Australian National University

Long-Run Estimates of Interfuel and Interfactor Elasticities of Substitution

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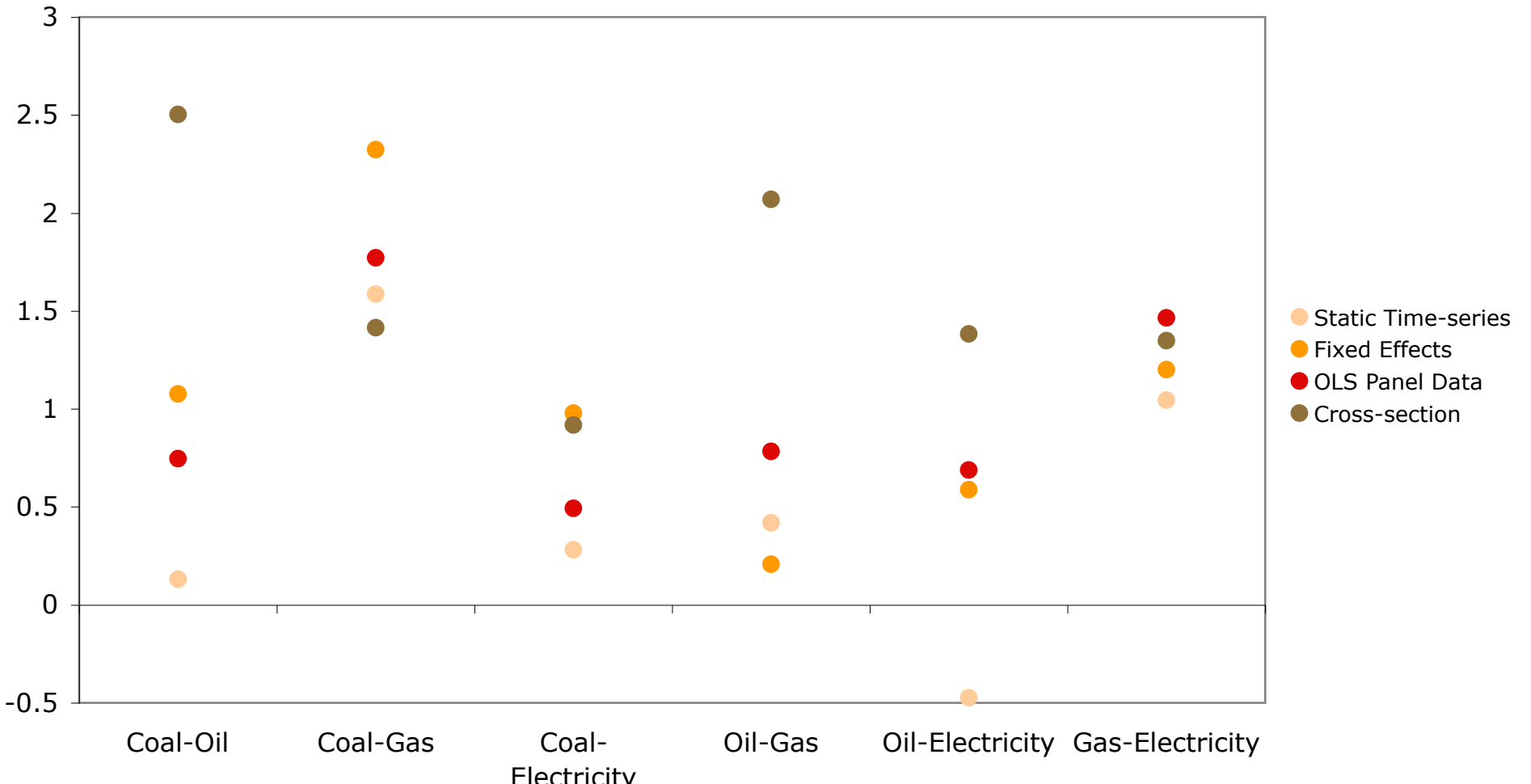
Estimating Long-Run Elasticities

- Meta-analysis shows estimates are sensitive to data type and estimator

Stern (2012) Meta-analysis: Elasticities of Substitution



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Estimating Long-Run Elasticities

- Meta-analysis shows estimates are sensitive to data type and estimator
- Time series: tends to converge to short-run effects
- Fixed effects: Ignores between variation, converges to short-run effect, measurement error potential problem

Estimating Long-Run Elasticities

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- Econometric theory: Between estimator is robust, consistent estimator of long-run coefficients
- Between estimator: Correlation with omitted variables potential problem
- Chirinko *et al*. (2011): IDE focuses on long-run, reduces other problems

What We Do

- Estimate interfuel and interfactor translog cost function systems
- Use between and IDE estimators
- Use Chinese provincial data
- Compute own- and cross-price elasticities and elasticities of substitution

Translog Cost Function System

$$\ln C_{it} = \beta_0 + \ln D_{it} + f_t + \sum_{j=1}^{J} \beta_j \ln P_{jit}$$

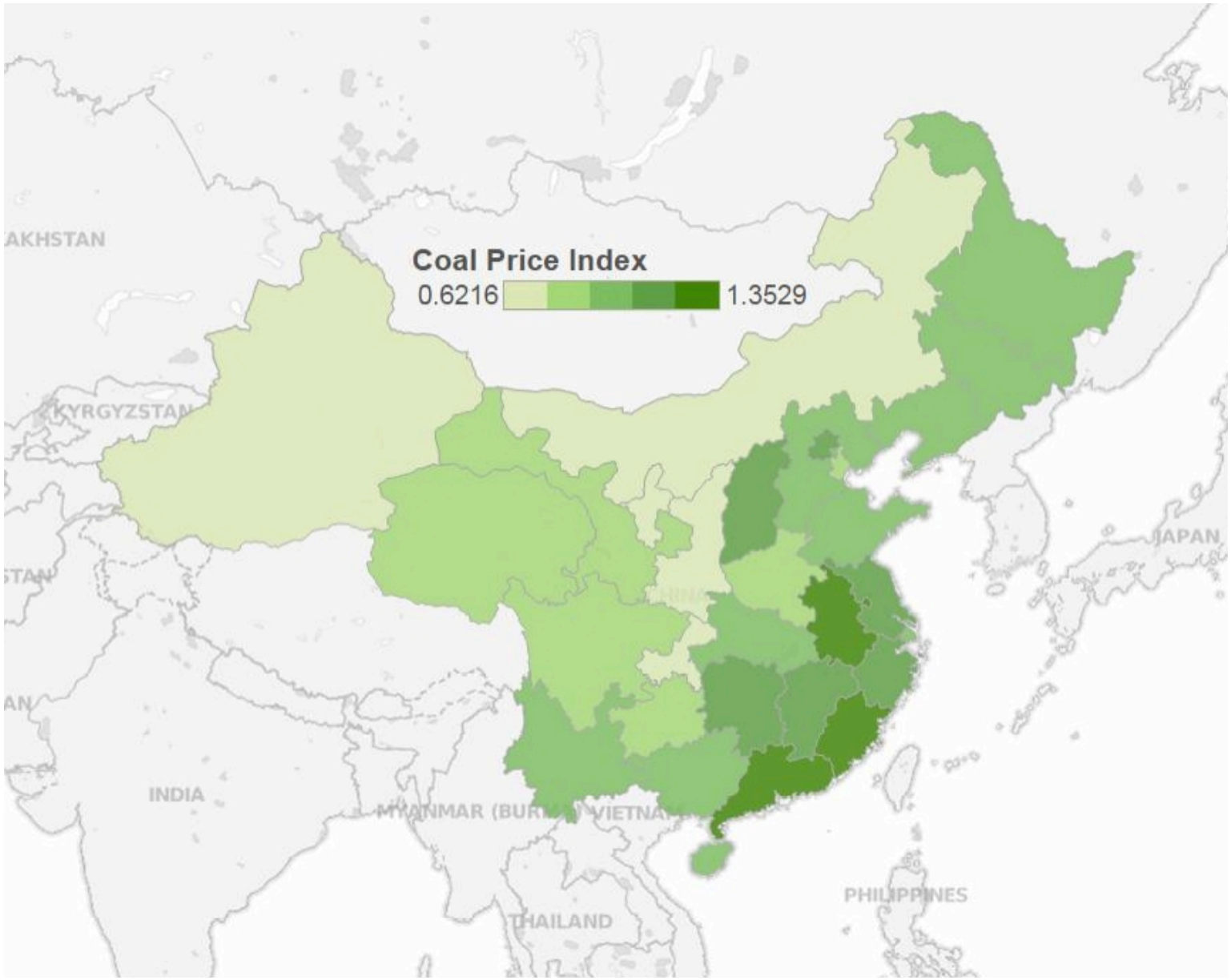
$$+0.5 \sum_{j=1}^{J} \sum_{k=1}^{J} \beta_{jk} \ln P_{jit} \ln P_{kit} + \sum_{j=1}^{J} \gamma_j t \ln P_{jit} + \varepsilon_{it}$$

$$S_{jit} = \beta_j + \sum_{k=1}^{J} \beta_{jk} \ln P_{kit} + \gamma_j t + \varepsilon_{jit}$$

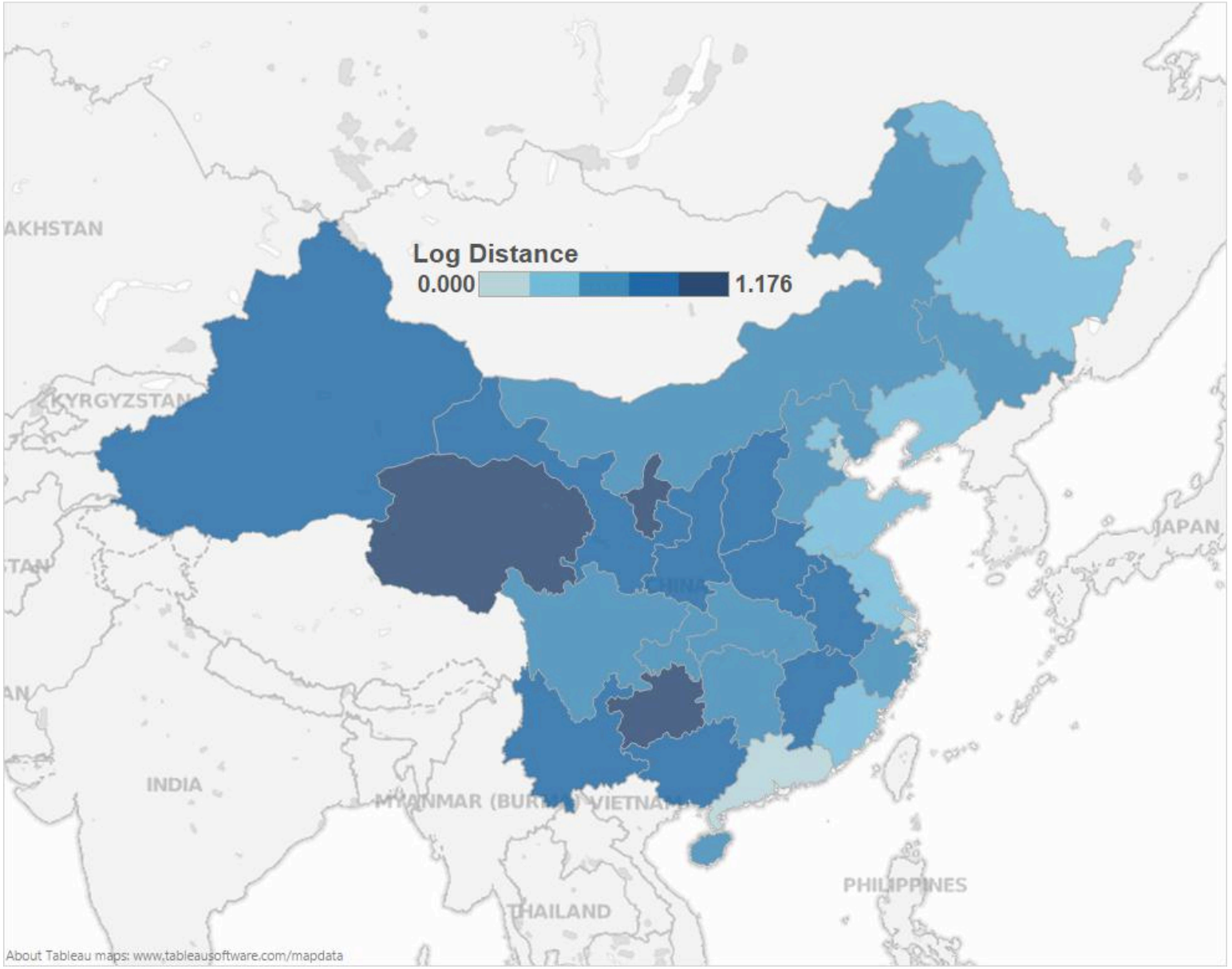
China Data

- 30 provinces, 2000-2010
- 8 fuels (4 coal, gasoline, diesel, coal, electricity)
- 3 factors (energy, capital, labor)
- Compute coal and energy price indices
- Compute provincial distance and national TFP indices

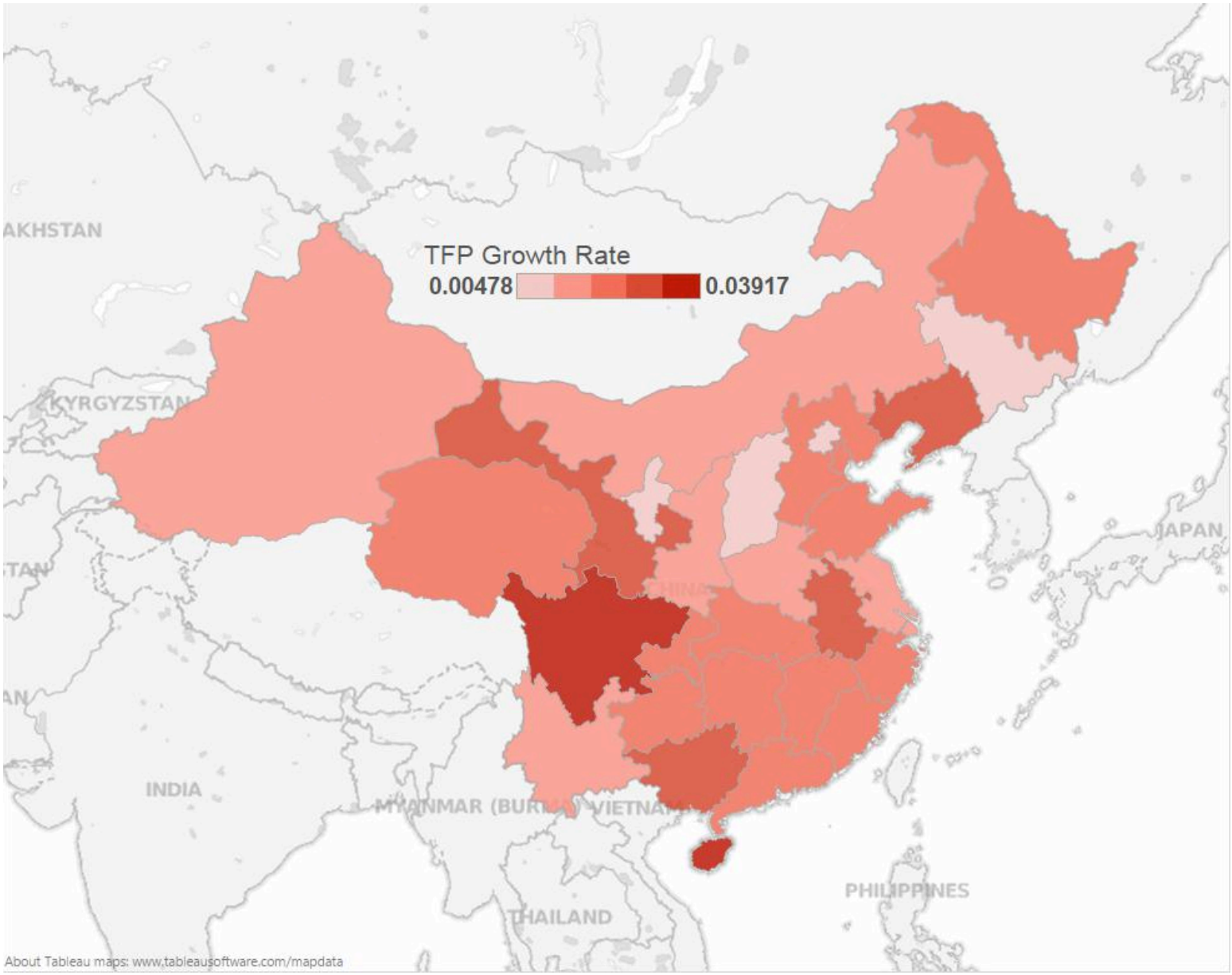
Laspeyres Coal Price Index 2010

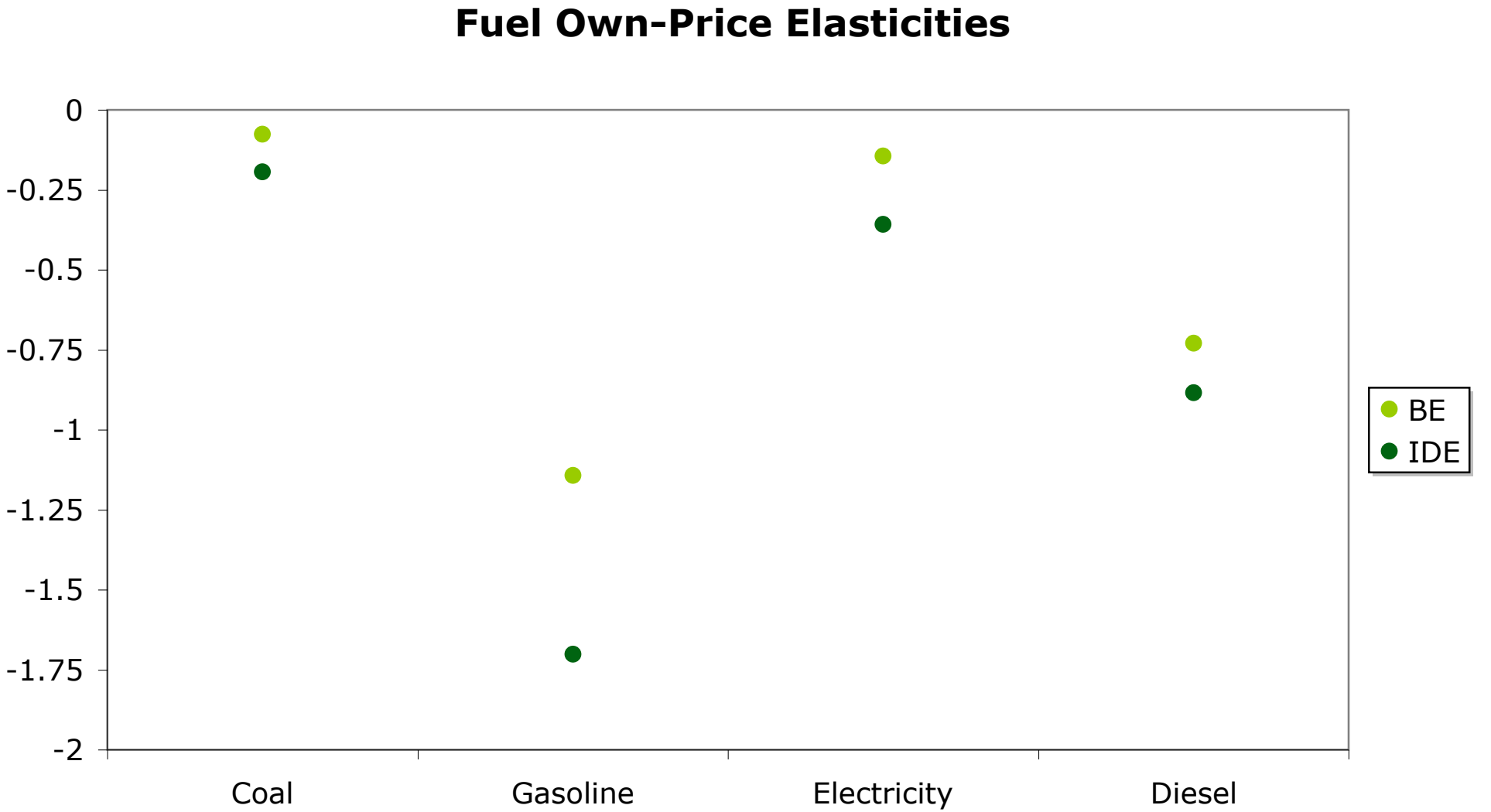


Log Distance from the Frontier 2010

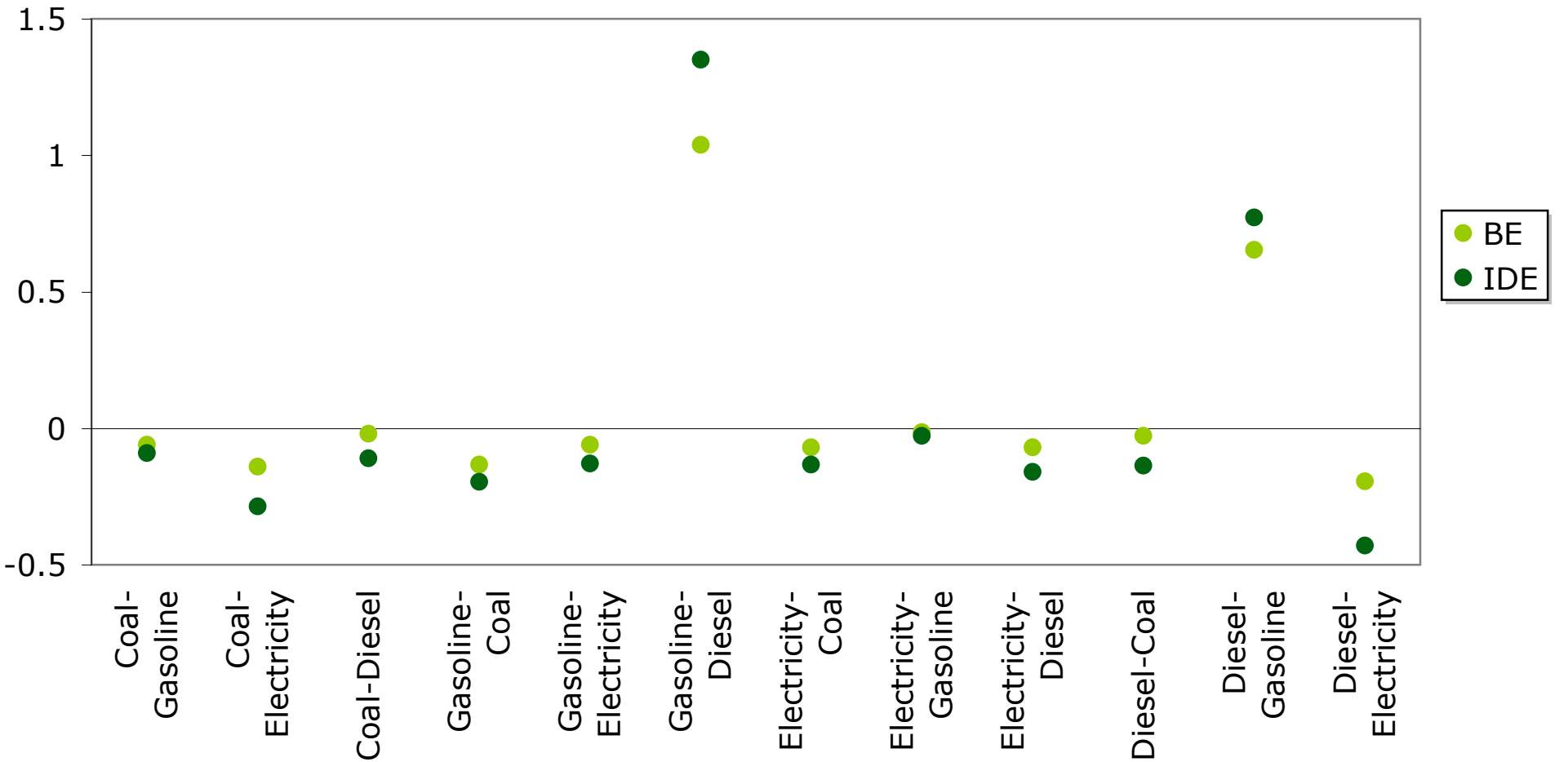


Growth Rate of TFP 2000-2010

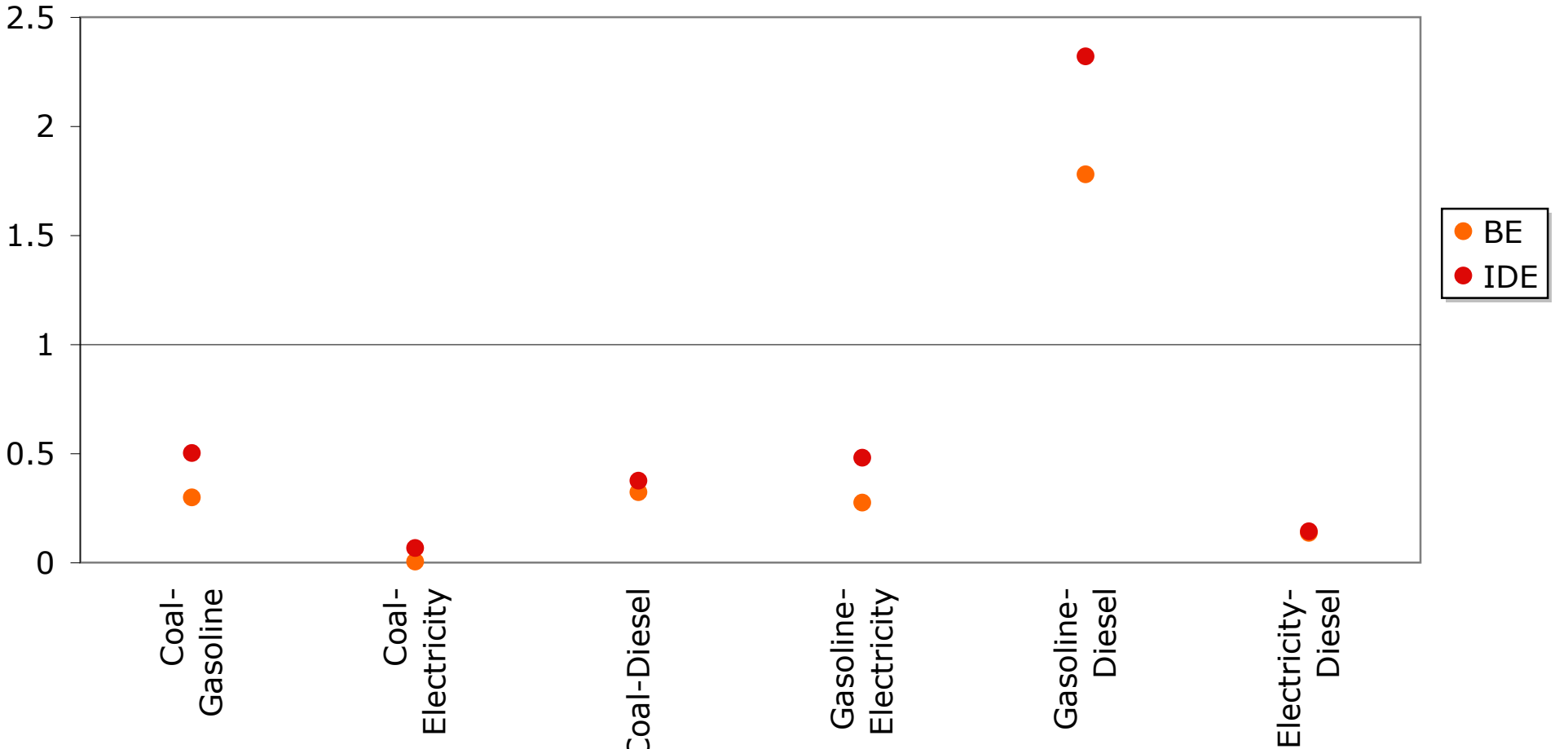



Fuel Own-Price Elasticities
0
-0.25
-0.5
-0.75
-1
-1.25
-1.5
-1.75
-2
Coal
Gasoline
Electricity
Diesel
BE
IDE

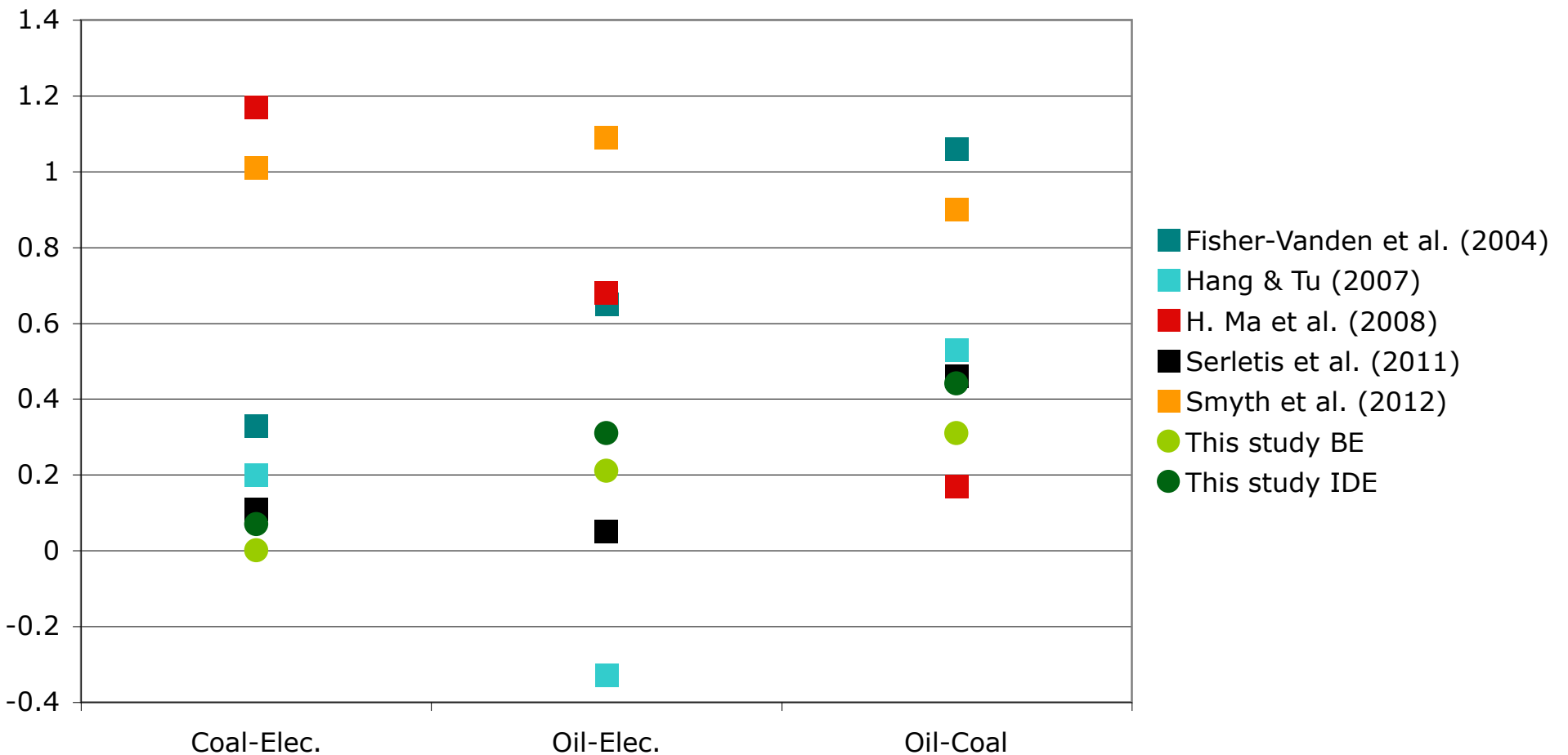
Interfuel Cross-Price Elasticities

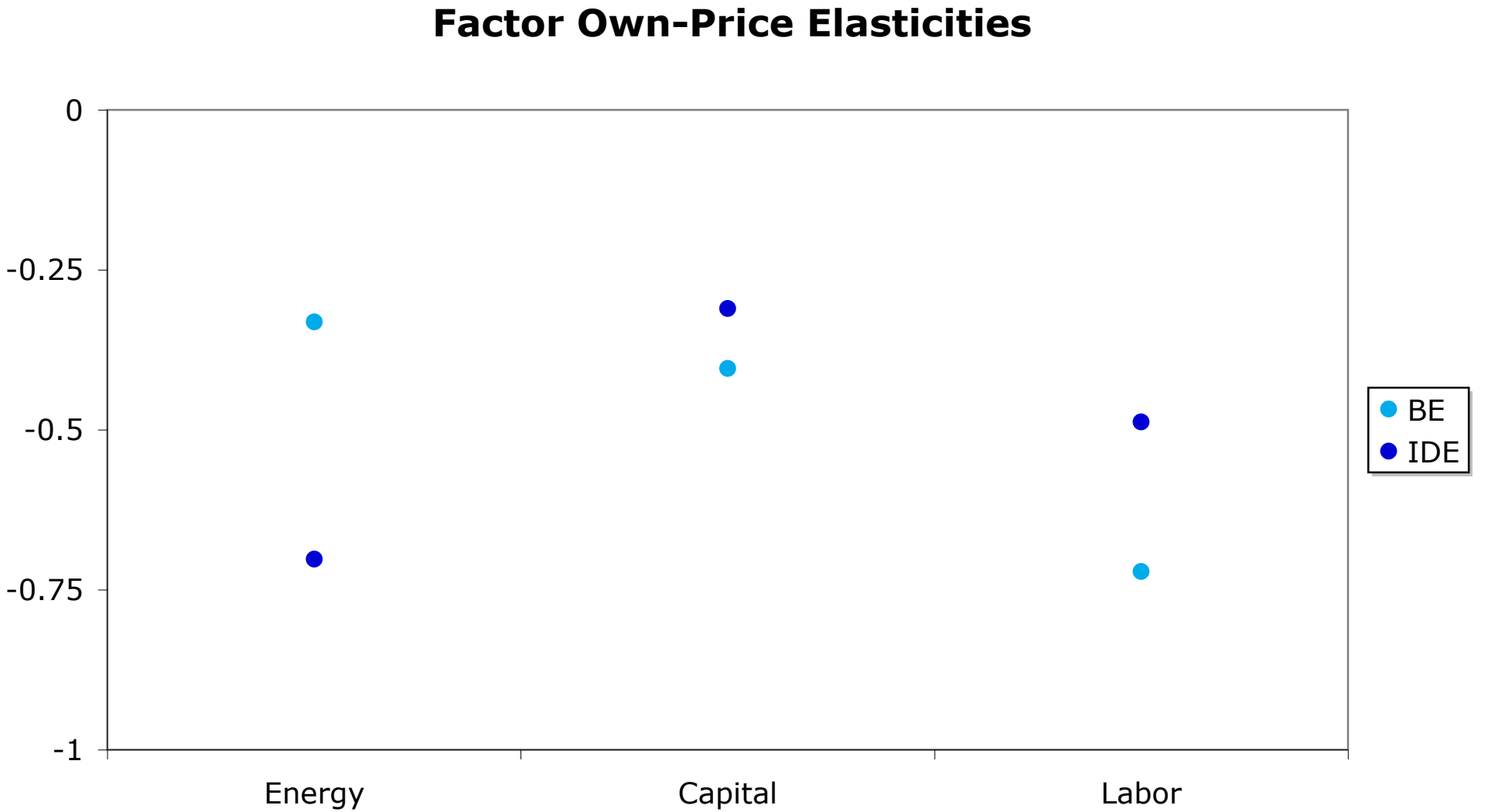


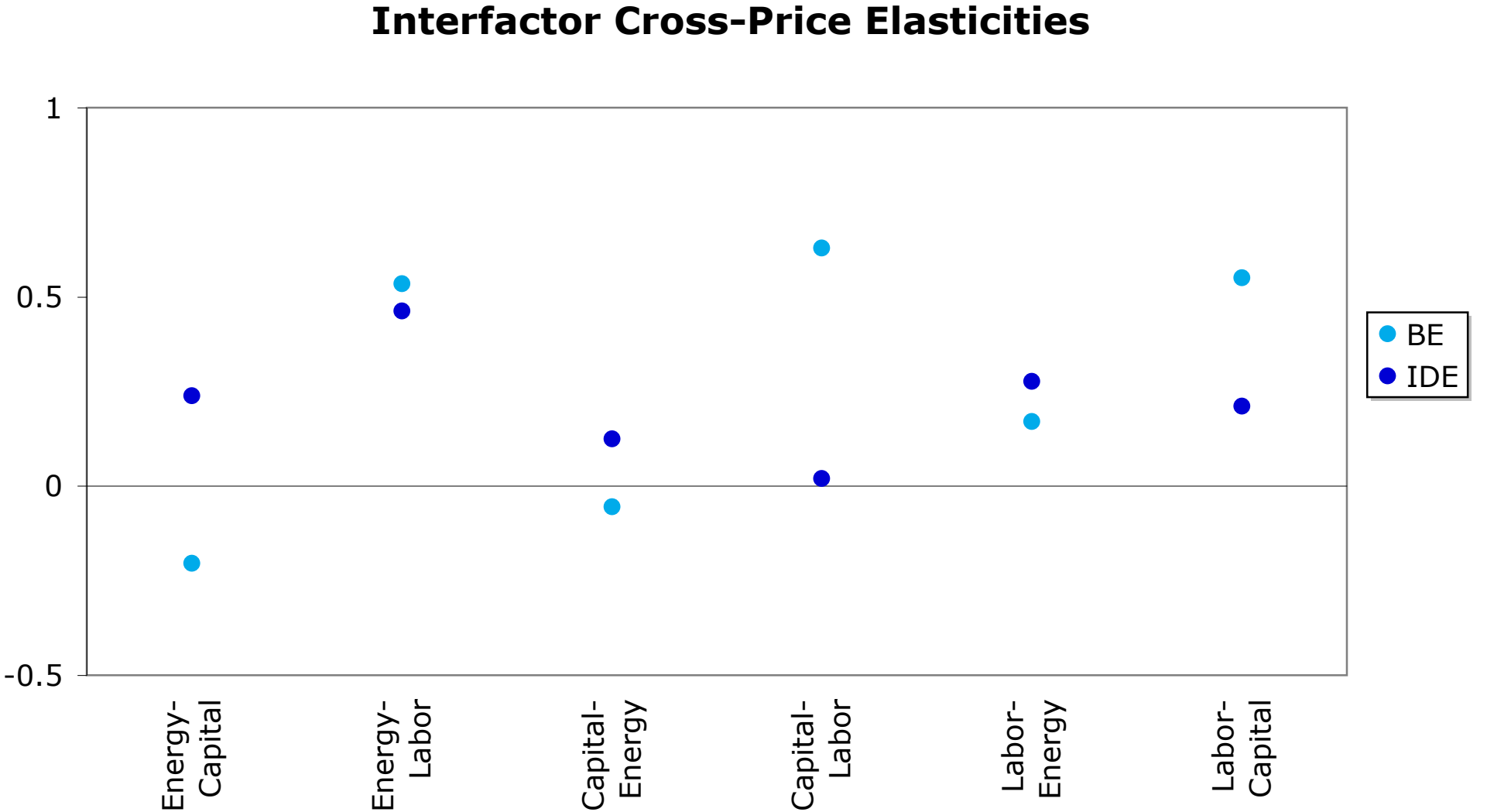
Interfuel Elasticities of Substitution



Interfuel Elasticities of Substitution: Comparison with Other Studies

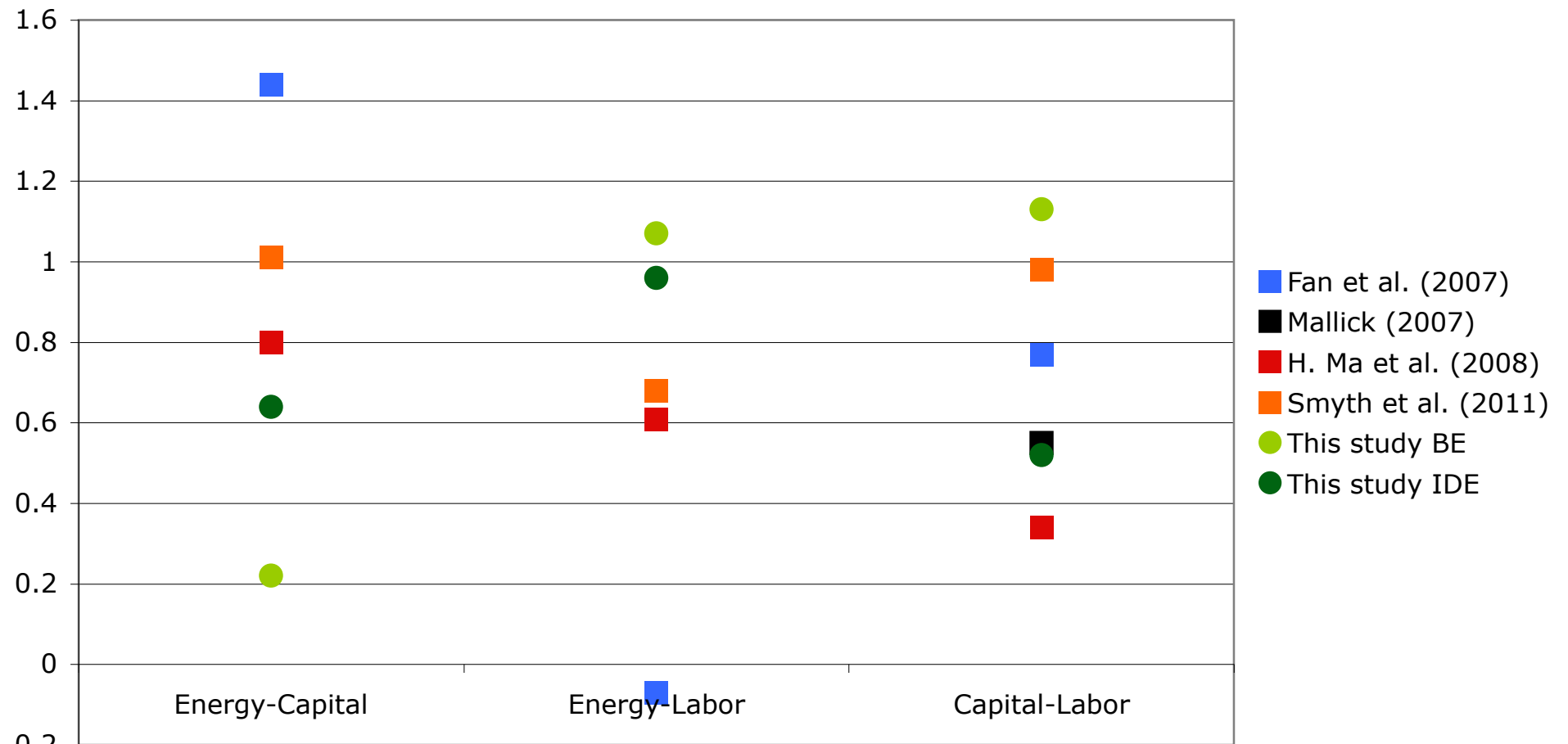



Factor Own-Price Elasticities
0
-0.25
-0.5
-0.75
-1
Energy
Capital
Labor
BE
IDE


Interfactor Cross-Price Elasticities
1
0.5
0
-0.5
Energy-Capital
Energy-Labor
Capital-Energy
Capital-Labor
Labor-Energy
Labor-Capital
BE
IDE


Interfactor Elasticities of Substitution
1.5
1
0.5
0
Energy-Capital
Energy-Labor
Capital-Labor
BE
IDE

Interfactor Elasticities of Substitution: Comparison with Other Studies



Conclusions 1

- Inelastic demand for fuels apart from gasoline. Coal -0.04 to -0.35
- Fuels are complements – gasoline and diesel are substitutes
- Particularly low elasticity of substitution between coal and electricity

Conclusions 2

- More substitutability between energy and labor than energy and capital
- Patterns match meta-analysis expectations
- IDE and BE are promising approaches

More information:

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