Internal Trade in India: Patterns and Determinants

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Motivation

- Vast scholarship on India's foreign trade patterns but sporadic research on internal trade flows
- Poor data availability for internal trade flows:
  - No publicly available data for goods transported by roads
  - Highly aggregated
- Limited understanding of internal trade drivers despite large variations in geographic units that trade with each other
- Trade flows intimately linked with trade barriers (Van Leemput (2021)) and costs (Abeberese and Chen (2021)) $\longrightarrow$ important implications for local economic development

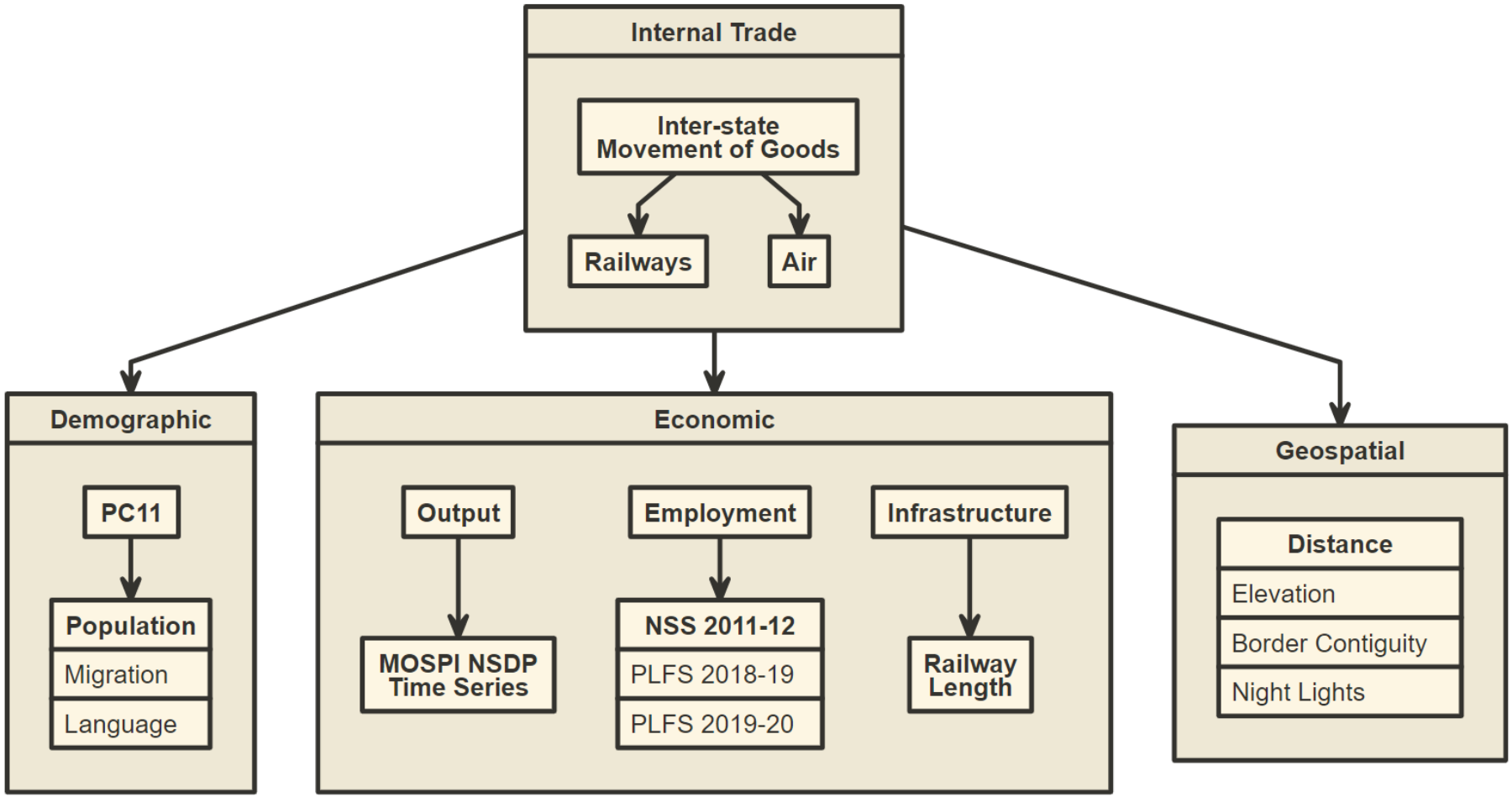
Context: Rising Trade within India

- India handles $\sim$4.6 billion tonnes of goods each year $\longrightarrow$ total value of 950k cr.
- Policy push to improve logistics performance:
  - Development of Dedicated Freight Corridor
  - Build-out of road infrastructure projects $\longrightarrow$ Bharatmala, national highway expansion
  - Capacity augmentation of waterways: Sagar Mala, Jal Vikas Marg Project

Preview of Findings

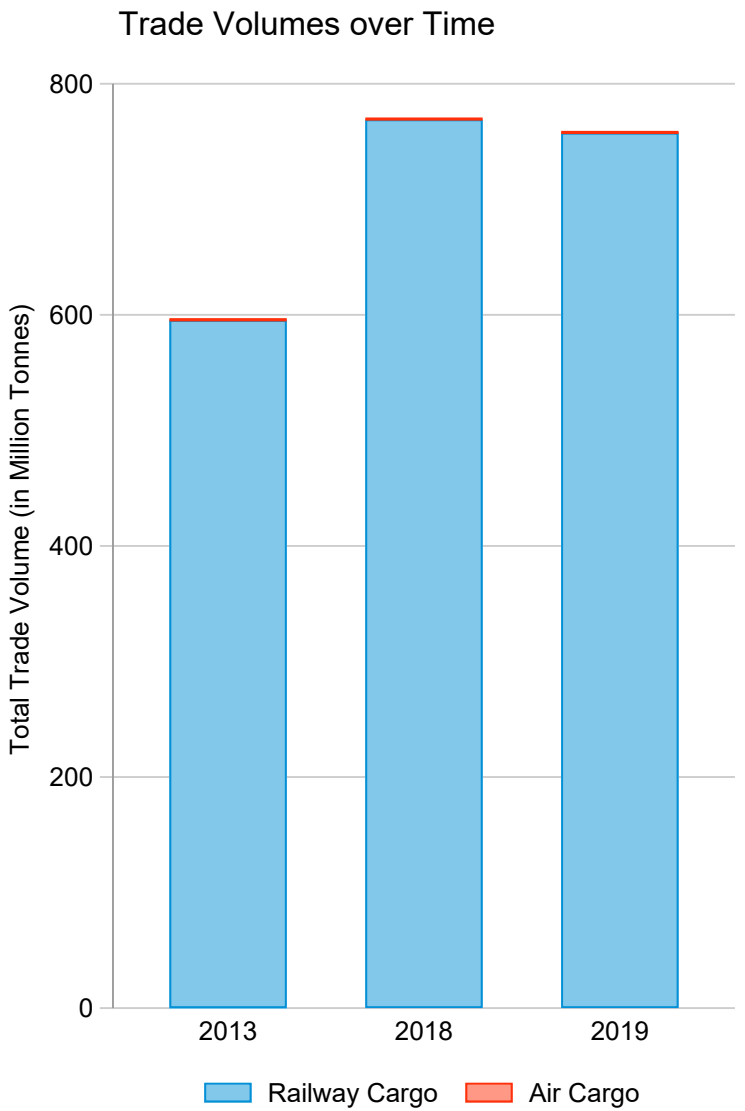
- Internal trade within India's borders is becoming **spatially concentrated** $\longrightarrow$ fewer states are trading more
- Product basket also becoming concentrated over time: Bilateral trade flows dominated by few commodities
- **Product concentration matters**: Key determinant of how much states trade with each other

Data


Internal Trade
Inter-state Movement of Goods
Railways
Air
Demographic
PC11
Population
Migration
Language
Economic
Output
MOSPI NSDP Time Series
Employment
NSS 2011-12
PLFS 2018-19
PLFS 2019-20
Infrastructure
Railway Length
Geospatial
Distance
Elevation
Border Contiguity
Night Lights

Overall Trends

- Railway $\longrightarrow$ dominant mode of transport
- Total trade volume: 600M tonnes in 2013-14, 770M tonnes in 2018-19 (28.3% increase in 5 years)
- 760M tonnes in 2019-20 (1.3% decline in 1 year)



Flow of Goods by Railways and Air

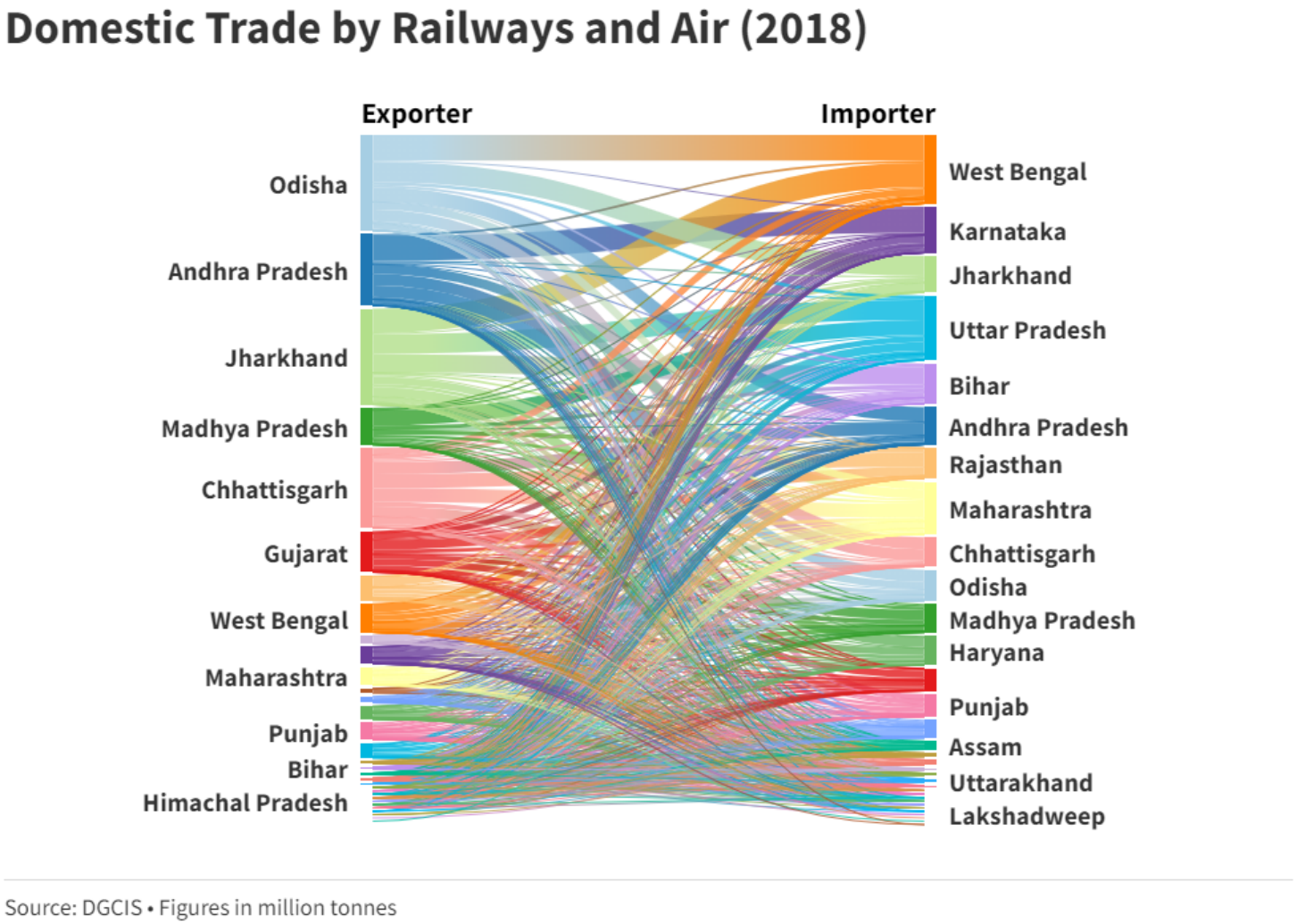
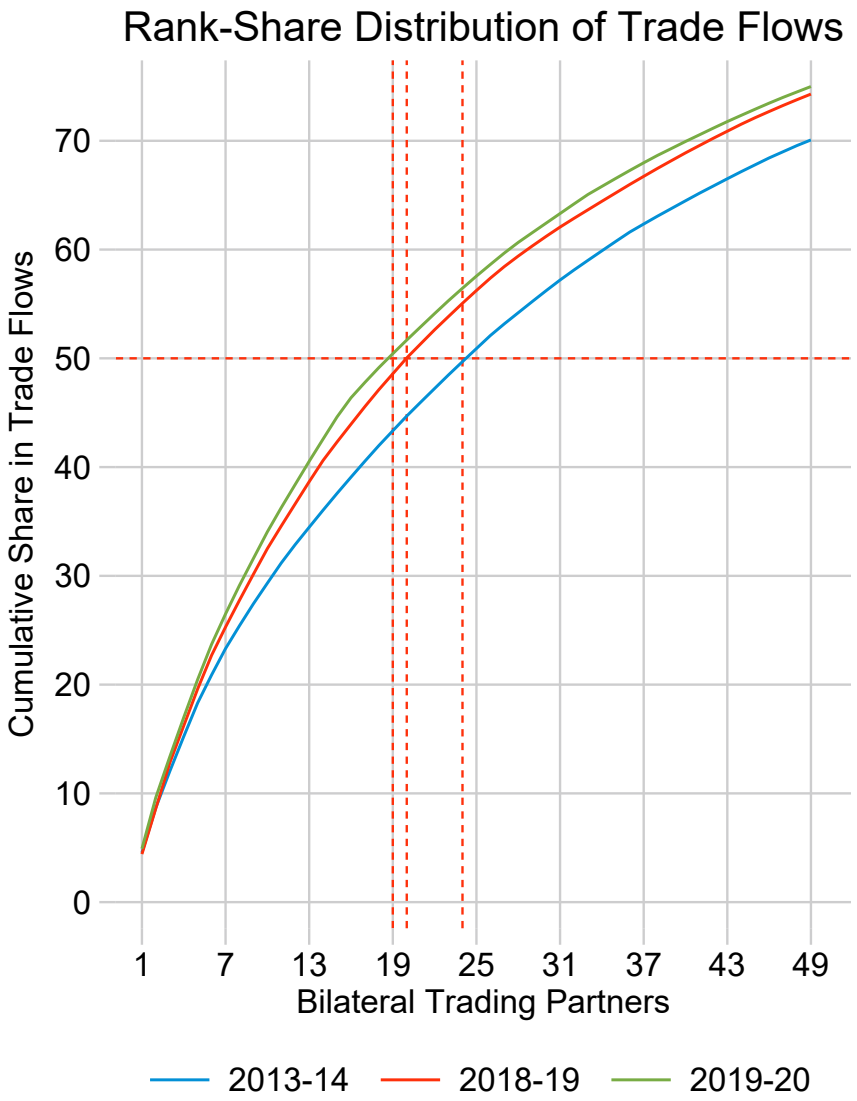


Figure: Sankey diagram depicting flow of goods by Railways and Air in 2018

Spatial Concentration



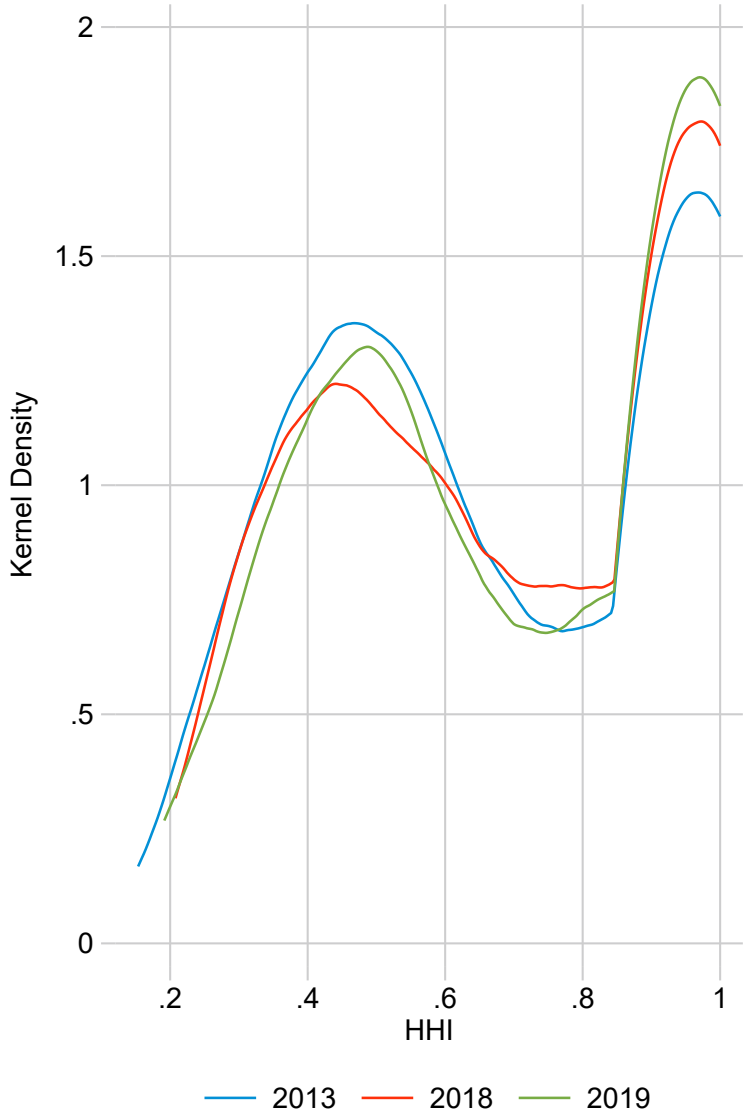
- Fewer states are trading more
- 2013: 24 trading partners accounted for 50% of all trade flows $\longrightarrow$ down to 20 partners in 2018-19; 19 in 2019-20

Product Concentration

- Measure of product concentration: **Herfindahl-Hirschman Index**

$$H_{ij} = \sum_{k=1}^{K} (s_{ij})_k^2 \in [0, 1]$$

- Leverage ITCHS codes to construct H-Index measure for each bilateral trading partner
- $\overline{H_{ij}}$ in 2013: 0.24; $\overline{H_{ij}}$ in 2018: 0.26; $\overline{H_{ij}}$ in 2019: 0.27
- Top commodities traded: **Iron ore** (OR $\longrightarrow$ WB), **Coal** (JH $\longrightarrow$ WB), **Cement** (MP $\longrightarrow$ UP)



Determinants of Trade: Gravity Model

- Structural gravity model in a partial equilibrium framework
- Consumer preferences represented by a CES utility function ((Novy (2013), Behrens et al. (2014), Arkolakis et al. (2012))

Comparison

Standard Model	Structural Model
$Y_{ij} = C\frac{X_i X_j}{t_{ij}}$	$Y_{ij} = \frac{X_i E_j}{X} \cdot \frac{1}{d_{ij}}$

where,

- Y_{ij} = trade flows from exporter state i to destination state j
- t_{ij} = trade cost term (barriers); d_{ij} = Distance between state i and j
- X_i and E_j = sizes (value of output) of state i and state j respectively

Empirical Strategy

- We augment the reduced-form gravity model with a panel structure and additional covariates

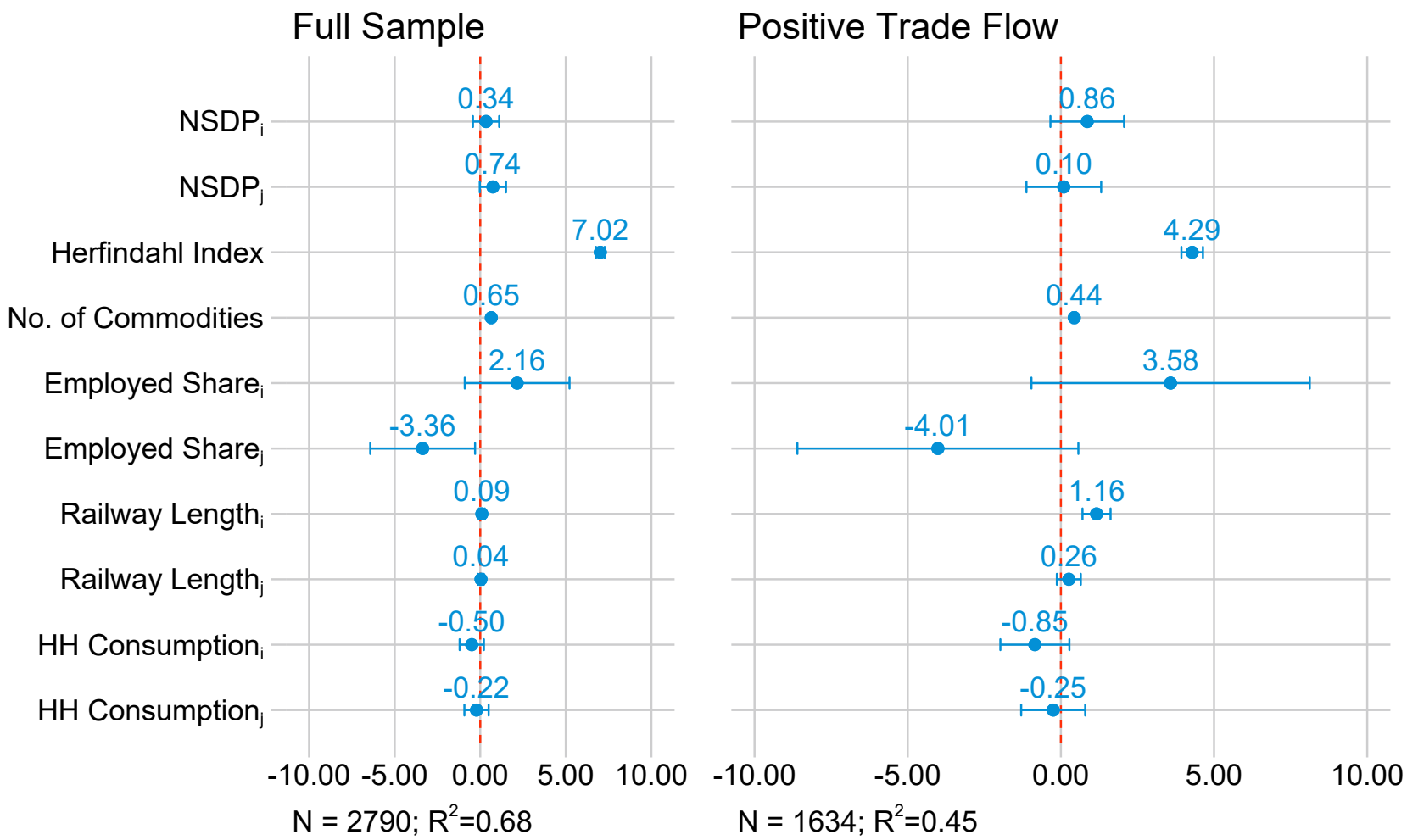
$$\underbrace{\mathbf{Y}_{ijt}}_{\substack{\text{Total trade volume} \\ \text{in year t}}} = \alpha_i + \underbrace{X_{it}\beta_1}_{\substack{\text{Output of Exporter} \\ \text{in year t}}} + \underbrace{E_{jt}\beta_2}_{\substack{\text{Output of Importer} \\ \text{in year t}}} + \underbrace{\mathbf{Z}'_{ijt}\gamma}_{\substack{\text{Time-varying} \\ \text{covariates}}} + \underbrace{\mathbf{B}'_{ij}\omega}_{\substack{\text{Time-invariant} \\ \text{covariates}}} + c_{ij} + u_{ijt}$$

- To account for **zero-trade flows**: Inverse Hyperbolic Sine Transformation (Bellamare (2020))

$$\tilde{x} = \sinh^{-1}(x) = \ln\left(x + \sqrt{x^2 + 1}\right) \tag{1}$$

- **Model Selection**:
  - Breusch-Pagan LM Test: $P > \chi^2 = 0 \longrightarrow$ RE > POLS ▸ RE / POLS result
  - Durbin-Wu-Hausman Test: $P > \chi^2 = 0 \longrightarrow$ FE > RE (> POLS)
  - Use **Fixed Effects estimator** to estimate parameters of the gravity model

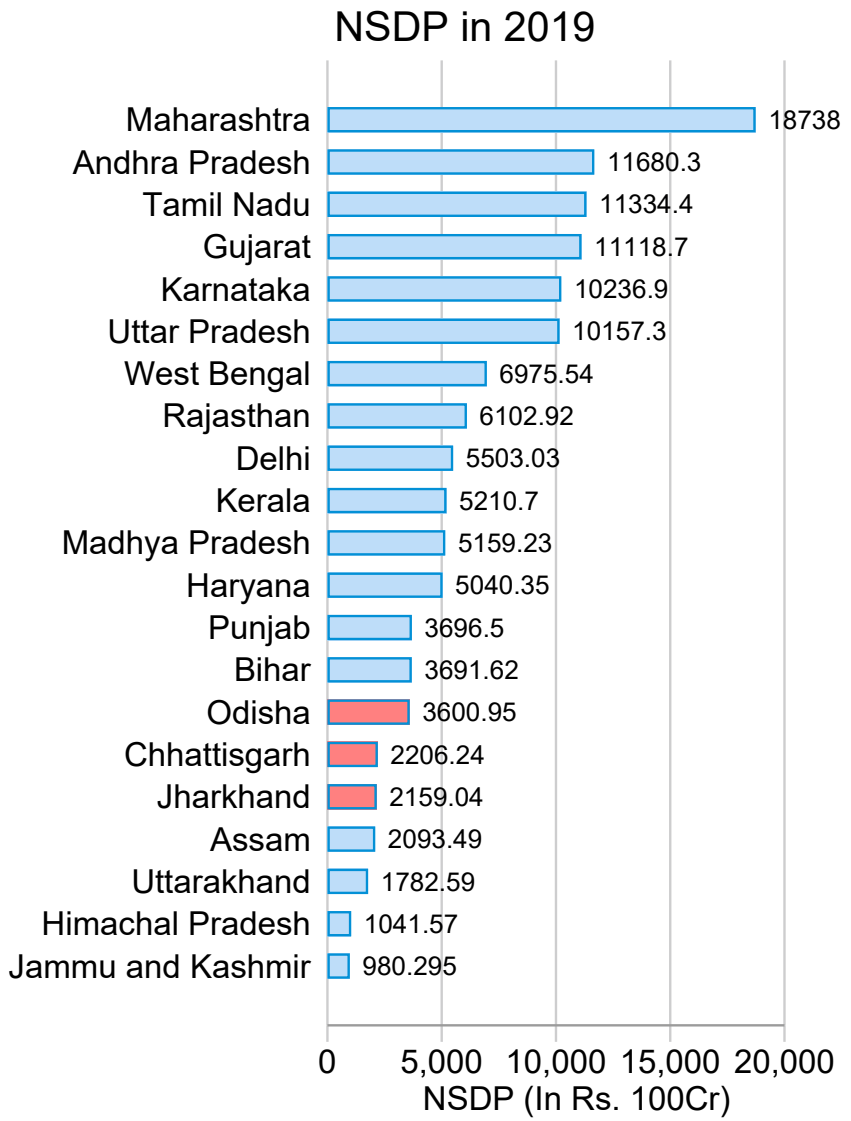
Results: Fixed Effects Estimation



All values (except total commodities) are IHS transformed

Mechanism: Resource Curse

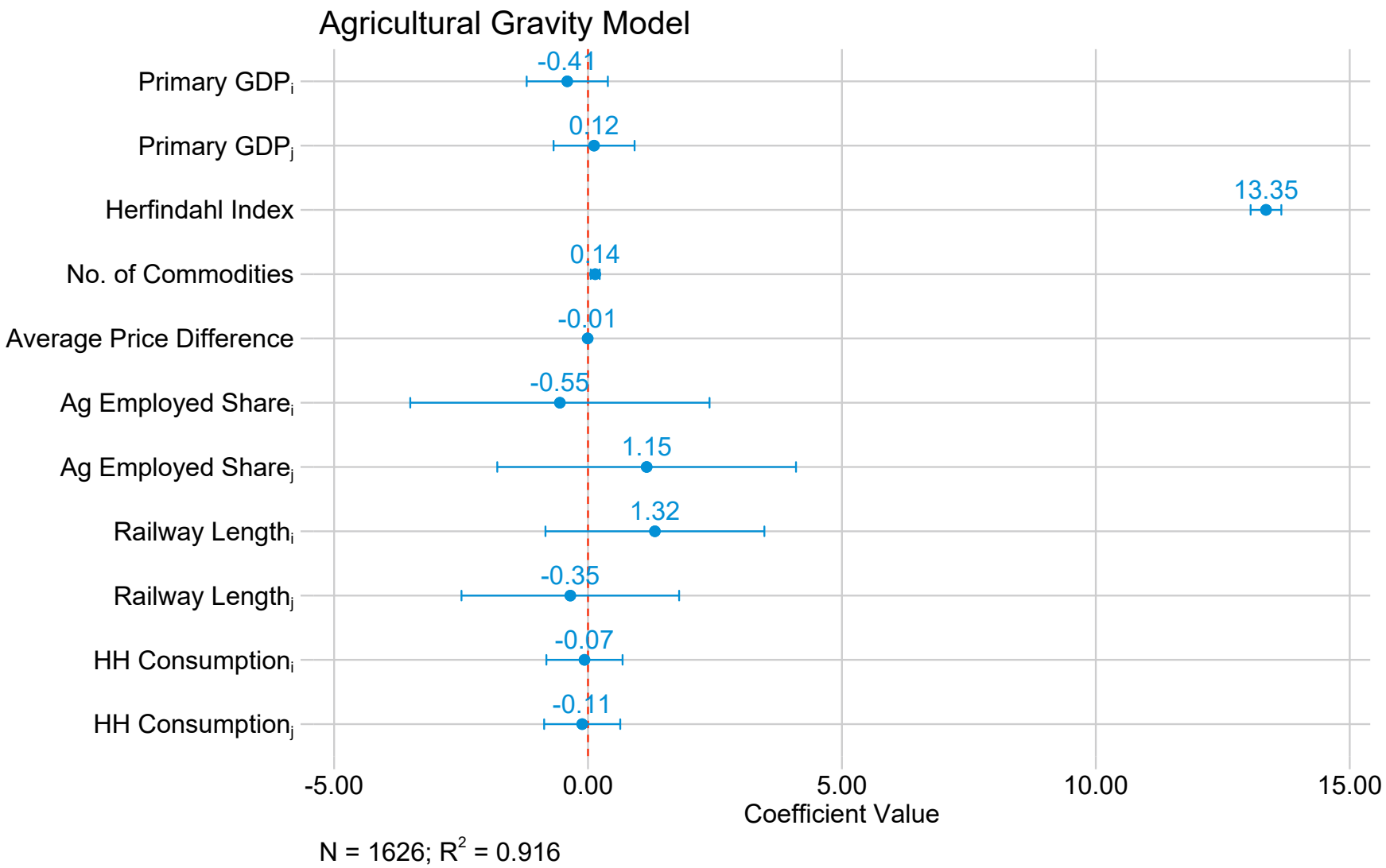
- States that trade more by railways and air (CH, OR, JH) are not economically prosperous
- States rich in resources end up worse off economically (Dhillon (2016))
- Any gains from internal trade don't translate into economic growth



From Volumes to Values: Agricultural Gravity Model

- Previous model only accounted for **volume**, not **value** of goods traded
- Agricultural goods:
  - Identifiable by ITCHS codes
  - Agricultural Price data: AgMarkNet database (agmarknet.gov.in)
  - Manually map ITCHS codes to AgMarkNet products
- Construct price difference measure a la Leemput (2021): average out daily modal prices, winsorize at 99th percentile; again average at year-level to get commodity prices

Results: FE Agricultural Gravity Model



Potential Explanations

- **Efficiency gains from infrastructural development**: Increased productivity $\longrightarrow$ firms prioritize production of goods in which they are most efficient (Abeberese and Chen (2021))
- **Quality hypothesis**: States that specialize in the production of certain goods tend to export a higher average quality of the good (Alcala (2014)) $\longrightarrow$ higher demand
- **Measurement Error**: Non-bulk goods are increasingly transported by roads due to lower trade costs
- **Declining trade barriers**: Lower bureaucratic complexity, harmonized rates under IGST

Policy Recommendations

- Need for **inclusionary internal trade policy**: integrate remote geographies in internal trade
- Bigger push to transportation infrastructural development: Potential for increased efficiency gains and product specialization
- Improvements in **data ecosystem**:
  - Trade flow data for roads: E-Way Bills
  - Spatially and temporally disaggregated data: **Trade is a highly local phenomenon**

Thank you! Questions?

Results: Pooled OLS v/s Random Effects

Empirical Strategy