Impact of Infrastructure Investment on Quality of Job Creation

Anushree Sinha, Rajesh Jaiswal and Avantika Prabhakar
asinha@ncaer.org

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1 This presentation draws heavily from a NCAER project report titled “Employment Dimension of Infrastructure Investment: State Level Input-Output Analysis ” completed in 2013 and funded by the International Labour Organisation.
BACKGROUND
The ILO Study Rationale

- Continuous economic slowdown will force countries to take a series of measures (reducing the debt burden and stimulating the economy).

- Infrastructure development would remain one of the key measures to provide enterprises with sustained access to markets and create jobs in the private sector.

- The ILO is widening its knowledge base to get a better insight of the different labour outcomes of infrastructure investments including the quantitative and qualitative aspects.

- A more comprehensive data set and methodology to estimate, direct, indirect and induced employment effects is required.

- The Indian Government endorsed this initiative and requested that India should be one of the countries to be analysed.
India has been advancing public investment in infrastructure and also been active in building up PPP in infrastructure sector to meet growing demand.

In 2009-10, the sector witnessed some regulatory reforms but the overall industry witnessed a slowdown in most sectors (India Infrastructure Report, 2011).

The Planning Commission is aiming at a total outlay of Rs 51.46 trillion in the infrastructure sector during the 12th Plan (2012-17). The current budget has allocated Rs. 378.8 billion for 2014-15 on roads.
Gujarat State Economy

- GSDP at factor cost at current prices grew by around 16.8% during 2009-10.

- Share of Gujarat state for 2009-10 at current prices in Indian GDP was around 7.0%.

- Per capita income at current prices grew by around 16.0% during 2009-10.

- The share of primary, secondary and tertiary sectors has been reported at 18.2%, 36.9% and 44.9% respectively to the total GSDP in 2009-10 at current prices.

- Higher growth during 2009-10 could be attributed to the manufacturing, electricity, construction and communication sectors, which have contributed to the tune of 11.0% to 34.6% growth during 2009-10 at constant (2004-05) prices.
West Bengal State Economy

- West Bengal economy has been undergoing a substantial structural change in favor of non-farm activities since the early 1990s.
- More than 70% of West Bengal’s population lives in rural areas.
- The per capita GSDP increased at a CAGR of 11.5% between 2004-05 and 2009-10.
- Tertiary sector is the largest contributor to the NDP of the state, contributing 65.52% (compared to 18.76% from primary and 15.72% from secondary sector).
- It is evident that the potential for growth in West Bengal remains untapped. The state needs to catch up with the rest of the Indian economy.
Growth and Employment Analysis

- Growth in infrastructure will potentially have a huge impact on job creation, and such employment would vary by types and regions, depending on the profile of construction carried out in a particular region or state.

- Economy wide analysis is essential when the indirect impact of policy changes is wide and other groups and other markets are affected as a result of a trade or financial policy.

- Policy makers are interested in studying the impact of particular policy measures, on various aspects such as growth and employment.
States and Year Selected for Study

- Year of focus for analysis: 2009-10
- States: Gujarat, West Bengal (as these are seen to be contrasting states in terms of infrastructure development; Gujarat being more developed and West Bengal being less developed)

Infrastructure Sectors in Focus (for Regional IOs)

- Irrigation Canals Construction
- National Highways/Urban Roads Construction
- Rural Roads Construction
- Buildings Construction
Objectives of the Study

Given the importance of infrastructure investment in India, the employment generation through this sector is critical. With this background, the objective is three-fold:

- To examine such employment growth by developing a set of employment multipliers (direct, indirect, induced) for selected infrastructure sub-sectors for selected State(s) of India.

- To evaluate employment multipliers based on work type (formal, informal) and gender.

- To analyze different infrastructure investment options as requested by national constituents (to the ILO), and provide policy recommendations on findings.
METHODOLOGY
Generating State/Regional IO Tables

Basic Steps:

- Identifying and adjusting a “parent” or “mother” table. Generally this “mother” table would be a national table from time \((t-i)\) for the country in which the region of interest is located. This parent table needs to be updated to the period for which the regional/state table is to be made.

- Defining the appropriate regional/state sectors, usually through aggregation of the national sectors depending on the motivation for the study.

- Converting national to regional/state tables using state level statistics.
- Inserting data from surveys for “new” sectors when such data are not available from secondary sources.

- Using superior data and opinion from expert interviews when survey data are not adequate.

- Developing the final regional/state IO tables following the above steps: Hybrid Method.
“Parent” IO Table for India

- The Indian national I-O table, 2007-08 is published by the CSO and available online. This table has been updated with relative price changes to 2009-10 by NCAER.

- The first Indian IO was of 60 Sectors, updated to 115 sectors in later years, and currently comprises 130 sectors since 2003-04.

- For the current study, we have aggregated the 130 sectors of the all-India IO to 16 relevant sectors. This becomes the “parent” table which is used to develop state IO tables.

- The state IO tables are extended from 16 to 20 sectors, adding 4 “new” sectors for the study.
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Indian IO Sector Number(s)</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-26</td>
<td>Agriculture and Allied Activities</td>
</tr>
<tr>
<td>2</td>
<td>27-37</td>
<td>Mining</td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>Furniture and Fixtures: Wooden</td>
</tr>
<tr>
<td>4</td>
<td>63</td>
<td>Petroleum Products</td>
</tr>
<tr>
<td>5</td>
<td>74</td>
<td>Bricks, Tiles (Structural Clay Products)</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>Cement</td>
</tr>
<tr>
<td>7</td>
<td>76</td>
<td>Non-Metallic Mineral Products</td>
</tr>
<tr>
<td>8</td>
<td>77-78</td>
<td>Iron &amp; Steel (Ferro Alloys and Casting &amp; Forging)</td>
</tr>
<tr>
<td>9</td>
<td>79</td>
<td>Iron &amp; Steel Foundries</td>
</tr>
<tr>
<td>10</td>
<td>88-89</td>
<td>Electrical Machinery and Tools</td>
</tr>
<tr>
<td>11</td>
<td>38-54, 56-62, 64-73, 80-87, 90-105</td>
<td>Other Manufacturing</td>
</tr>
<tr>
<td>12</td>
<td>106</td>
<td>Construction</td>
</tr>
<tr>
<td>13</td>
<td>107-108</td>
<td>Electricity and Water Supply</td>
</tr>
<tr>
<td>14</td>
<td>109-113</td>
<td>Transport Services</td>
</tr>
<tr>
<td>15</td>
<td>114-129</td>
<td>Other Services</td>
</tr>
<tr>
<td>16</td>
<td>130</td>
<td>Public Administration</td>
</tr>
</tbody>
</table>
Using the Hybrid Method

- The state level IO tables were derived for Gujarat and West Bengal using state level secondary data on control totals (output, GVA, PFCE, GFCE, GFCF) and all-India coefficients.

- The four “new” infrastructure sectors were disaggregated from the “construction” sector of each state level table respectively using data from primary and secondary sources as well as expert interviews.

- Thus, a 20 X 20 matrix for each state respectively was obtained using the steps above.
<table>
<thead>
<tr>
<th>IO Sectors for 20 X 20 Matrix (All India, 2009-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and Allied Activities</td>
</tr>
<tr>
<td>Mining</td>
</tr>
<tr>
<td>Furniture and Fixtures: Wooden</td>
</tr>
<tr>
<td>Petroleum Products</td>
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<tr>
<td>Bricks, Tiles (Structural Clay Products)</td>
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<td>Cement</td>
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<td>Non-Metallic Mineral Products</td>
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<td>Iron &amp; Steel Foundries</td>
</tr>
<tr>
<td>Electrical Machinery and Tools</td>
</tr>
</tbody>
</table>
DATA
Output

- The outputs of the basic 16 sectors at the state level were obtained by imposing GVA-Output ratios at the national level (except for manufacturing sectors) on sectoral GVA.
- GVA was obtained from state level data (following slides).

- For the “new” sectors:
  - The values of “new construction” and “repairs and maintenance” were obtained from the CSO for Irrigation Canal Construction and Roads Construction (rural and urban/highways) Construction. The sum of these two values is the output for these sectors.
  - For buildings, the public buildings component is similar to the above sectors. The private buildings components (new construction and R&M) were estimated using all-India shares. Adding new construction and R&M of both types of buildings provides the output.
The State Domestic Product (SDP) for all states of India are available on the MOSPI (Ministry of Statistics and Programme Implementation) website for 2009-10 for the following sectors:

- Agriculture and Allied Activities
  - Agriculture
  - Forestry and Logging
  - Fishing
- Mining and Quarrying
- Manufacturing
  - Registered
  - Unregistered

The state GVA data are only available for the registered and unregistered sectors of manufacturing (and not by individual manufacturing sector). The GVA of the manufacturing sectors are obtained unregistered from the following data sets:

- For Registered Sector: Annual Survey of Industries Part I (2009-10)
Value Added (2)

- Construction
- Electricity, Gas and Water Supply
- Transport, Storage and Communication
  - Railways
  - Transport by Other Means
  - Storage
  - Communication
- Trade, Hotels and Restaurants
- Banking and Insurance
- Real Estate, Ownership of Dwellings and Business Services
- Public Administration
- Other Services

- “New” Sectors

For “new” sectors, we first applied the all-India IO shares for “construction” (GVA-Output Ratio) on the outputs of the sub-sectors and fine-tuned using expert advice.
Final Demand

- **CAPITAL FORMATION**
  Total GFCF for the states were obtained from the CSO and sector-wise distribution was obtained using all-India IO shares. For “new” sectors, any “new construction” was considered capital formation obtained from CSO.

- **CONSUMPTION**
  To obtain total state-level PFCE, we use shares from the 66th Consumer Expenditure Round of NSSO which is available at the state level. These total PFCE are distributed by sectors imposing all-India IO shares. For “new” sectors, there is no PFCE for irrigation canals and roads. For buildings, CSO estimates were used to distinguish public and private buildings.

- **GOVERNMENT EXPENDITURE**
  Government expenditure (for the final demand part of the table) at the state level is obtained from state government budgets and from reports of the CSO. For “new” sectors, the estimates for “repairs and maintenance” for irrigation canals, roads and public buildings were under GFCE (as these are all government activities).

*The intermediate demand component of the buildings sector is repairs and maintenance of private buildings.*
Employment and Consistency

- **EMPLOYMENT**
  Employment data are estimated using Census 2001 (Population Projections, Registrar General of India) and imposing WPR (NSSO) on these projections, for estimating state-level total employment. The NSSO’s 66th Round (2009-10): Schedule 10.0 on "Employment and Unemployment“ was used to distribute these totals by sector.

- **CONSISTENCY**
  To make the state IO tables consistent by sector-wise receipts and expenditure, we used the remaining final demand components as a residual column
  - These remaining components were not disaggregated as the study sectors are construction sectors where net exports and CIS are zero.
Primary Survey and Expert Interviews

- Data were collected from selected enterprises and contractors to estimate the values of inputs of the study sectors.

- A survey of 5 road construction enterprises, 5 building construction enterprises and 5 irrigation infrastructure construction enterprises in Gujarat and West Bengal each was carried out during February-March 2013.

- A list of contractors was procured from the respective government departments and randomly 5 enterprises were selected each for road construction, building construction and irrigation infrastructure construction in Gujarat and West Bengal.

- For rural roads, semi-structured interviews were conducted with state and district level government officials including secretaries, chief engineers, and other officials.
FINDINGS
In this study, we used the open (Type I) and closed (Type II) IO models for both the states.

We compared the differences in the Type I and Type II results for the selected sectors both for output and employment.

Also, we compared differences in results of the two state economies that reflect their structural differences.

The relative positioning of the study sectors for the 2 states are different.

We combine the two types of multipliers and derive a composite index which we rank to determine driving sectors for the states.
## Output Multipliers

<table>
<thead>
<tr>
<th>Sector</th>
<th>Gujarat</th>
<th>West Bengal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type I</td>
<td>Type II</td>
</tr>
<tr>
<td>Irrigation canal Construction</td>
<td>2.254</td>
<td>5.656</td>
</tr>
<tr>
<td>Buildings Construction</td>
<td>2.351</td>
<td>5.795</td>
</tr>
<tr>
<td>Highways/Urban Roads Construction</td>
<td>2.360</td>
<td>5.765</td>
</tr>
<tr>
<td>Rural Roads Construction</td>
<td>2.293</td>
<td>5.722</td>
</tr>
</tbody>
</table>
## Employment Multipliers

<table>
<thead>
<tr>
<th>Sector</th>
<th>Gujarat</th>
<th>West Bengal</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type I</td>
<td>Type II</td>
<td>Induced Effect</td>
</tr>
<tr>
<td>Irrigation canal Construction</td>
<td>0.903</td>
<td>3.240</td>
<td>2.337</td>
</tr>
<tr>
<td>Buildings Construction</td>
<td>0.564</td>
<td>2.930</td>
<td>2.366</td>
</tr>
<tr>
<td>Highways/Urban Roads</td>
<td>0.731</td>
<td>3.071</td>
<td>2.340</td>
</tr>
<tr>
<td>Construction</td>
<td>2.677</td>
<td>5.032</td>
<td>2.355</td>
</tr>
</tbody>
</table>
Direct, Indirect and Induced Employment Effects: Gujarat

- Irrigation Canal
- Buildings
- Highways/Urban Roads
- Rural Roads

Multiplier

Formal Employment

- Direct Impact
- Indirect Impact
- Induced Impact

Informal Employment

- Direct Impact
- Indirect Impact
- Induced Impact
Direct, Indirect and Induced Employment Effects: West Bengal

- **Formal Employment**
  - Irrigation Canal
  - Buildings
  - Highways/Urban Roads
  - Rural Roads

- **Informal Employment**
  - Irrigation Canal
  - Buildings
  - Highways/Urban Roads
  - Rural Roads

- **Multipliers**
  - Direct Impact
  - Indirect Impact
  - Induced Impact
# Ranking “New” Construction Sectors: Composite Employment and Output Multipliers

<table>
<thead>
<tr>
<th>Sector</th>
<th>Gujarat</th>
<th></th>
<th>West Bengal</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type I</td>
<td>Type II</td>
<td>Type I</td>
<td>Type II</td>
</tr>
<tr>
<td>Irrigation canal Construction</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Buildings Construction</td>
<td>6</td>
<td>6</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Highways/Urban Roads Construction</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Rural Roads Construction</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Impact of Investment Shock on Employment

- Based on the results of the ranks of the combined indices, two simulations each for Gujarat and West Bengal were carried out, one for the rural roads construction sector and the other for the buildings construction sector.

- These sectors were selected as rural roads construction has a high rank among the infrastructure sectors (and for the economy as a whole) in the two states while the buildings sector has a comparatively low rank among the two states.

- For each selected construction sector, it is assumed that the capital investment or the GFCF in the closed IO model increases by 10% due to an exogenous factor. This increase is incorporated into the IO model.
### Investment Shock on Rural Roads Construction: Gujarat

<table>
<thead>
<tr>
<th>No. of Workers</th>
<th>Agriculture and Allied Activities</th>
<th>Other Manufacturing</th>
<th>Rural Roads Construction</th>
<th>Other Services</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Formal Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female Formal Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male Informal Employment</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Female Informal Employment</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Male Total Employment</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female Total Employment</td>
<td></td>
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</tr>
</tbody>
</table>

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**Note:** The graph shows the distribution of employment across different sectors and genders for rural roads construction in Gujarat.
Investment Shock on Rural Roads Construction: West Bengal

No. of workers

Agriculture and Allied Activities
Other Manufacturing
Rural Roads Construction
Other Services
Total

Male | Female | Male | Female | Male | Female
---|---|---|---|---|---
Formal Employment |  |  |  |  |  |  
Informal Employment |  |  |  |  |  |  
Total Employment |  |  |  |  |  |  

NCAER
Investment Shock on Buildings Construction: Gujarat

- No. of Workers
- Male
- Female
- Formal Employment
- Informal Employment
- Total Employment

Categories:
- Agriculture and Allied Activities
- Other Manufacturing
- Buildings Construction
- Transport Services
- Other Services
- Total
Investment Shock on Buildings Construction: West Bengal

No. of workers

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and Allied Activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Manufacturing</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buildings Construction</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Services</td>
<td></td>
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<td></td>
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<tr>
<td>Total</td>
<td></td>
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</tr>
</tbody>
</table>
Conclusions

- West Bengal is more labour intensive than Gujarat. Irrigation canal construction has the highest Type I and Type II employment multipliers (amongst the “new” sectors) in West Bengal while rural roads construction has the highest multipliers in Gujarat.

- Difference between Type I and Type II multipliers are high in general, and higher for West Bengal than Gujarat, reflecting West Bengal’s labour intense economy.

- Results of the closed model reflect the fact that growth in output is driven by high employment intensity (income induced growth) and not by high productivity. This is why West Bengal’s output multipliers are also higher than Gujarat’s.

- But the employment is driven by informal workers demonstrating the fact that output is driven by informal employment in India in general, and these states in particular.
Policy Recommendations

- There is a need to improve productivity and transform informal workers to formal i.e., formalization of labour and women’s work participation.
  - Short Term: Skill development, social security, working conditions, women-specific training.
  - Long Term: Education, incentives and disincentives for participation of women in education (primary and higher), quality job creation and women-friendly technology and job conditions.

- More quality data required to be collected on informal workers, wages and unpaid work, with a gender focus.
Future Research

- Developing a SAM to look at income distribution aspects by type of workers (formal, informal; gender).

- The SAM would provide a detailed picture by including distribution of households (rural-urban; rich-middle-poor).

- This would help to better elaborate the implications of the induced effect in a more transparent way.
THANK YOU