JAPANESE EXPERIENCE IN
HIGH SPEED RAIL

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• The History of Japanese HSR
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The History of Japanese high speed rail

1964

First high speed rail started operations between Tokyo and Osaka.
Economic Effects of HSR

![Graph showing economic effects of HSR over time.](image-url)
About MAGLEV

Modern Shinkansen (bullet) trains run at up to 200mph, covering the Tokyo to Osaka journey in ...

2 hrs 25 min

By 2045 the planned Chuo Shinkansen Maglev will cut this journey time to ...

1 hr 7 min

Japan's maglev train breaks world speed record with 600km/h test run

Seven-car ‘magnetic levitation’ train hits top speed of 603km/h less than a week after breaking the 2003 record of 581km/h

Yasukazu Endo, the head of the research centre run by Central Japan Railways, discusses the new maglev train.
The Purpose of Japanese HSR Project

1. Economic Growth of Japanese economy

2. Regional Development for Regional Equity Issues

3. Environmental Friendly for Climate Change
Research Background

• High Speed Rail plays the role of interregional passenger transport.

• Regional benefits and regional economic effects are important issues of the HSR investment project assessment, sometimes more important than the efficiency of total benefits.

• The Spatial CGE models are able to provide the answer to above requests
Model Assumptions of Spatial CGE

HSR: Interregional Passenger Transport System
Explicit transport service demand

(passenger travel)
Spatial Economic Analysis for Intercity Transport Policies

Atsushi Koike, Tomoki Ishikura, Mitsuhiro Miyashita, Kazuyuki Tsuchiya
## Assumptions

<table>
<thead>
<tr>
<th>Transport Mode</th>
<th>High-speed Rail, air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial Units</td>
<td>47 Prefectures</td>
</tr>
<tr>
<td>Industrial Sectors</td>
<td>7 Sectors</td>
</tr>
<tr>
<td>Exogenous Variable</td>
<td>Generalized Transport Cost</td>
</tr>
</tbody>
</table>

### Cases of Analysis

Case 1
- Scenario 1
  - ★ Benefit
  - ★ Change of GRP
  - ★ CO2emission
Results Scenario1: Benefit

- Benefit
  - 135.8 billion US$
  - 14.6 trillion JPY
- GDP (2000) 4.24%

※ GDP (2000) 3,206 billion US$  
503 trillion JPY
Results Scenario 1: Change of GNP

Change of GNP

- 10.3 billion US$ /year
- 1,112 billion yen /year

※Exchange rate: 1US$ = 107.62\(2000\)

![Graph showing changes in GNP across different sectors]

- Agriculture and forestry fisheries: 12.4 billion yen
- Manufacturing: 382.0 billion yen
- Construction: 94.2 billion yen
- Electric Power, Gas and Water Supply: 25.1 billion yen
- Commerce: 133.9 billion yen
- Finance, Insurance and Real Estate: 142.8 billion yen
- Service: 321.9 billion yen

(unit: billion yen)
Results Scenario 1: Change of GRP

Change of GRP

(million US$/year)

0 400km

TOKYO

OSAKA

AICHI (NAGOYA)

Agriculture and forestry fisheries
Manufacturing
Construction
Electric Power, Gas and Water Supply
Commerce
Finance, Insurance and Real Estate
Service

(unit: billion yen)

0.0 5.0 10.0 15.0

0.0

0.1

0.1

0.1

0.1

0.1

0.1

0.1

5.5

2.1

0.3

5.6

6.6

13.0

4.6

1.0

0.4

2.5

1.7

4.2

4.7

0.6

0.2

0.8

0.6

1.7
Results Scenario1: CO2 emission

Transport sectors

[CO2 emission]

- Transport sectors: 9.3% increase of CO2 emission from transport sector

[Change of CO2 emission]

- Total CO2 emission change: -355 million t-CO2/year
- Air: -355 million t-CO2/year
- Train: -55 million t-CO2/year
- MGLEV: 1,021 million t-CO2/year
- Total: 611 million t-CO2/year

9.3% increase of CO2 emission from transport sector
Results Scenario 1: CO2 emission

Industrial sectors

[CO2 emission]

- Agriculture: 3.5 million t-CO2/year
- Manufacturing: 41.5 million t-CO2/year
- Construction: 2.1 million t-CO2/year
- Electric power: 58.3 million t-CO2/year
- Commerce: 2.4 million t-CO2/year
- Finance: 8.8 million t-CO2/year
- Service: 38.8 million t-CO2/year

[Change of CO2 emission]

- Agriculture: 3 thousand t-CO2/year
- Manufacturing: 45 thousand t-CO2/year
- Construction: 2 thousand t-CO2/year
- Electric power: 62 thousand t-CO2/year
- Commerce: 13 thousand t-CO2/year
- Finance: 1 thousand t-CO2/year
- Service: 41 thousand t-CO2/year

0.11% increase of CO2 emission from industrial sector
Korean KTX and Japanese MGLEV
## Result: Comparison of KTX and MGLEV

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>KTX</th>
<th>MGLEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit</td>
<td>40.9 billion US$</td>
<td>135.8 billion US$</td>
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<tr>
<td></td>
<td>45.6 trillion won</td>
<td>14.6 trillion ¥</td>
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<tr>
<td>Cost</td>
<td>19.7 billion US$</td>
<td>92.9 billion US$</td>
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<tr>
<td></td>
<td>22.0 trillion won</td>
<td>10.0 trillion ¥</td>
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<td>B/C</td>
<td>2.07</td>
<td>1.46</td>
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<tr>
<td>Benefit/GDP</td>
<td>5.29 %</td>
<td>4.24 %</td>
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<tr>
<td>CO2 emission transport</td>
<td>-257 t- co2/year</td>
<td>610,907 t- co2/year</td>
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<tr>
<td></td>
<td>-0.00 million US$/year</td>
<td>16.02 million US$/year</td>
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<tr>
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<td>-3.5 million won/year</td>
<td>1,724.0 million ¥/year</td>
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<tr>
<td>Industrial</td>
<td>717,904 t- co2/year</td>
<td>327,722 t- co2/year</td>
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<tr>
<td></td>
<td>8.78 million US$/year</td>
<td>8.59 million US$/year</td>
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<tr>
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<td>9,792 million won/year</td>
<td>925 million ¥/year</td>
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</table>
Conclusions

• High Speed Rail projects are effective investments not only nationally but also locally in East Asia.

• HRS investments decrease CO2 emissions in transport sectors, however increase it in industrial sectors.

• The outputs of the SCGE models are useful in evaluating the projects from multiple viewpoints. (regionally, environmentally and so on)