"Transport Costs, Structural Change and Urbanization: Evidence from a large transport investment (Jamuna Bridge) in Bangladesh"

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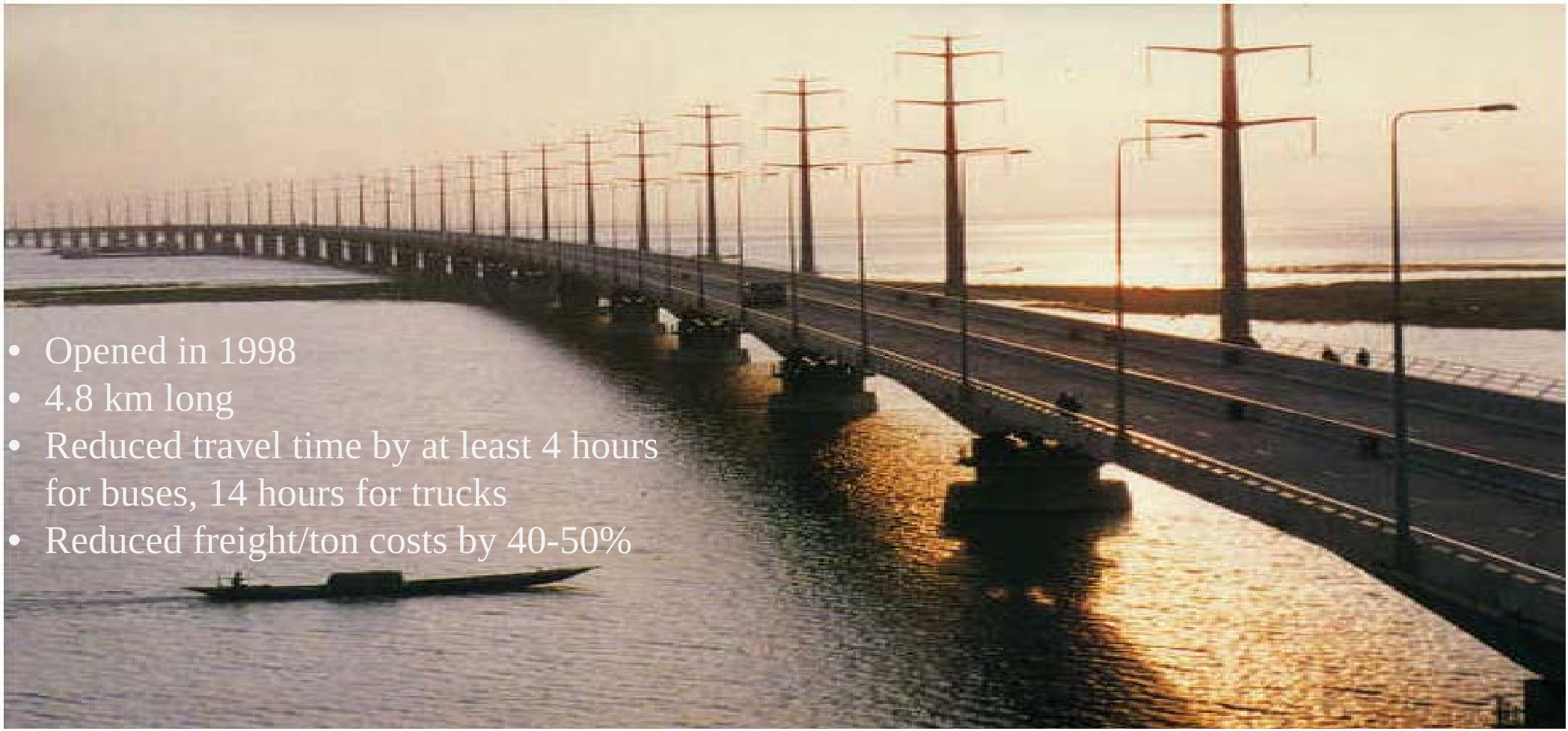
Introduction

- Smaller cities and towns: account for a disproportionate share of urban population and urban poor
- Competitiveness of these cities depends on market access
- Improved connectivity is an important policy recommendation
- Impacts of this investment on urbanization and structural transformation, comparing the effects for smaller cities/towns with overall impacts

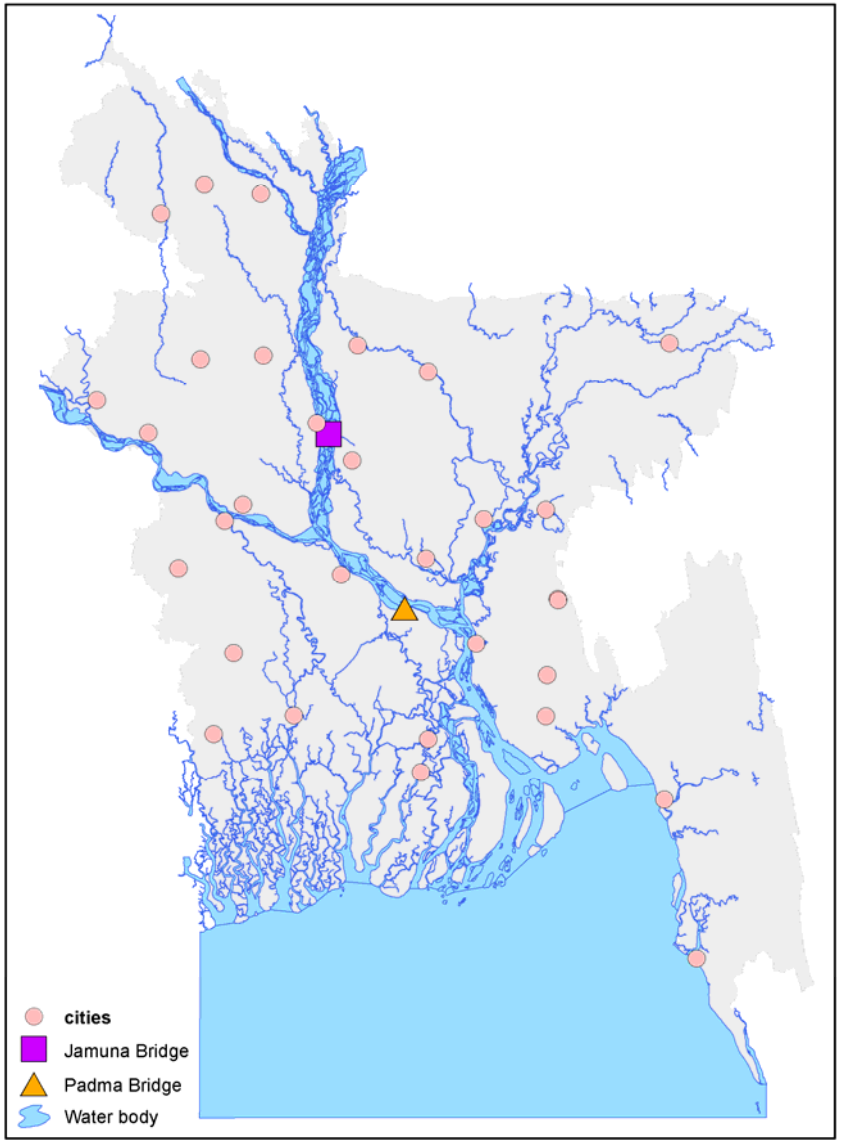
Empirical Literature

- Vast Empirical literature on the impacts of transport on a range of economic indicators: GDP, population, sectoral transformation, agricultural specialization, industry location etc. Two recent survey papers: Redding and Turner (2014) handbook chapter (Regional and Urban Economics), and Berg, Deichmann, Liu and Selod (2015)
- Most evidence is in favor of a substantial positive impact on economic activities and welfare with a few exceptions
- Our approach is different:
  - Substantial reduction in travel time and costs
  - Geographical setting ideal for testing predictions from center-periphery models vs. comparative advantage models
  - Difference in difference approach afforded by geography and political economy

Jamuna Bridge in Bangladesh



- Opened in 1998
- 4.8 km long
- Reduced travel time by at least 4 hours for buses, 14 hours for trucks
- Reduced freight/ton costs by 40-50%

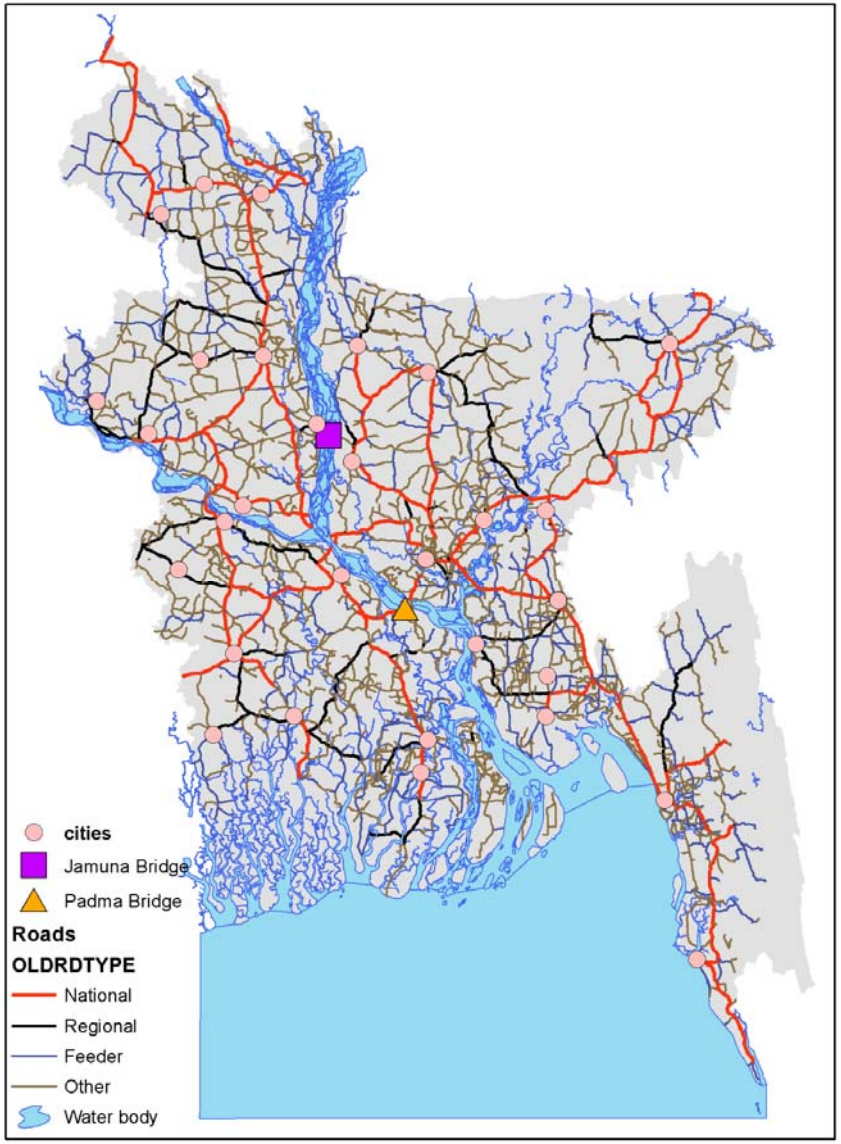


Treatment vs. Center

- Connected 30 million people to more prosperous eastern part of the country
- Poorest region with pre-bridge poverty rate over 61% (vs. 55% in control)
- Poverty rate in Dhaka – center – was about 40% in the same year (1995/96)
- Population density in treatment area was about 908/sqkm compared with 5140 in center. Density in control:1304
- 66% in agriculture in center compared with 81% in treatment area and 71% in control

Theoretical Literature: Potential Impacts

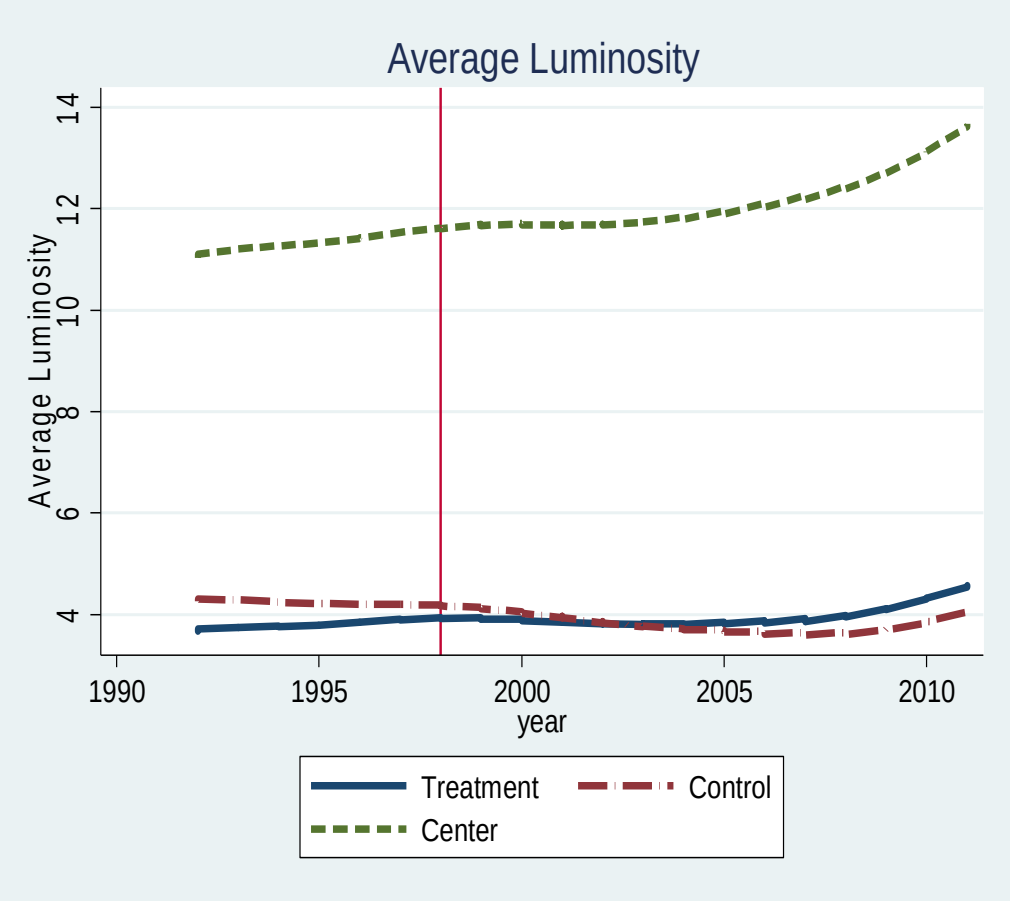
- Center-periphery models: Krugman (1991), and Krugman and Venables (1995)
  - Reduction in transport costs from high to intermediate levels: industry and people move to center
  - No agricultural productivity change in these models
- Agricultural Productivity and Industrialization (Matsuyama (1992) model)
  - With free trade, industry will move away from areas with higher agricultural productivity because of higher labor costs but population can increase
  - Extension of this model to include services (Foster and Rosenzweig (2004)): Relative shares of agriculture and services should remain unchanged

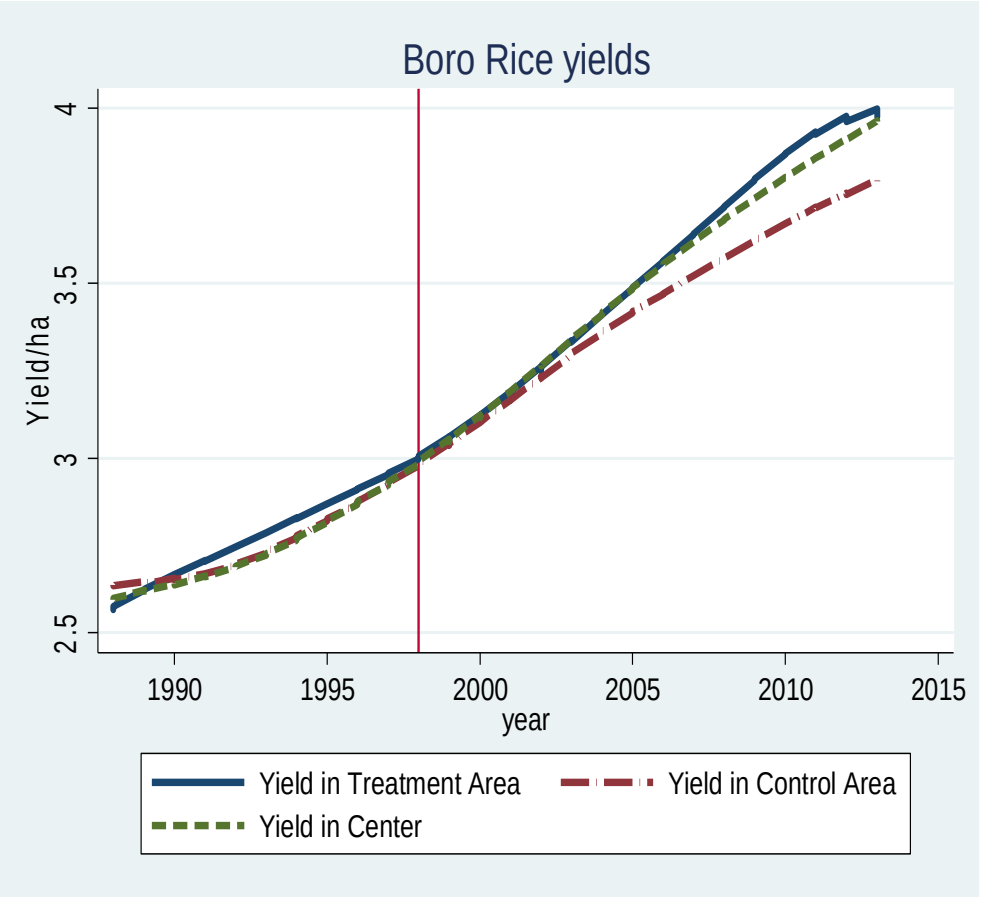


Treatment vs. Control

- Pre-bridge poverty rate over 61% vs. 55% in control
- Population density in treatment area was about 908/sqkm compared with 1304 in control
- Agriculture's share in employment: 81% in treatment area and 71% in control
- Services share: 16% vs. 26%
- More semi-skilled workers in control

- Differences between the center, treatment and control areas in average luminosity of night lights and rice yields before the bridge





Placement and financing of the bridge

- Bridge construction costs: about $1 billion
- Three donors (WB, ADB, JICA): 24% each of originally estimated costs of $800 million, rest financed by government of Bangladesh
- Three regions: center (Dhaka, capital city), and two peripheries (treatment and control)
- Control areas: that would have been connected to center, had Padma bridge been constructed. Control is isolated from treatment by Padma River
- Why Jamuna bridge but not Padma bridge
  - 3 presidents/ prime ministers in power for most of 1975-1999 were from treatment area
  - Proposed Padma bridge: 6.18 km and costs increase exponentially with length
  - Treatment area was the poorest region in the country

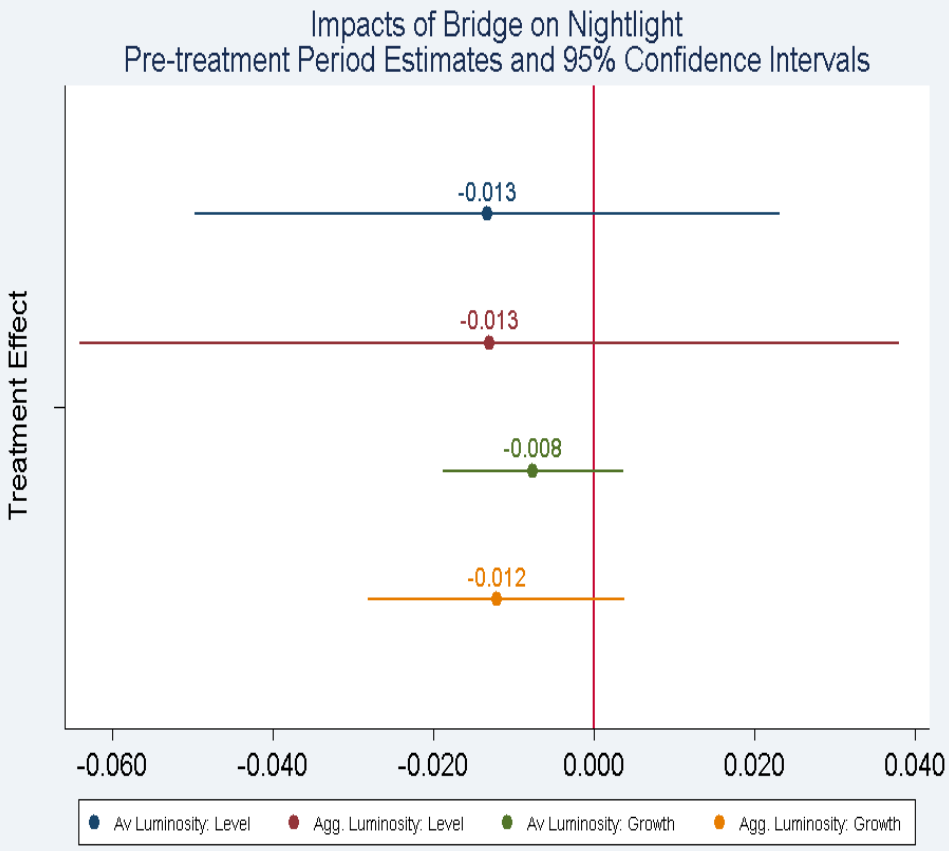
Empirical Specification

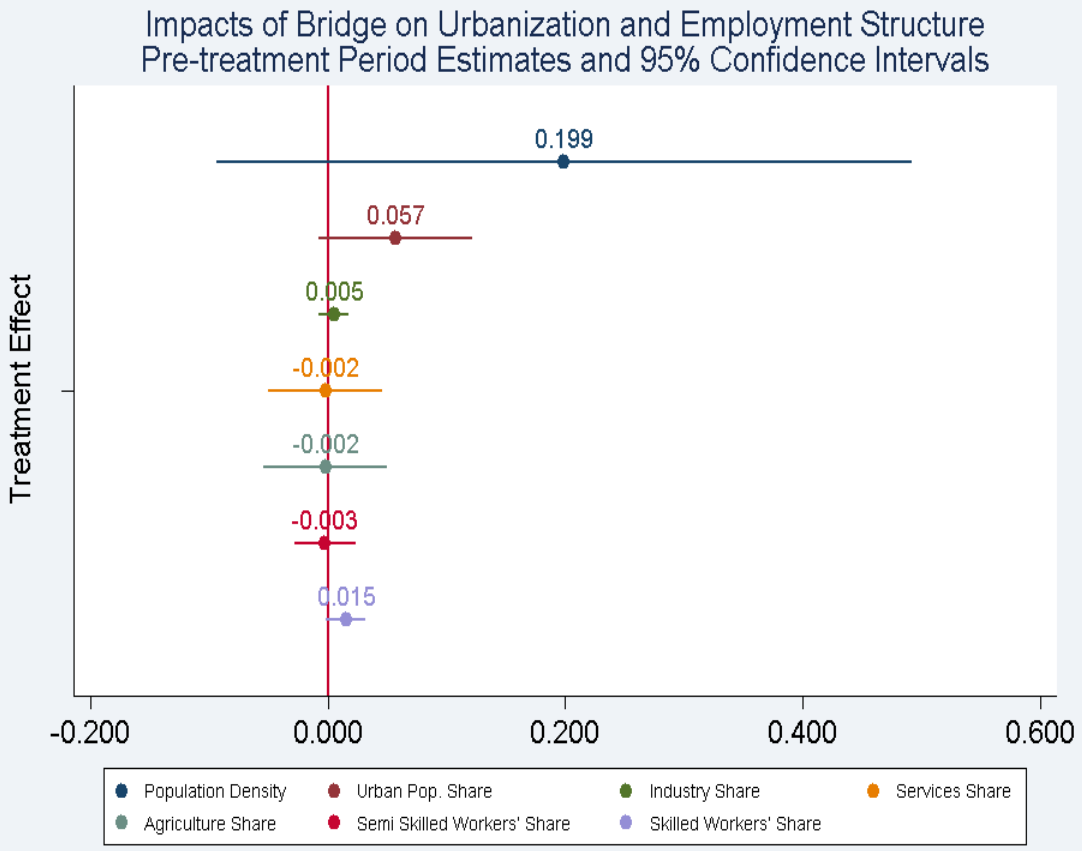
- Estimating equation in difference in difference formulation:

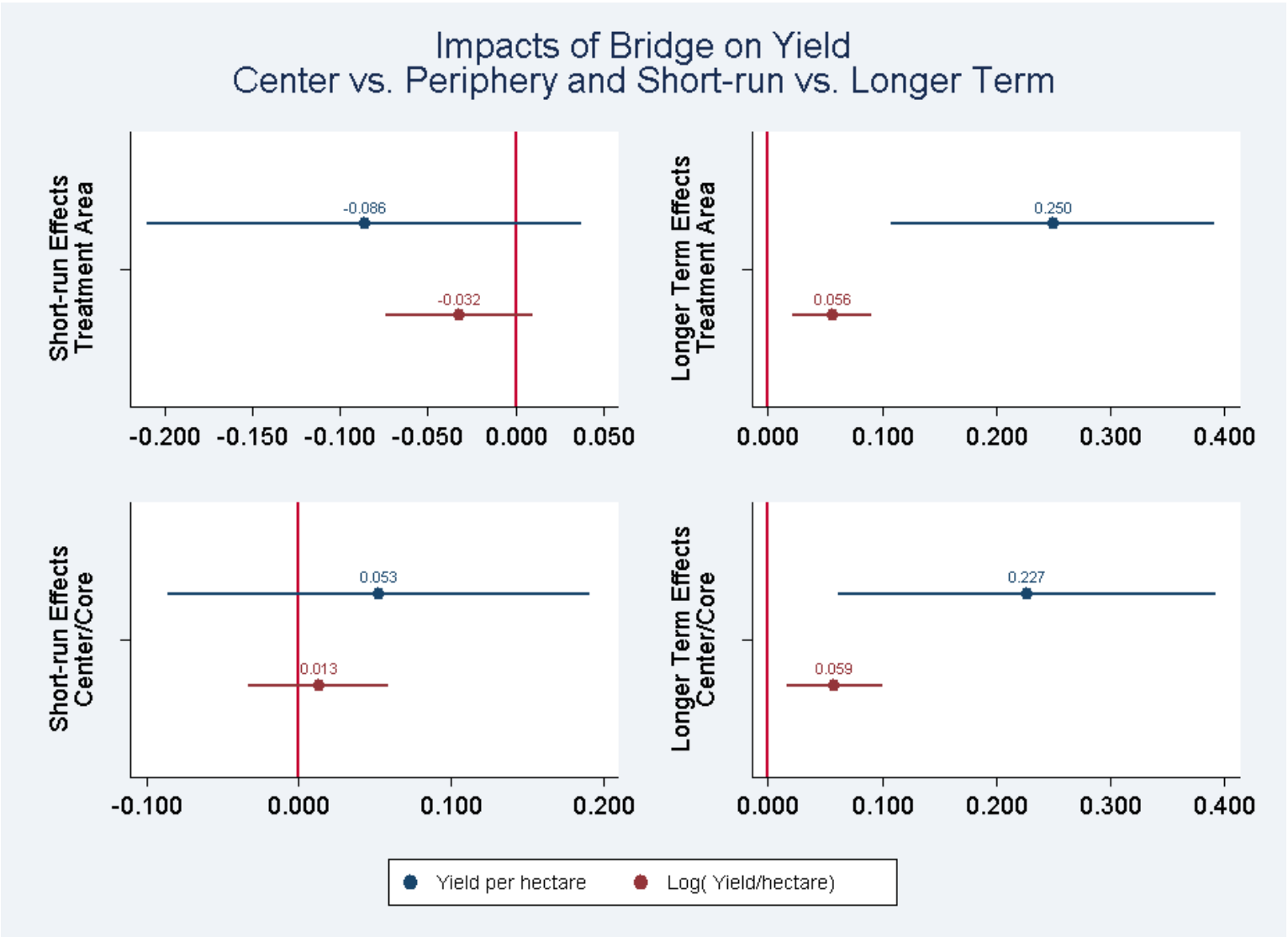
$$Y_{ijt} = \alpha + \beta * treat * year_{t*} + \gamma Z_{ijt} + \delta * treat + \tau * year_{t*} + \theta_i + \mu_t + \varepsilon_{ijt}$$

- β=treatment effect, $year_{t*}$ is dummy for treatment years (after 1999), *treat* is dummy for treatment areas, θ_i=upazila FE, μ_t=time fixed effect, Z_{ijt}=time variant upazila level controls
- Upazilas in Rajshahi division are in treatment group and upazilas in Barisal and Khulna are control groups
- Coefficient of interaction of treatment years and treatment group is the treatment effect
- Z_{ijt}: Pre-treatment characteristics: log(rainfall), log(SD of rainfall), log(1991 population), distance to bridge (Actual for treatment and proposed for control) . Also include contemporaneous rainfall
- Data Sources: Population Censuses, Agricultural statistics, Global Satellite data on night lights

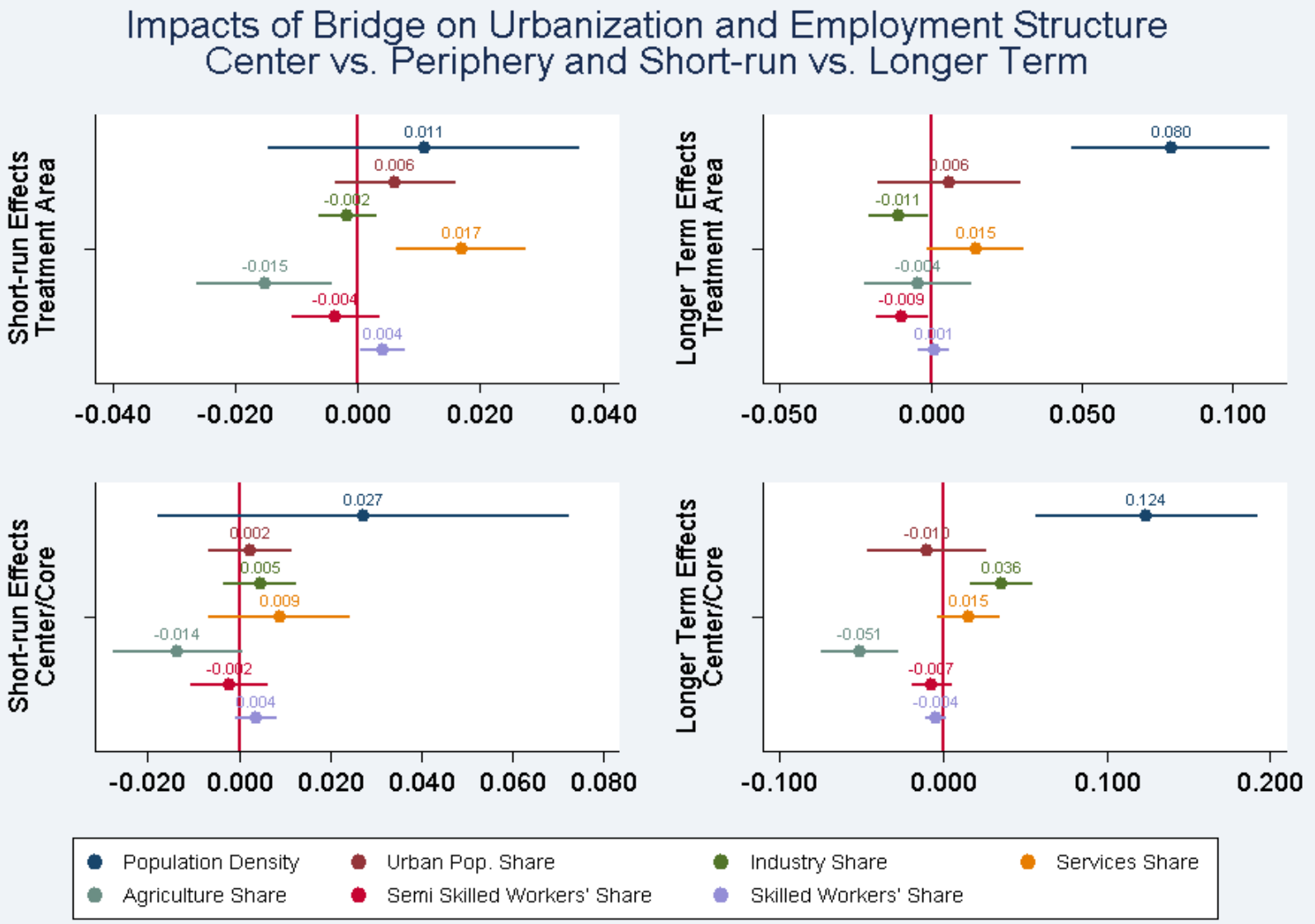
Treatment vs. control: no statistically significant differences



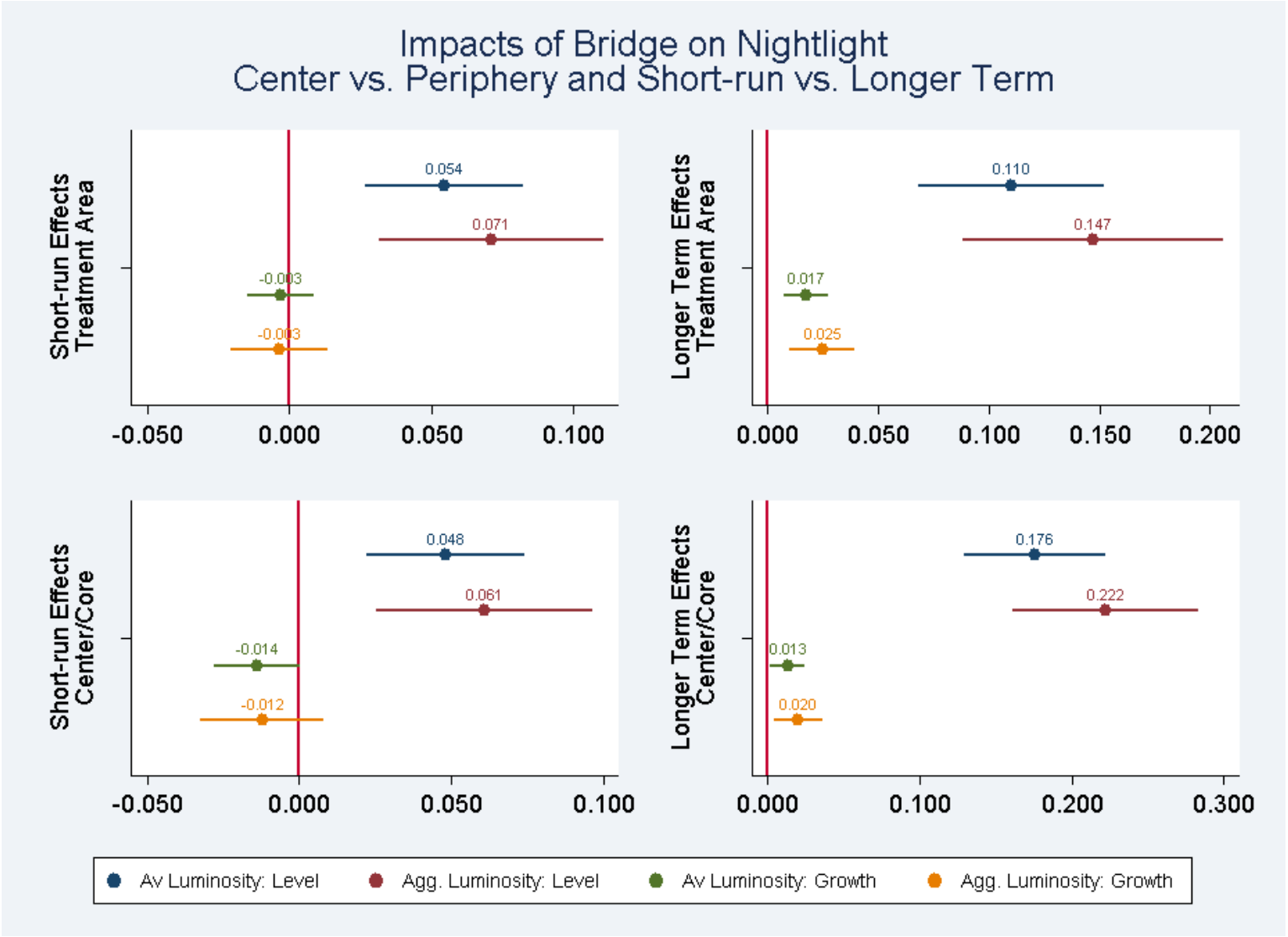




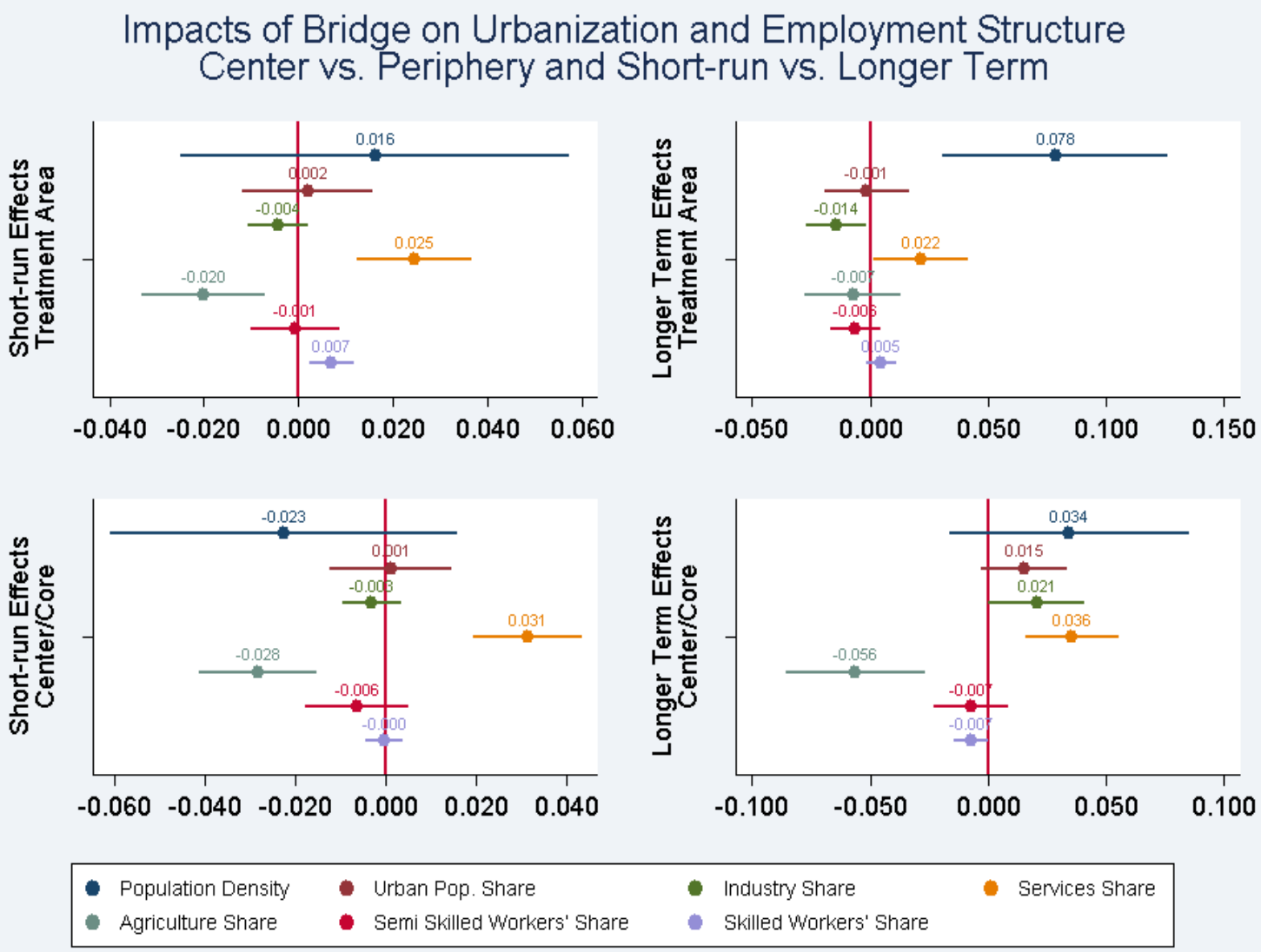
- No change in yield in the 6 year period following bridge opening
- Large and significant increase in yield 10 year later: 6-8% increase in yields in treatment area
- Yield increase in treatment area at least as large as that in center



- In treatment area, no significant change in population density 3 year after bridge opening, but significant shift in employment share of services (an increase) at the expense of that of agriculture
- Significant increase in density in the longer term (12 year after), with services share increasing significantly but manufacturing declining
- In the center: no effect in shorter term, but significant increase in density, manufacturing and services shares and decrease in agriculture share

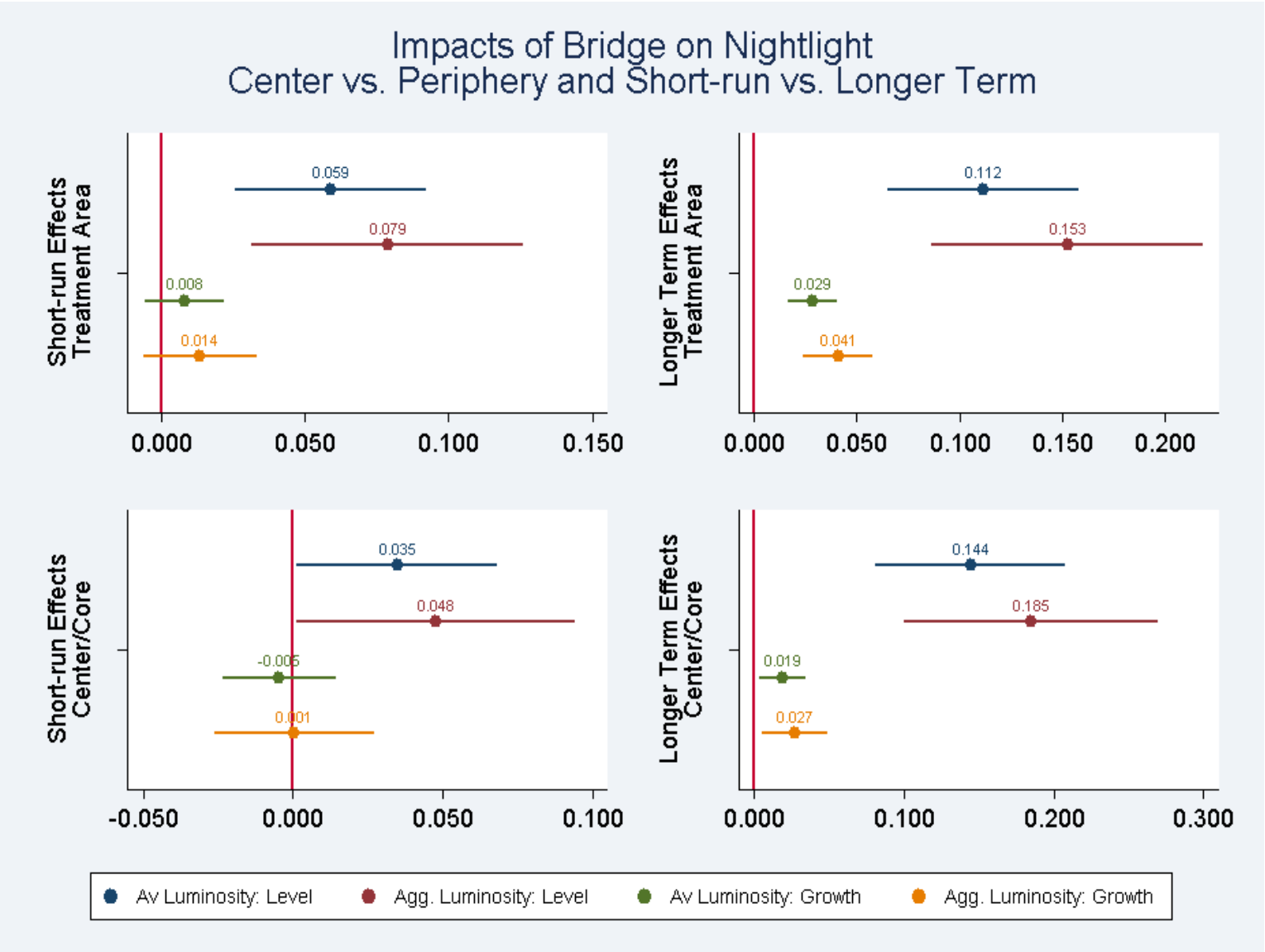


- No change in nightlight luminosity growth rate within first 5 years but increase in level (3.8%)
- The magnitudes of effects are nearly double that of short-term effects (first 5 years)
- The longer term increase in level of nightlight luminosity much larger in center, growth rates are comparable
- But treatment areas are starting to catch up with center



Small Cities and Towns Sample

- For treatment areas: effects are slightly larger though in the same direction as full sample
- For center: no effect on density, smaller increase in manufacturing share but large increase in services share



Small Cities and Towns Sample

- Effects are somewhat larger in treatment areas compared with full sample
- For center: opposite (slightly smaller)

Concluding Remarks

- Removal of transport bottleneck had significant impacts on urbanization and structural transformation
  - Significant increase in agricultural yield
  - Within region adjustment in employment (from agriculture to services) with no movement of people in the shorter term
  - Longer term adjustment in population to increase urbanization, reduce industry share in employment and increase services share
  - Industry appears to move to center instead of low labor cost control region pointing to importance of agglomeration economies
  - Welfare improvements in terms of nightlight growth
  - Smaller towns and cities: Industry and people moved to larger cities within the center.

Taking Evidence to Theory

- Results are only partially consistent with center-periphery or Matsuyama type models
- Need a richer model incorporating:
  - Technology adoption and agricultural productivity growth in response to reduction in transport cost
  - Non-homothetic preference to explain services growth and nearly unchanged agriculture's share in employment and an increase in population density
  - Agglomeration economies in the center