Economic Impacts of Kobe Earthquake

Toshihisa Toyoda
Professor Emeritus, Kobe University
Concept of Economic Losses

Without disaster
Case C
Case A
Case B

Recent Study by Skidmore and Toya (2002) supports Case C.
Stocks and Flows

Stocks

Flows

Other factors
(Government and other external aids)
<table>
<thead>
<tr>
<th>Disasters</th>
<th>Investigators</th>
<th>Amounts of losses</th>
<th>Total losses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Direct losses</td>
<td>Indirect losses</td>
</tr>
<tr>
<td>East Japan (2011)</td>
<td>Cabinet of Japan</td>
<td>$160 billion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Toyoda=Kochi</td>
<td>$ 133 billion</td>
<td>$ 7.2 billion</td>
</tr>
<tr>
<td>9/11 NY Terror (2001)</td>
<td>NY City</td>
<td>$ 30.5 billion</td>
<td>$ 52-64 billion</td>
</tr>
<tr>
<td></td>
<td>Fed of NY</td>
<td>$ 29.4 billion</td>
<td>$ 3.6-6.4 billion</td>
</tr>
<tr>
<td>Katorina (2005)</td>
<td>CBO</td>
<td>$ 70-130 billion</td>
<td>$ 36-62.5 billion</td>
</tr>
<tr>
<td></td>
<td>BEA</td>
<td>$ 96 billion</td>
<td></td>
</tr>
</tbody>
</table>
## Comparison of Losses of the Three Great Disasters (2)

<table>
<thead>
<tr>
<th>Disasters</th>
<th>Investigators</th>
<th>Purposes of Estimation</th>
<th>Evaluation methods of stocks</th>
<th>Evaluation methods of flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pre-acquisition price</td>
<td>Current price</td>
</tr>
<tr>
<td>Hanshin-Awaji Quake</td>
<td>Hyogo Prefect.</td>
<td>policy purposes to prepare funds, request for approval of devastating disaster</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>Toyoda=Kochi</td>
<td>provide more precise basic data for policy</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>9/11 NY Terror</td>
<td>NY City</td>
<td>assessing economic and fiscal effects</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Fed of NY</td>
<td>assessing effects on physical capital and labor market</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>Katorina</td>
<td>CBO</td>
<td>report to congress, effects on macro economy and budget</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>BEA</td>
<td>calculating losses of fixed assets</td>
<td>○</td>
<td></td>
</tr>
</tbody>
</table>
Estimates of Direct Losses

• **Official Estimates (April 1995):**
  
  9.9 trillion yen
  
  (≈ US$ 124 billion)

• **The Modified Estimates (Toyoda, 1997):**
  
  13.3 trillion yen
  
  (≈ US$ 166 billion)

[Exchange Rate $1≈¥80]
Direct Losses by Industry and Size

Based on a survey on about 1,000 enterprises.
Characteristics of Recovery from Direct Damage
(the case of Kobe EQ)

(1) The Government budget for disaster management is mainly allocated to
direct losses of physical stocks. (About 5/7 of the central government were
spent on them).

(2) The central government promised to provide recovery cost but denied to
cover BBB cost. The composition of recovery costs are: the central
government – about 6 tri. yen, Hyogo prefecture – 2.3 tri. yen, the local
municipalities – 3 tri. yen, the public organizations – 800 billion yen,
and the private sector – the rest.

(3) The government budget is allocated through related ministries and
agencies.

(4) No well-established system to assist victim’s livelihood for great disasters
existed. Reconstruction Fund, Act on Victims’ Livelihood
Reconstruction (1998, 2007 amendment), etc.
A Without-disaster Line

$$\text{GRP} = F(\text{①trend, ②country's economic condition})$$
Estimation Result
(using adjusted stationary time-series data after ADF test)

\[ \Delta HGRP = -1970.9 + 212.41 \hat{GDP} + 189.03T \]

\[ (-2.83) \quad (4.02) \quad (3.43) \]

\[ \bar{R}^2 = 0.67, DW = 1.79 \]

\textbf{HGRP}: Gross regional product of Hyogo Pref.

\( \hat{RP} \): Growth rate of the Japanese economy

\( T \): Time trend.
We get estimated values of $\triangle HGRP^*$.

Since $\triangle HGRP = HGRP - HGRP_{-1}$,

We get the estimated HGRP without disaster as follows:

$$HGRP^* = HGRP_{-1} + \triangle HGRP^*$$

Therefore, we get

$$Loss = HGRP - HGRP^*$$
Estimated Indirect Losses

[Graph showing estimated losses from 1994 to 2005 in billion yen.]
Sum of Indirect Losses

\[
\approx 14.0 \text{ trillion yen} \\
(\approx \text{US$ 175 billion})
\]
Characteristics of Indirect Losses

(1) They are large.

(1) They arise for longer than 10 years.

(2) They are almost equal to direct losses.
Factors to have caused large indirect costs

1. Supply side
   ♦ Discontinuity of supply chain (e.g., damage of Kobe Port)
   ♦ Bankruptcy and closing businesses (e.g., traditional local industries and small-scale stores)
   ♦ Worsening employment situation (decrease in job offers, mismatch of employment conditions, population loss, etc.)

2. Demand side
   ♦ Temporary upward-shift of reconstruction demand
   ♦ Discontinuity of demand chain (a “vicious circle” of demand shrinkage)
   ♦ Prolonged decline in consumption (a very unusual phenomenon)

3. Insufficient support by the central government
   ♦ Severe deficits of municipalities
   ♦ Weak recovery of households’ livelihoods and business activities of SME.
Kobe’s Case (D)
Budget for Reconstruction

Million yen

Hyogo

Kobe

Fiscal Year

Budget for Reconstruction

Million yen

Hyogo

Kobe

Fiscal Year
Amount of Orders of Construction

Public or Private Fund?

Public : Private = 3 : 7

(Nagamatsu (2008))
Number of Employees, 1994=100

Source: Industrial Statistics

Fiscal Year (as of Dec. 31)
Implications

(1) Disaster management policy paying more attention to indirect losses is necessary.

(2) Regional economic and industrial policy is very important.

(3) Supporting livelihood revival of disaster victims is important.
After the Kobe Earthquake, some progresses have been made. (E.g. the amendment of Act on Victims’ Livelihood Reconstruction (2007))

For the Great East Japan Earthquake, these progresses have been formalized but their realizations are still on the process. Despite the huge amount of budget allocation, I fear the similar prolonged stagnant process will continue as the case of Kobe EQ,