THE ECONOMIC IMPACT OF A TERRORIST ATTACK ON THE TWIN PORTS OF LOS ANGELES-LONG BEACH

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INTRODUCTION

• We have applied different versions of SCPM (Southern California Planning Model) to estimate spatially disaggregated economic impacts of projects, policies and plans.

• In recent years, many applications related to earthquakes. This is our first experiment with terrorist attacks.
• SCPM started as a regional I-O model -- with the number of geographical zones, usually political jurisdictions, ranging from about 50 to 308. SCPM is now also a transport network model -- with 1527 Traffic Analysis Zones (TAZs).
Table 1. Total Loss ($b.) of an Elysian Park 7.1 Earthquake

A. Structure Loss $45.250 b. (48.326%)
B. Business Loss (Direct + Indirect + Induced) $46.737 b. (49.991%)
C. Network Loss = \( \Delta \) Network Costs
   \( \Delta \) Personal Travel Cost $1.134 b.
   \( \Delta \) Freight Cost $0.295 b.
   \( \Delta \) Total Travel Cost $1.429 b. (1.526%)
D. Bridge Repair Cost $0.219 b. (0.233%)

Total = A + B + C + D = $93.635 b. (100%)
EXAMPLE IMPACT ESTIMATES (cont.)

• The table shows an earthquake impact illustration. It estimates the full economic costs of the event.
• It is not directly applicable to the terrorist attack example because (except for bridge damage) structure losses would be minimal. The approach could be used to estimate the impact of other types of attacks, e.g., a building (or buildings) in downtown LA.
• It disaggregates losses into four categories -- structures, business interruption, network costs, and infrastructure repair. In the earthquake case, the latter two are quite modest (<2%) with the balance evenly split between structure damage and business interruption.
• All results are available for each TAZ.
RADIOLOGICAL BOMB ATTACK

• We explore the implications of a simultaneous radiological bomb at the two ports (LA and LB):
  – 5 lbs of explosive,
  – Small radius of intensive damage (about 50 yards),
  – Area of low radioactivity will vary with wind and climatic conditions (probably several km²),
  – Staying indoors for a period of time desirable, but evacuation of sites outside the ports probably unnecessary.
RADIOLOGICAL BOMB ATTACK + BRIDGES

• Reopening the ports would be a political decision, but could occur within 15 days.
• Thus, we also modeled simultaneous attacks on 3 bridges/overpasses -- I-110, I-710, and the Vincent Thomas Bridge that links the ports. This would cause severe port disruption for at least 120 days.
FIG. 1. SCPM2 Dataflow and Calculations
EXPLANATION OF MODEL

• Iterative approach that achieves consistency between travel demand, spatial activities, and network costs.
• Baseline economic and network equilibria calculated.
• Scenarios define changes in network capacity and economic activities.
• Direct, indirect and induced impacts allocated as in SCPM1.
• Travel demand changes are combined with baseline spatial economic behavior to update shopping, commuting, and freight flow matrices.
• Spatial allocation of impacts re-estimated via SCPM1.
MODEL RUNS

- Local Impacts -- The ports close down as an economic activity (sector).
- Regional and National Impacts -- Interruption of trade flows to and from the ports.
- We ran the model many times -- both impacts, 15 and 120 days, each port individually and combined, with and without bridge damage.
- Here we report on just one or two examples.
FREIGHT PERFORMANCE SUB-MODEL

• An important computability issue is how quickly the numerical results for a new scenario converge to a new set of equilibria.

• As shown in the illustrative example for one port -- Long Beach with Bridge Damage -- the answer is “very fast.”
CONVERGENCE RATE

Objective Function Value of Assignment
(LB Port With Bridge Damage)
RESULTS

• A radiological bomb attack on both ports alone would have more of a psychological and symbolic than an economic impact.
• Alone, it might close the ports for only 15 days.
• If the bombs were relatively small, e.g., 5 lbs, the human toll in deaths and radiation illness would probably be modest.
• Supplementing the radiological bomb with conventional bomb attacks -- on 2 freeway access bridges (I-110 and I-710) and 1 bridge linking the ports results in major economic impacts.
RESULTS (cont.)

• The “local” impact, i.e., job and output losses associated with the cessation of port activities, amounts to $138.5 m. of output and 1,258 PYEs (person-years of employment) over 15 days, with no bridge damage.

• The regional (and national) impact -- the consequences of the interruption in exports and imports with bridge damage -- would, in effect, close the ports for at least 120 days, resulting in $34 billion of lost output -- 212,165 PYEs and $648 million of travel cost delays.
FIG. 2. Spatial Distribution of Job Losses: 120-Day Port Closure, Ports of Long Beach-Los Angeles, Bridge Damage (Scenario 6)
SPATIAL DISTRIBUTION OF JOB LOSSES

• The map shows that job losses are quite dispersed and are not clustered close to the ports.
• The explanation is that so many firms and jobs throughout the region are directly -- and indirectly -- linked to the ports via imports and/or exports.
OUT-OF-REGION IMPACTS

- Our model permits an aggregate estimate of impacts outside Southern California.
- In the “local effects” cases, most of the impacts (about 2/3) occur within the region -- and >50% within LA County.
- In the trade flows interruption cases, about 2/3 of the impacts are felt outside Southern California.
QUALIFICATIONS

• Transportation analysis is limited to the highway network. We will incorporate the new grade-separated rail (Alameda Corridor) and other non-highway facilities.
• The 120-day period may be too short.
• The research is not a “full cost” analysis.
• We have not analyzed mitigation, either w.r.t. traffic or port substitutions.
CONCLUSIONS

• The “local” impacts of this type of attack are modest because of the minimal damage to port infrastructure.
• High priority has been given to protecting the ports, but this goal needs to be interpreted more broadly.
• It is relatively easy to disrupt port access, and the costs of trade flow interruption are very high.
CONCLUSIONS (cont.)

• This research models only economic impacts -- business interruption and impaired transport network performance. Other costs, e.g., bridge reconstruction, mortality and illness, prevention and mitigation, are not yet estimated.

• The high economic impact costs justify considerable resource expenditures on prevention -- especially on freeway access routes.
CONCLUSIONS (cont.)

• The methodology used in this study is adaptable to almost any kind of terrorist attack in Southern California -- LAX, Disneyland, the Alameda Corridor, downtown, etc.

• The methodology is also transferable to other large metropolitan areas -- New York, Washington D.C., San Francisco -- if a similar model to SCPM is for these areas.
• The input-output model is sometimes criticized for its linearity and non-substitutability, but in other research we have accommodated some price and substitution effects.

• A limitation of the current model is that out-of-region impacts are estimated only in the aggregate. We are currently working on an integrated regional-national model (SCPM2004-NIEMO) that specifies these out-of-region impacts, state-by-state.