi Valley	13	1	15
South Park	167	64	231
Tarzana	48	12	61
Thousand Oaks/Newbury Park	216	43	259
Universal City/ Studio City	9	2	11
Valencia/New Hall	101	8	109
Van Nuys	16	5	21

Warner Center	15	3	18
West Hollywood	85	15	99
West Lake Village	31	4	35
West Los Angeles	120	31	151
Westwood	20	7	27
Woodland Hills	4	1	5
Sum	7,845	1,536	9,381

Source: Authors' calculations from SCAG 1997 Employment Data

Table 7: Economic Impacts of All Businesses and Households from the Inner and Outer Zones: Relocation Scenario (Output, $1,000s, 2001)

	Positive				Negative				Net			
	Direct	Indirect	Induced	Total*	Direct	Indirect	Induced	Total*	Direct	Indirect	Induced	Total*
City of Los Angeles	748,207	141,554	515,510	1,405,271	2,360,961	141,554	515,509	3,018,023	-1,612,753	0	1	-1,612,753
County of Los Angeles	2,283,156	374,571	1,342,772	4,000,500	2,360,961	374,571	1,342,771	4,078,303	-77,804	0	1	-77,803
County of Orange	47	121,124	474,155	595,326	0	121,124	474,156	595,280	47	0	-1	46
County of Ventura	77,752	25,111	110,694	213,557	0	25,111	110,694	135,805	77,752	0	0	77,752
County of Riverside	0	37,846	208,645	246,491	0	37,846	208,645	246,491	0	0	0	0
County of San Bernardino	5	45,900	223,352	269,257	0	45,900	223,352	269,252	5	0	0	5
Sum of Five Counties	2,360,961	604,553	2,359,618	5,325,131	2,360,961	604,553	2,359,618	5,325,131	0	0	0	0
Regional Leakages	324,994	84,799	347,847	757,640	324,994	84,799	347,847	757,640	0	0	0	0
Total	2,685,954	689,352	2,707,465	6,082,771	2,685,954	689,352	2,707,465	6,082,771	0	0	0	0

Source: Authors' calculations

Table 8: Economic Impacts of All Businesses and Households from the Inner and Outer Zones: Relocation Scenario (Jobs, 2001)

	Positive				Negative				Net			
	Direct	Indirect	Induced	Total*	Direct	Indirect	Induced	Total*	Direct	Indirect	Induced	Total*
City of Los Angeles	2,311	1,005	5,336	8,651	7,927	1,005	5,336	14,268	-5,617	0	0	-5,617
County of Los Angeles	7,697	2,519	13,903	24,119	7,927	2,519	13,903	24,349	-230	0	0	-230
County of Orange	1	904	4,910	5,815	0	904	4,910	5,814	1	0	0	1
County of Ventura	230	180	1,145	1,555	0	180	1,145	1,325	230	0	0	230
County of Riverside	0	288	2,168	2,456	0	288	2,168	2,456	0	0	0	0
County of San Bernardino	0	327	2,320	2,647	0	327	2,320	2,647	0	0	0	0
Sum of Five Counties	7,927	4,218	24,446	36,591	7,927	4,218	24,446	36,591	0	0	0	0
Regional Leakages	1,511	664	3,577	5,749	1,511	664	3,577	5,749	0	0	0	0
Total	9,439	4,881	28,023	42,340	9,439	4,881	28,023	42,340	0	0	0	0

Source: Authors' calculations

Table 9: Relocation Scenario; Impacts of Businesses and Households from Inner and Outer Zones (2001, $1,000s)

Rank	County	Place	Positive*			Negative*			Net
			Households	Businesses	Total	Households	Businesses	Total	
1	LOS ANGELES	Los Angeles	5,079	1,400,192	1,405,271	5,969	3,012,054	3,018,023	-1,612,753
2	LOS ANGELES	Torrance	111	362,664	362,775	102	40,020	40,122	322,653
3	LOS ANGELES	Industry	50	168,807	168,857	50	22,258	22,308	146,549
4	LOS ANGELES	El Monte	41	126,063	126,104	35	15,615	15,650	110,454
5	LOS ANGELES	Glendale	143	141,165	141,308	90	38,260	38,349	102,959
6	LOS ANGELES	Pasadena	296	127,818	128,115	85	35,646	35,731	92,384
7	VENTURA	Thousand Oaks	76	99,469	99,546	70	29,232	29,302	70,244
8	LOS ANGELES	Monterey Park	28	79,708	79,736	23	9,528	9,551	70,185
9	LOS ANGELES	El Segundo	34	82,402	82,435	33	14,814	14,847	67,588
10	LOS ANGELES	UNCOR-LOS ANGELES	157	115,782	115,940	117	54,728	54,845	61,095
11	LOS ANGELES	West Covina	33	73,130	73,162	33	14,017	14,050	59,113
12	LOS ANGELES	Commerce	35	68,858	68,893	35	16,044	16,079	52,813
13	LOS ANGELES	Santa Clarita	44	72,421	72,465	40	19,700	19,740	52,724
14	LOS ANGELES	Santa Monica	120	78,530	78,650	69	29,398	29,467	49,183
15	LOS ANGELES	Avocado Heights	8	42,451	42,459	7	2,886	2,892	39,567
16	LOS ANGELES	Alhambra	53	48,286	48,339	33	14,389	14,422	33,917
17	LOS ANGELES	Beverly Hills	107	54,515	54,622	56	22,992	23,047	31,575
18	LOS ANGELES	Arcadia	26	38,781	38,807	26	11,041	11,067	27,740
19	LOS ANGELES	Cerritos	32	39,030	39,063	31	13,461	13,492	25,571
20	LOS ANGELES	Monrovia	22	31,760	31,782	20	8,898	8,918	22,865
21	LOS ANGELES	Manhattan Beach	45	29,606	29,652	18	7,537	7,554	22,098
22	LOS ANGELES	West Hollywood	30	33,769	33,799	29	12,510	12,539	21,259
23	LOS ANGELES	Agoura Hills	6	21,070	21,076	6	2,658	2,664	18,412
24	LOS ANGELES	Burbank	67	43,789	43,856	62	26,238	26,300	17,556
25	LOS ANGELES	Culver City	38	28,245	28,283	38	16,437	16,475	11,808

* Direct +Indirect+ Induced

Table 10: Relocation Scenario; Impacts of Businesses and Households from Inner and Outer Area (2001, Jobs)

Rank	County	Place	Positive*			Negative*			Net
			Households	Businesses	Total	Households	Businesses	Total	
1	LOS ANGELES	Los Angeles	56	8,595	8,651	67	14,201	14,268	-5,617
2	LOS ANGELES	Torrance	1	1,121	1,122	1	369	370	752
3	LOS ANGELES	El Segundo	0	722	722	0	129	130	592
4	LOS ANGELES	Pasadena	3	881	884	1	357	358	526
5	LOS ANGELES	Glendale	1	827	829	1	374	375	454
6	LOS ANGELES	Beverly Hills	1	513	514	1	214	214	300
7	LOS ANGELES	Santa Monica	1	560	561	1	290	291	271
8	LOS ANGELES	Industry	0	451	451	0	210	211	240
9	VENTURA	Thousand Oaks	1	503	504	1	290	291	213
10	LOS ANGELES	Manhattan Beach	0	274	274	0	75	75	199
11	LOS ANGELES	El Monte	0	343	343	0	152	153	190
12	LOS ANGELES	Commerce	0	319	320	0	142	142	177
13	LOS ANGELES	UNCOR-LOS ANGELES	2	663	665	1	492	493	172
14	LOS ANGELES	West Covina	0	295	295	0	142	143	152
15	LOS ANGELES	Arcadia	0	256	256	0	110	110	146
16	LOS ANGELES	Burbank	1	390	391	1	248	248	143
17	LOS ANGELES	Monterey Park	0	227	227	0	94	95	133
18	LOS ANGELES	Alhambra	1	249	250	0	131	132	118
19	LOS ANGELES	Cerritos	0	234	234	0	130	130	104
20	LOS ANGELES	Monrovia	0	177	177	0	85	85	92
21	LOS ANGELES	West Hollywood	0	206	206	0	127	127	80
22	LOS ANGELES	Santa Clarita	0	256	256	0	177	177	79
23	LOS ANGELES	Culver City	0	242	242	0	164	164	78
24	LOS ANGELES	Avocado Heights	0	86	86	0	27	27	58
25	LOS ANGELES	Agoura Hills	0	77	77	0	25	25	52

* Direct +Indirect+ Induced

Table 11: Economic Impacts from Businesses and Firms of a Terrorist Attack on Downtown LA, Hybrid Scenario

	Output ($1,000s)				Jobs			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
City of Los Angeles	2,116,737	130,270	478,037	2,725,043	5,713	907	4,953	11,573
County of Los Angeles	2,215,967	347,420	1,245,170	3,808,556	6,607	2,283	12,906	21,796
County of Orange	47	111,077	439,692	550,817	1	814	4,559	5,373
County of Ventura	4,026	23,138	102,648	129,811	35	162	1,063	1,261
County of Riverside	0	35,045	193,485	228,531	0	262	2,012	2,274
County of San Bernardino	5	42,746	207,124	249,874	0	298	2,154	2,452
Sum of Five Counties	2,220,044	559,426	2,188,119	4,967,589	6,643	3,820	22,694	33,157
Regional Leakages	284,059	70,813	301,237	656,109	1,200	544	3,101	4,843
Total	2,504,103	630,239	2,489,356	5,623,698	7,843	4,363	25,795	38,000

Source: Authors' calculations

Table 12: Net Impacts of Businesses and Households Relocated from the Outer Zone in the Hybrid Scenario

Rank*	County	Place	Output ($1,000s)			Jobs		
			Households	Businesses	Total	Households	Businesses	Total
1	LOS ANGELES	Los Angeles	-891	-102,417	-103,308	-10	-920	-930
2	LOS ANGELES	El Segundo	1	13,509	13,509	0	119	119
3	LOS ANGELES	Torrance	10	10,352	10,362	0	89	89
4	LOS ANGELES	Glendale	53	9,502	9,555	1	83	84
5	LOS ANGELES	Pasadena	211	9,239	9,450	2	89	91
6	LOS ANGELES	Beverly Hills	51	6,223	6,274	1	59	60
7	LOS ANGELES	Commerce	0	5,041	5,041	0	43	43
8	LOS ANGELES	Santa Monica	52	4,541	4,592	1	42	43
9	LOS ANGELES	Manhattan Beach	28	4,253	4,281	0	42	42
10	LOS ANGELES	Burbank	5	4,201	4,206	0	31	31
11	VENTURA	Thousand Oaks	7	3,808	3,814	0	33	33
12	LOS ANGELES	Arcadia	0	3,464	3,464	0	33	33
13	LOS ANGELES	Industry	0	2,827	2,827	0	23	23
14	LOS ANGELES	Cerritos	2	2,711	2,712	0	22	23
15	LOS ANGELES	UNCOR-LOS ANGELES	41	2,652	2,693	0	25	26
16	LOS ANGELES	West Covina	0	2,397	2,397	0	24	24
17	LOS ANGELES	Monrovia	2	2,164	2,167	0	18	18
18	LOS ANGELES	El Monte	6	2,146	2,152	0	19	20
19	LOS ANGELES	Culver City	0	2,049	2,049	0	18	18
20	LOS ANGELES	Alhambra	20	2,023	2,043	0	21	21
21	LOS ANGELES	Monterey Park	5	1,430	1,436	0	13	13
22	LOS ANGELES	West Hollywood	1	1,097	1,098	0	11	11
23	LOS ANGELES	Diamond Bar	0	1,002	1,002	0	9	9
24	LOS ANGELES	Agoura Hills	0	801	801	0	7	7
25	LOS ANGELES	Rowland Heights	1	609	610	0	5	5

* Ranked in terms of total output.

Figure 1: Employment Growth in New York and the United States Compared

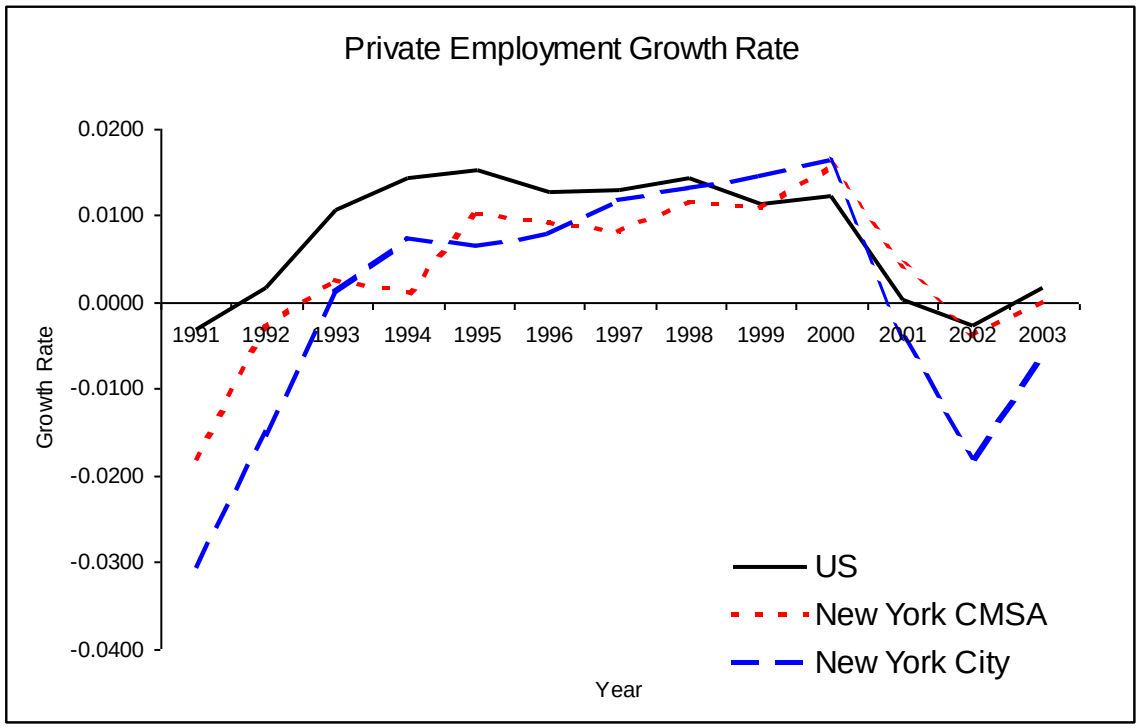

Figure 2: Relocated Jobs from a Terrorist Attack on Downtown LA (Relocation Scenario) for All Businesses and Households Moving out of the Inner and Outer Zones, Five-County Region, 2000