



Cross-country Comparisons of Energy and Emissions Intensities: Implications for China and India

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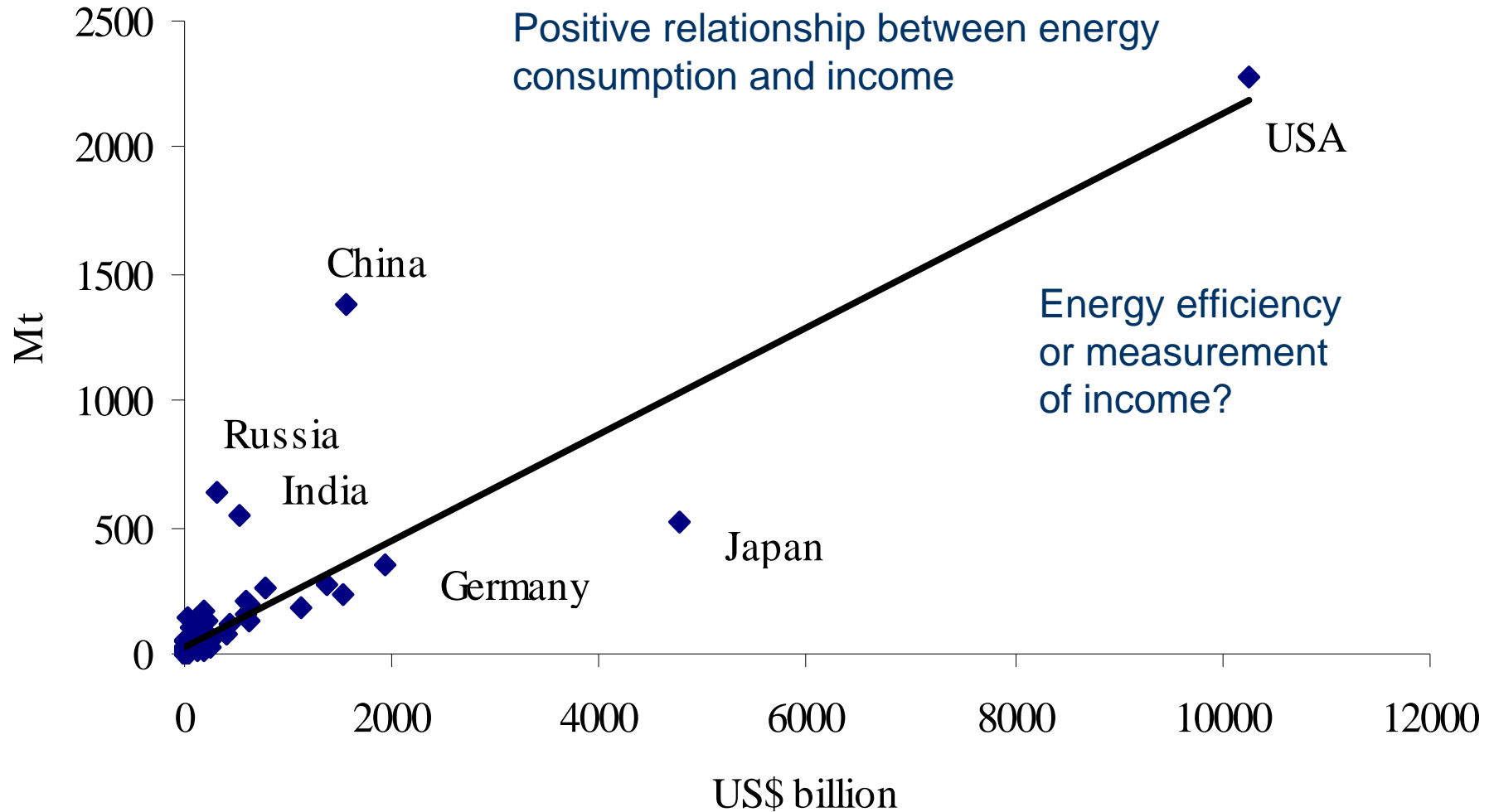
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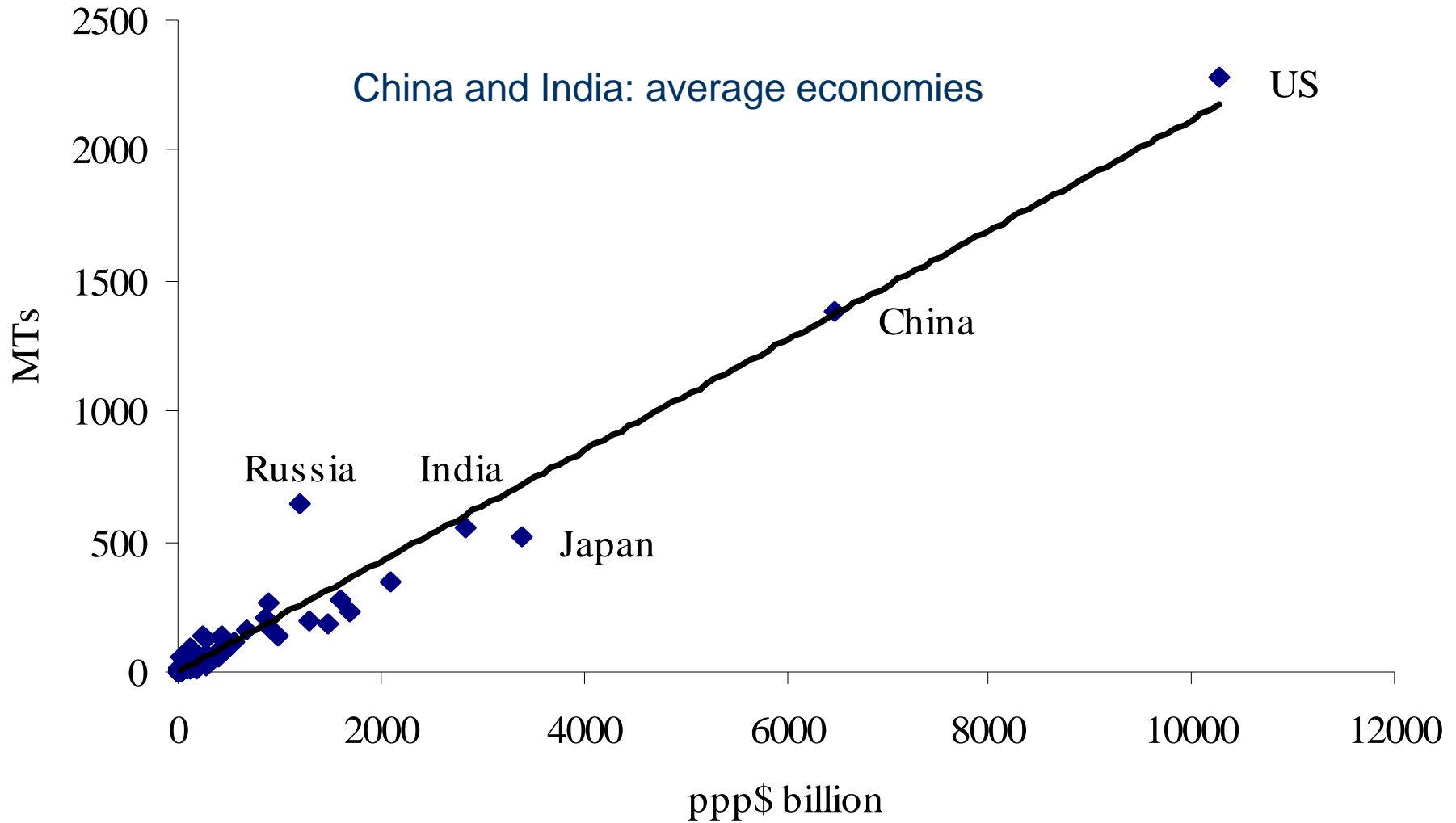


Outline of Presentation

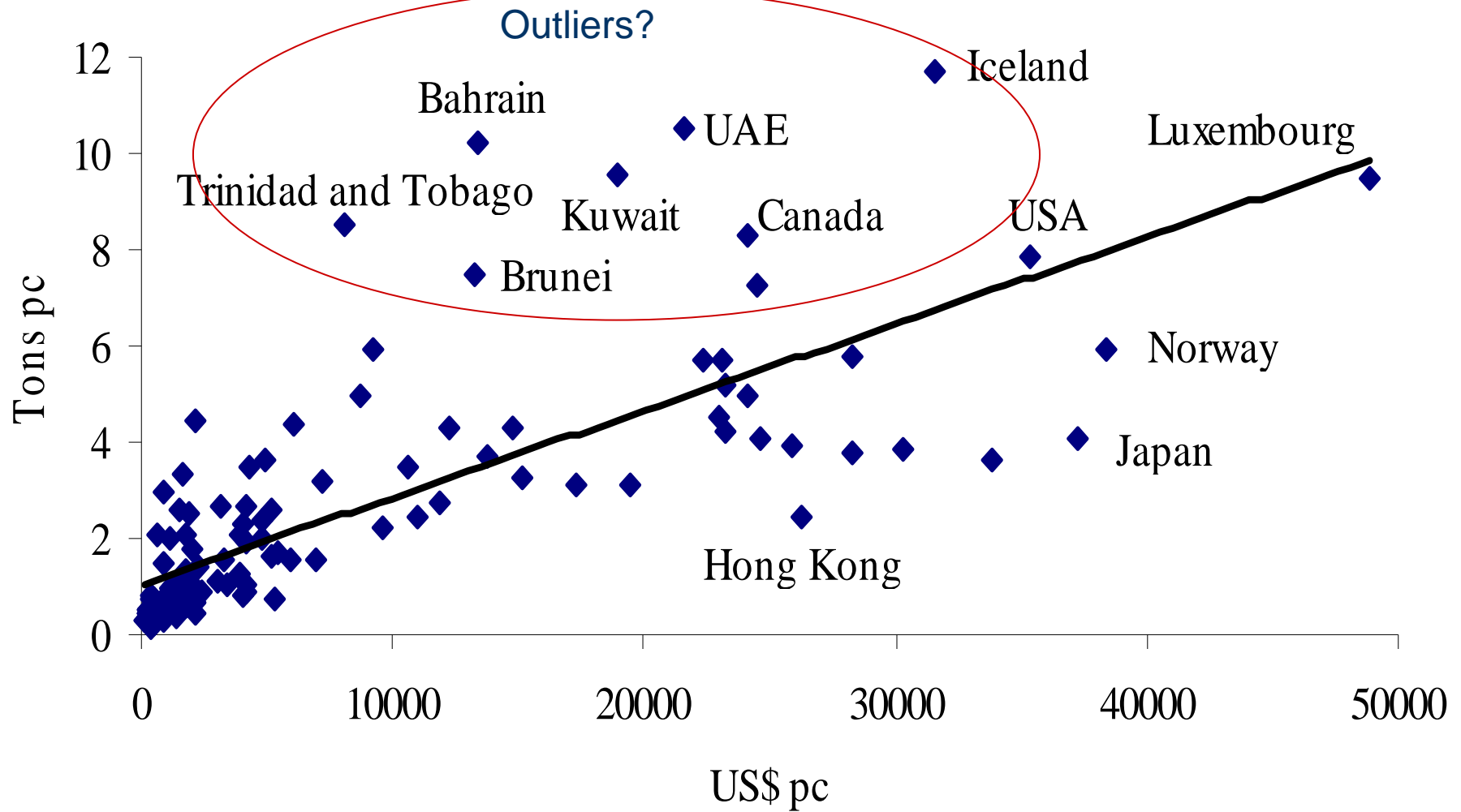
- Cross-country comparison of CO₂ emissions and energy consumption
- Energy and CO₂ emissions intensities
- Sources of cross-country variations
- Insights into energy consumption and CO₂ emissions in China and India



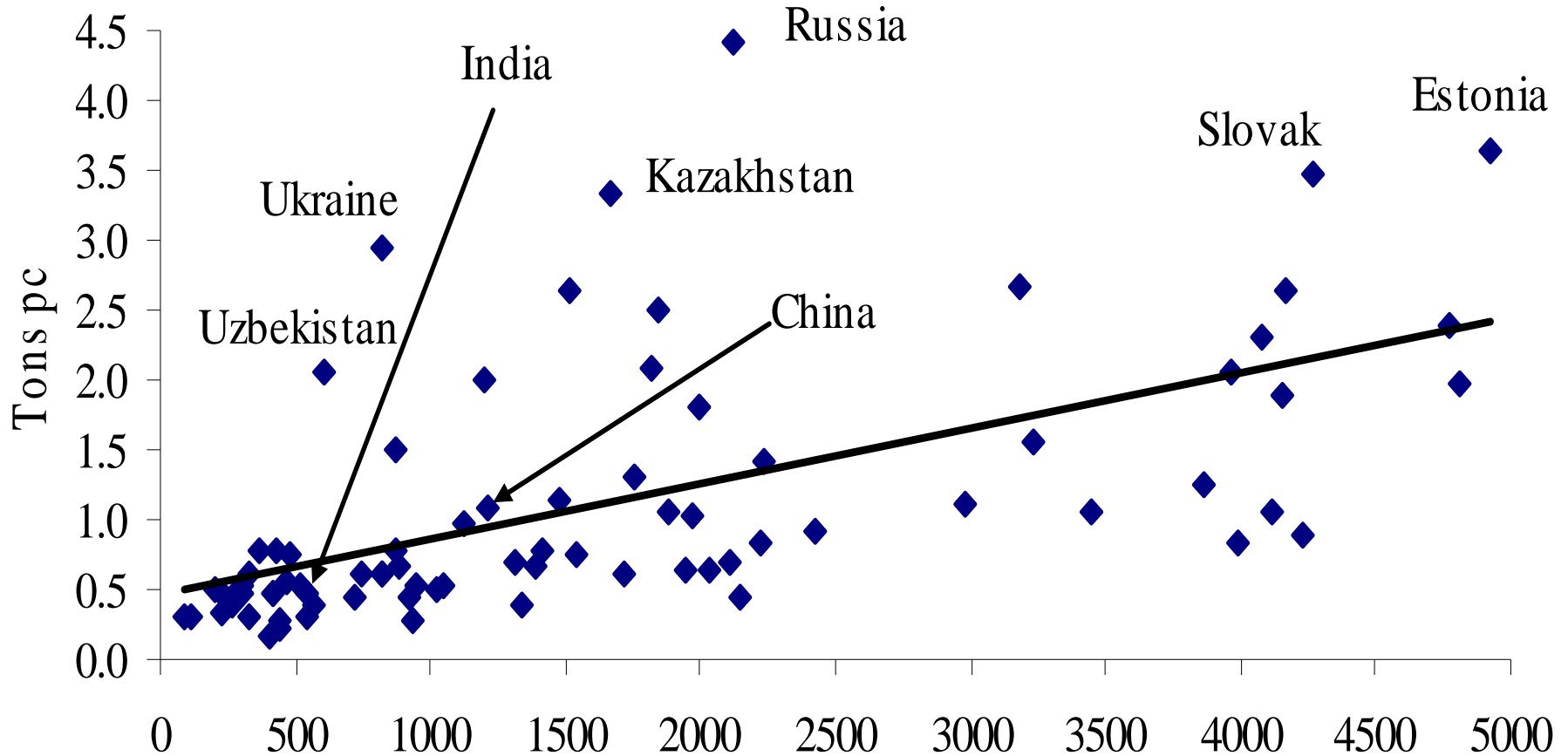
GDP and Energy Consumption in Selected Economies, 2003



Energy Consumption and GDP in 2003

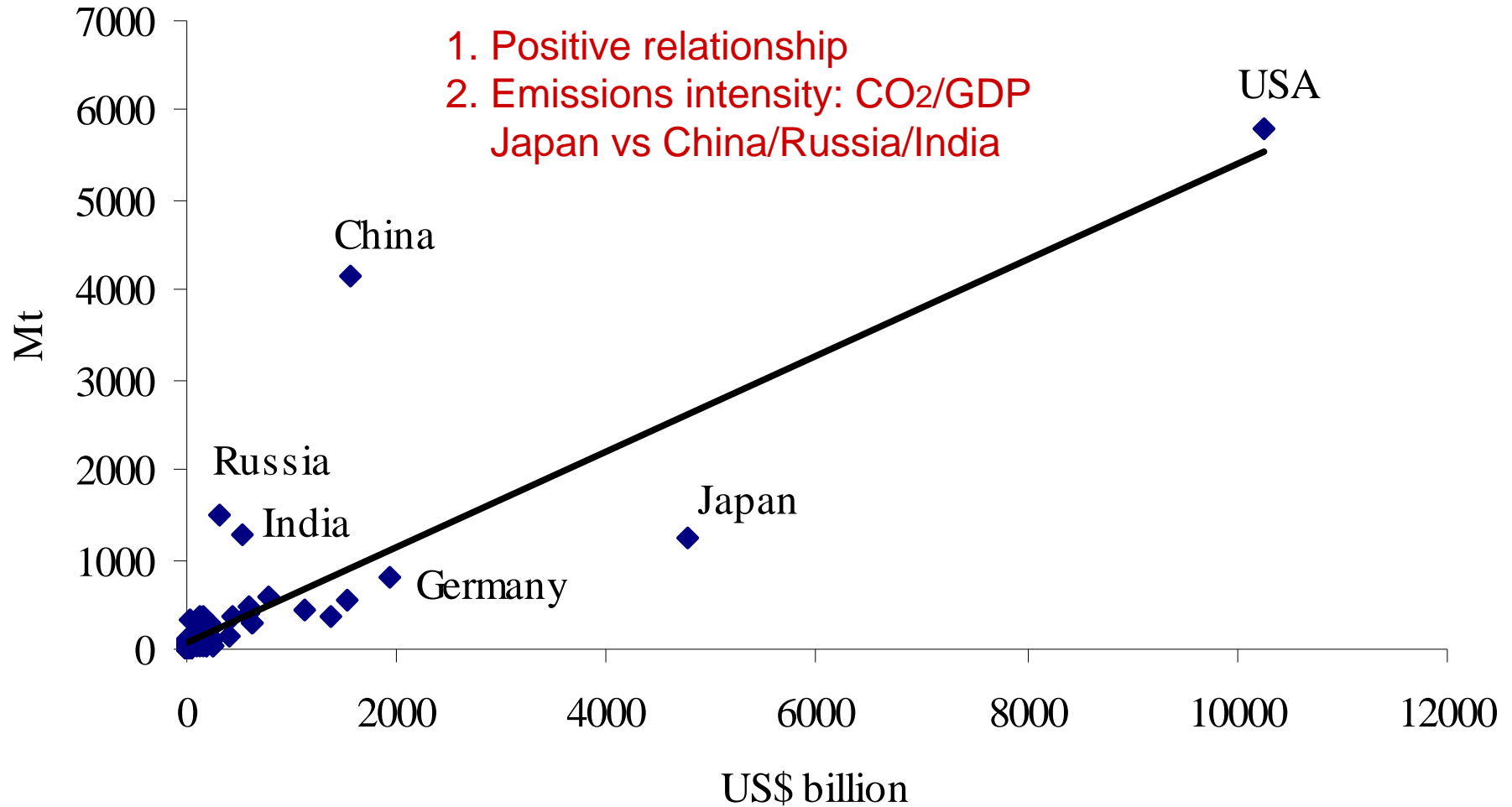


Energy Consumption and GDP per capita, 2003

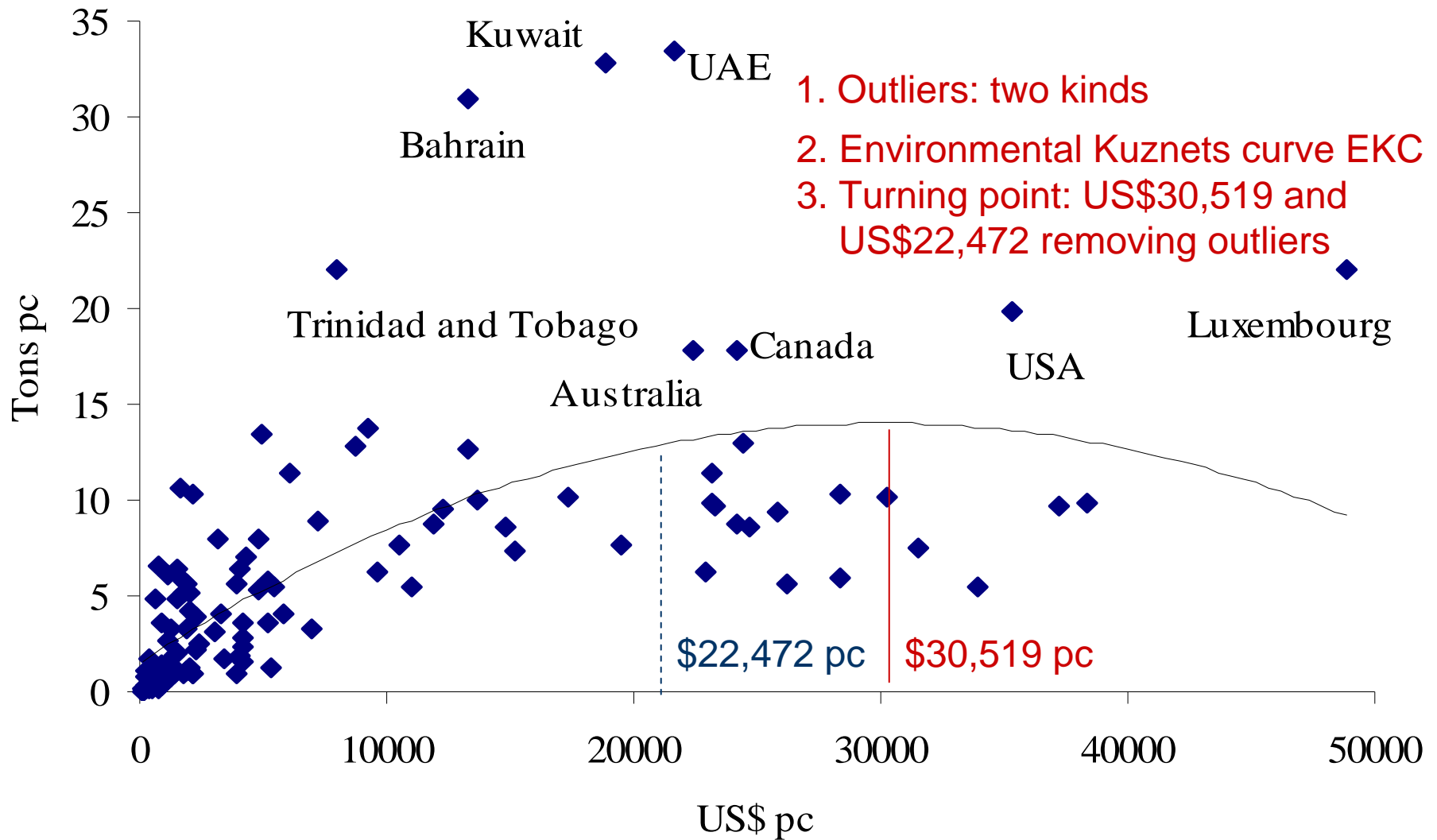


Former centrally planned economies: US\$ pc
outliers

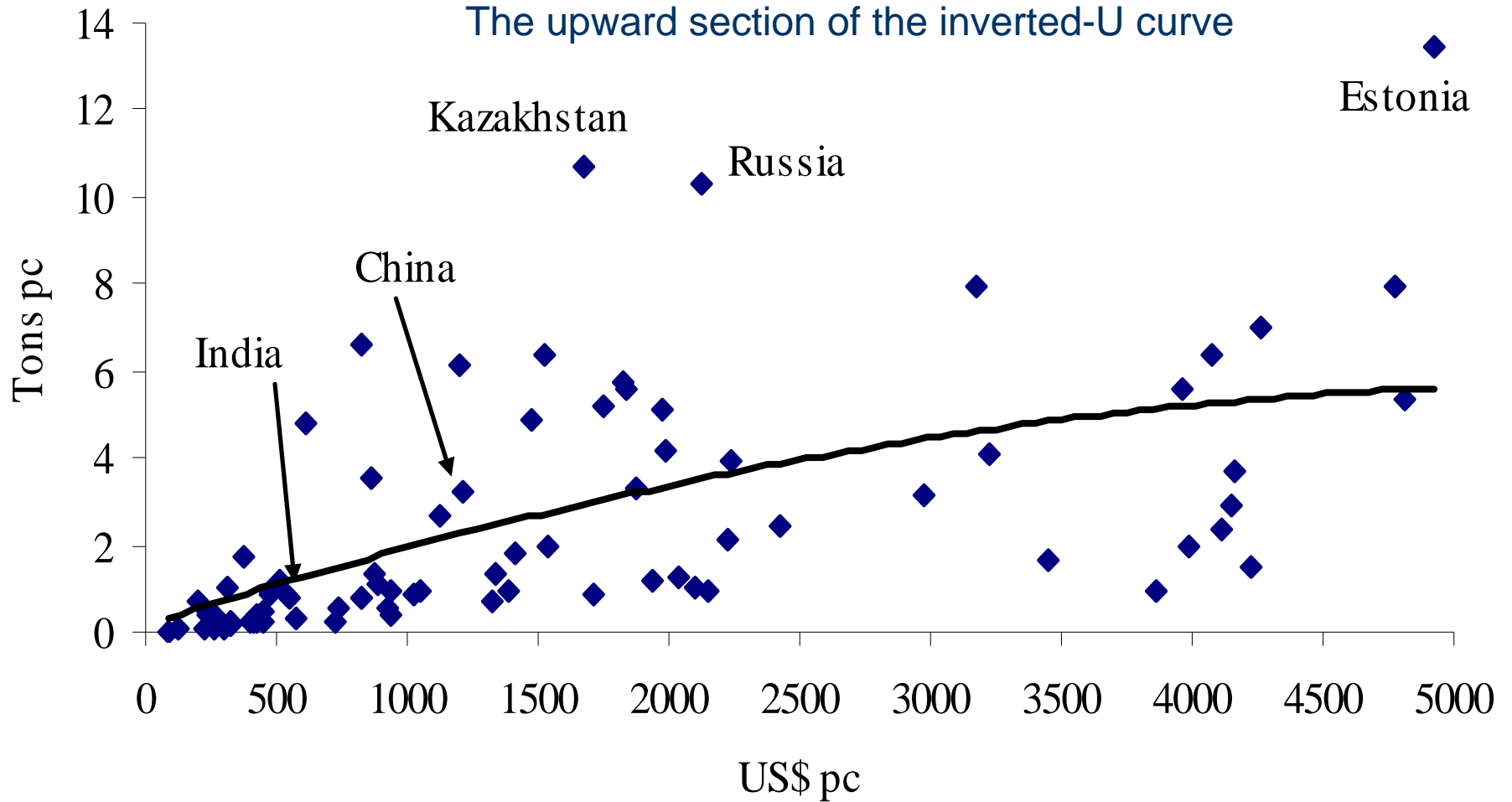
China and India: average
economies



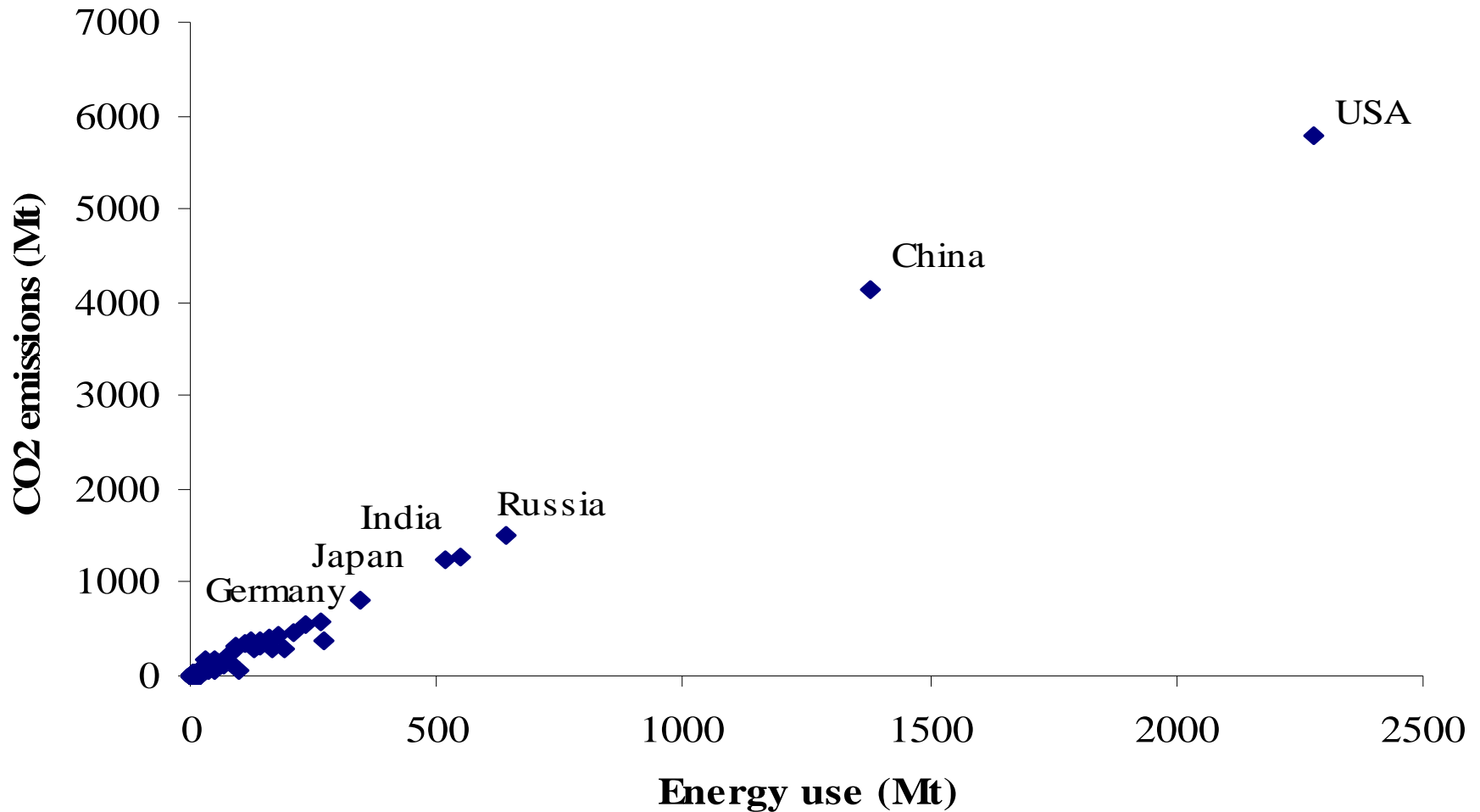
CO₂ Emissions and GDP, 2003



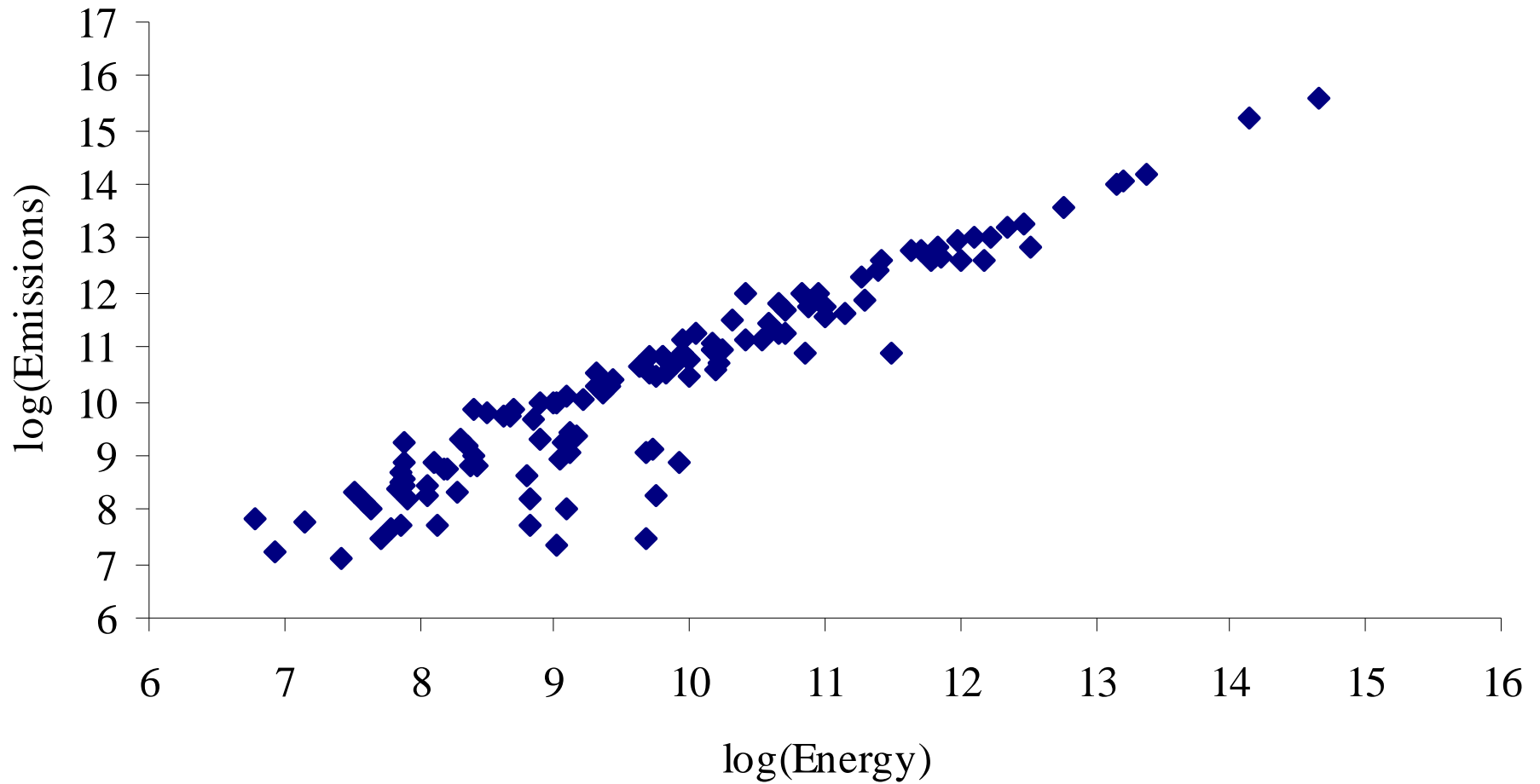
CO₂ Emissions and GDP per capita, 2003



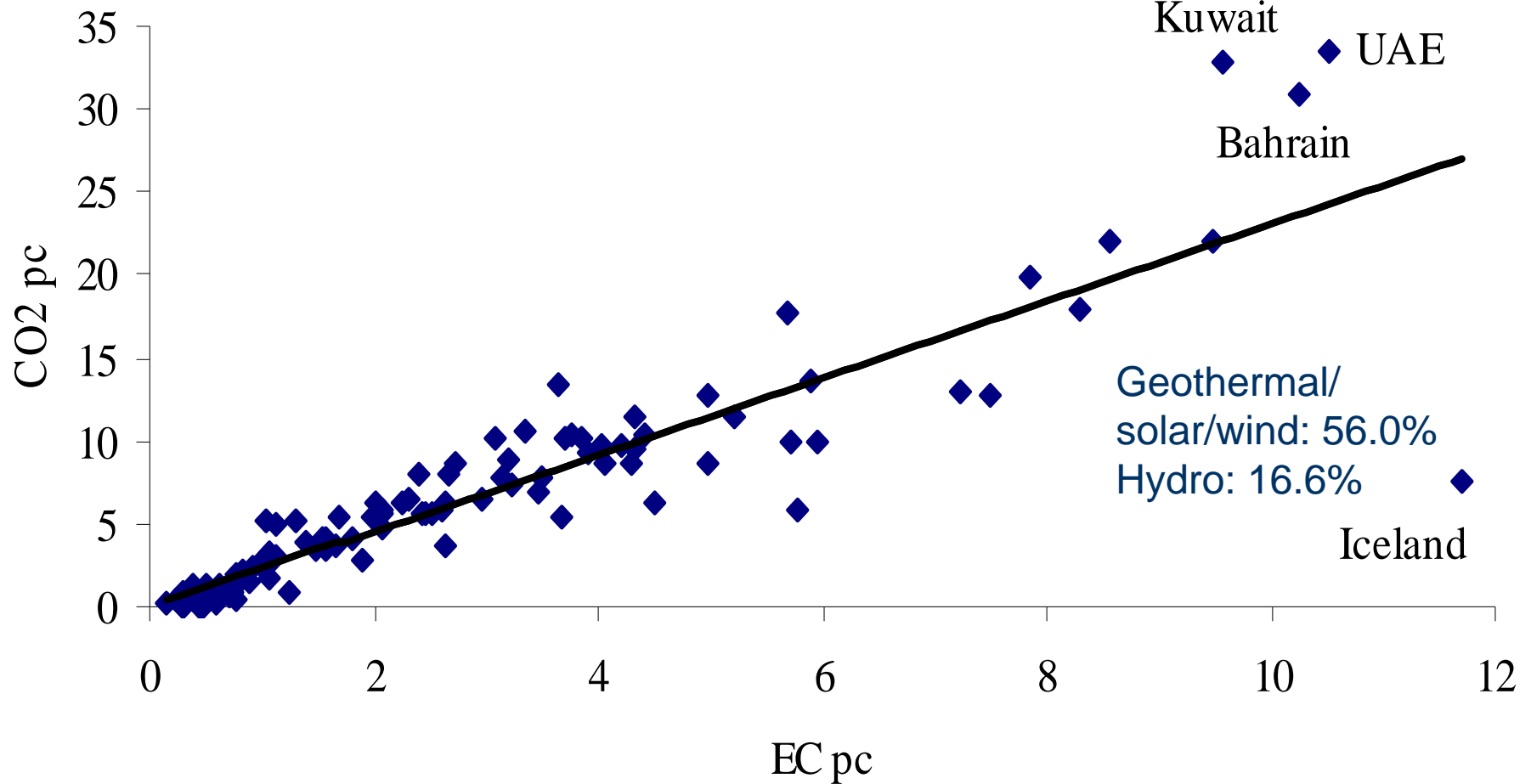
CO₂ Emissions and GDP in Lower Income Economies, 2003



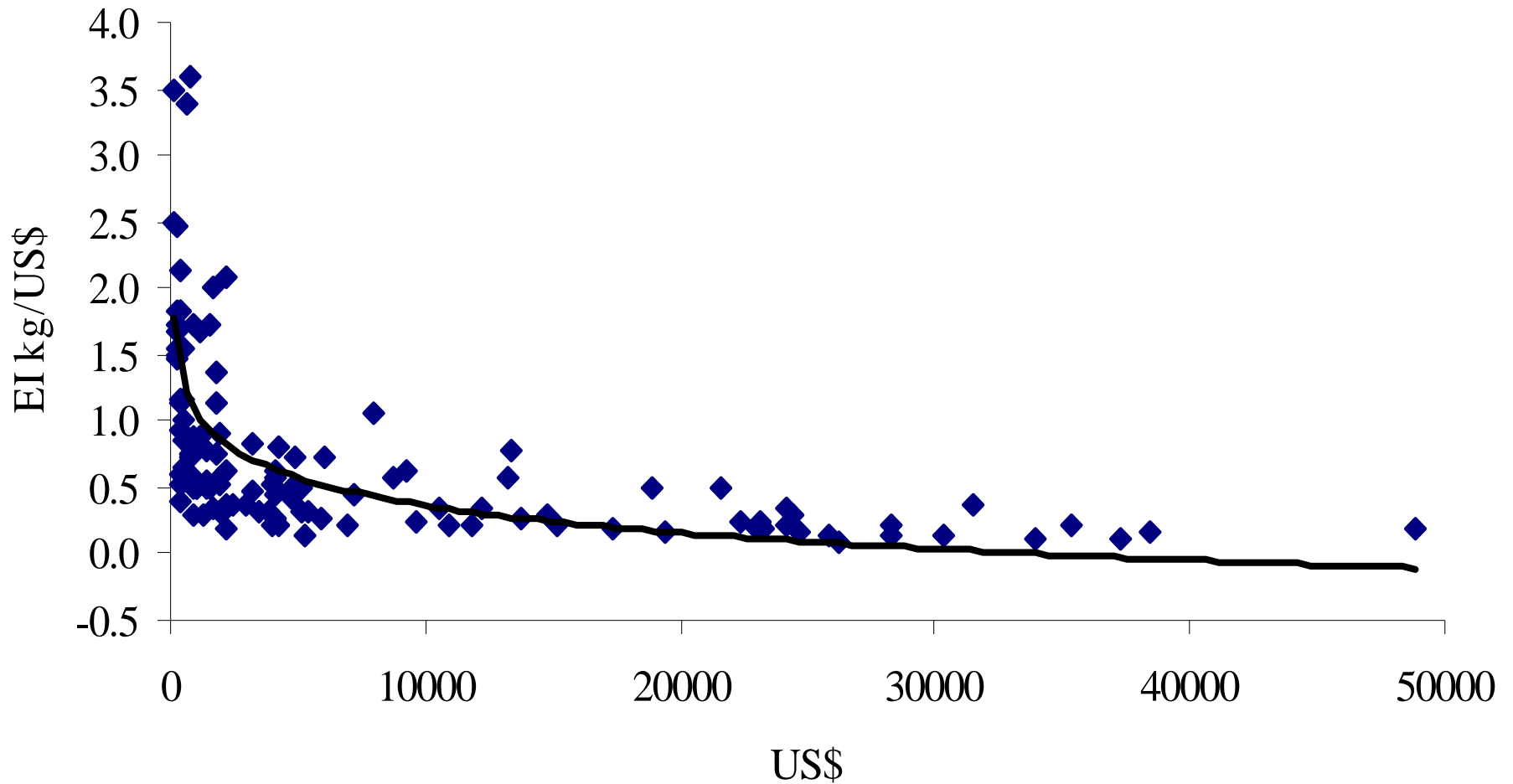
Aggregate Energy Consumption and CO₂ Emissions in 2003



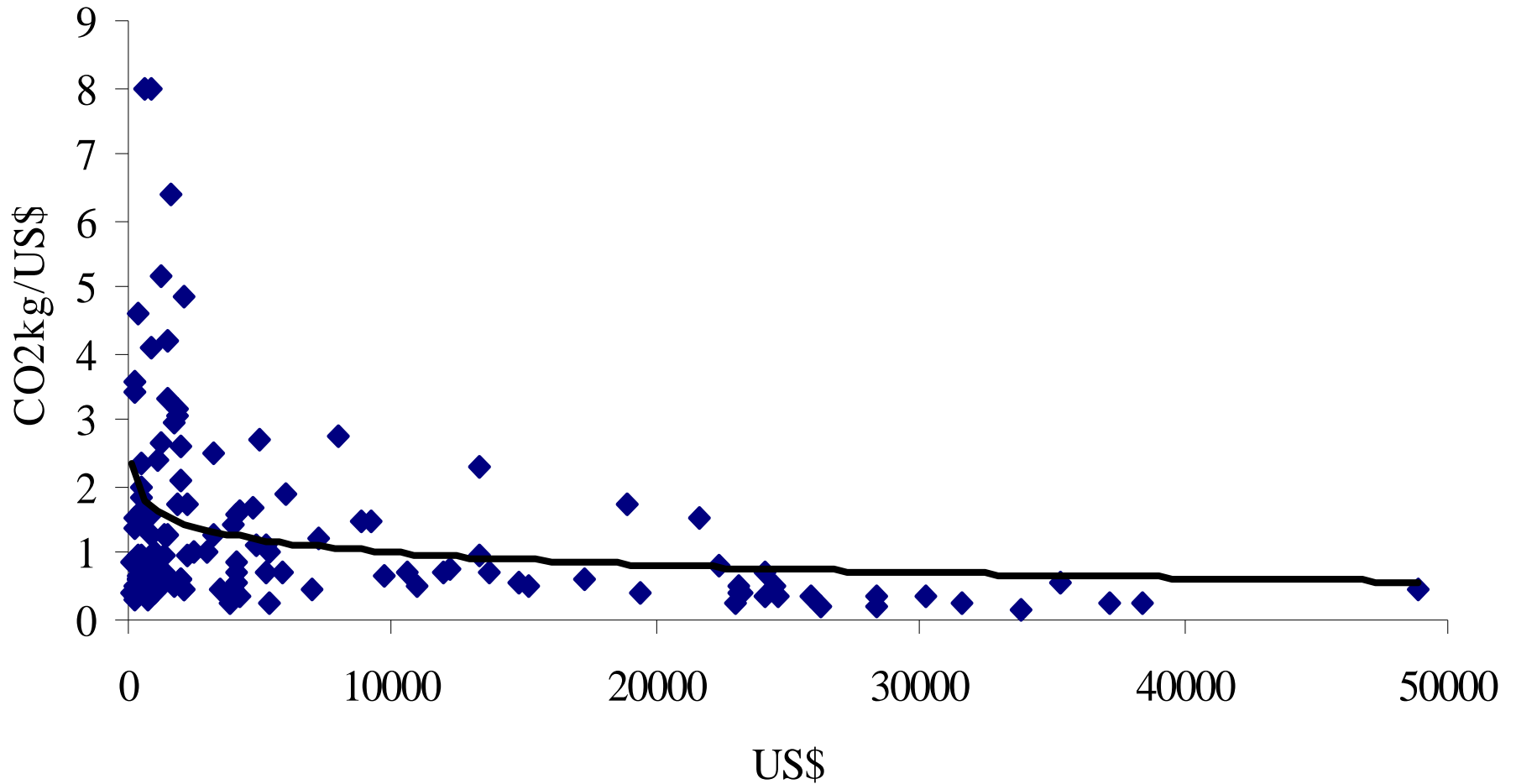
Aggregate Energy Consumption and CO₂ Emissions in 2003



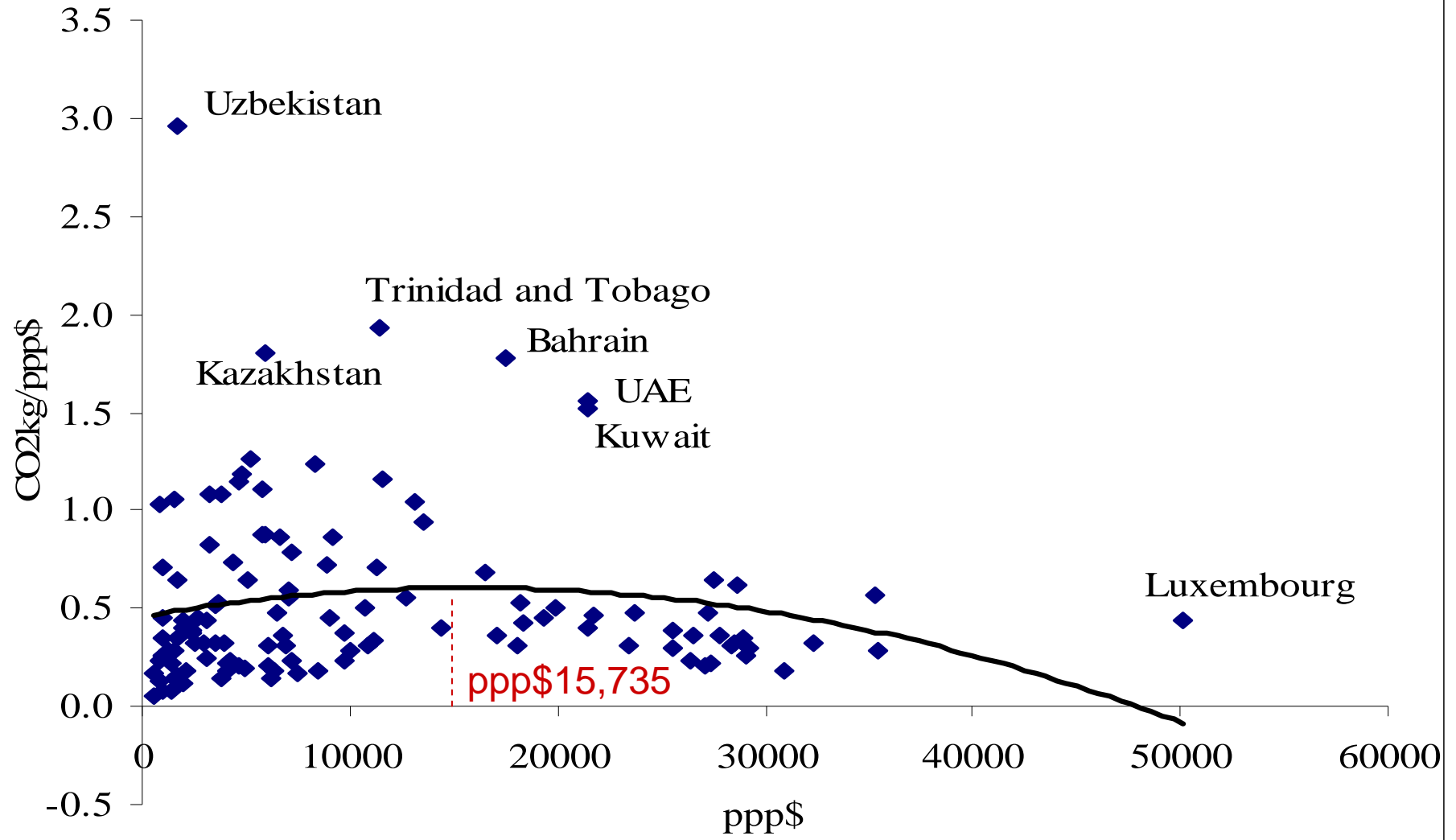
Per Capita Energy Consumption and CO₂ Emissions in 2003



Energy Intensity and Level of Income, 2003



Emissions Intensity and Level of Income, 2003



Emissions Intensity and Income Level in 2003



Sources of intensity variation

- Stage of economic development
- Level of industrialization
- Degree of urbanization
- Service sector development
- Energy prices



Regression analysis

$$\log Intensity = \alpha_0 + \alpha_1 \log Y + \alpha_2 (\log Y)^2 + \alpha_3 IND + \alpha_4 SER + \alpha_5 URB + u$$



Estimation Results

Variables	logEI	logEM
Constant	4.082 (3.374)*	-5.234 (-3.085)*
$\log Y$	-0.680 (-2.110)**	1.588 (3.508)*
$(\log Y)^2$	0.023 (1.171)	-0.108 (-3.958)*
<i>IND</i>	0.007 (1.003)	0.021 (2.203)**
<i>SER</i>	-0.015 (-3.287)*	-0.012 (-1.868)***
<i>URB</i>	-0.002 (-0.546)	-0.002 (-0.423)
Adjusted R ²	0.67	0.31
Sample size	112	111

Notes: *, ** and *** indicate significance at the level of 1%, 5% and 10%. The results are based on 2003 data with several outliers being removed.



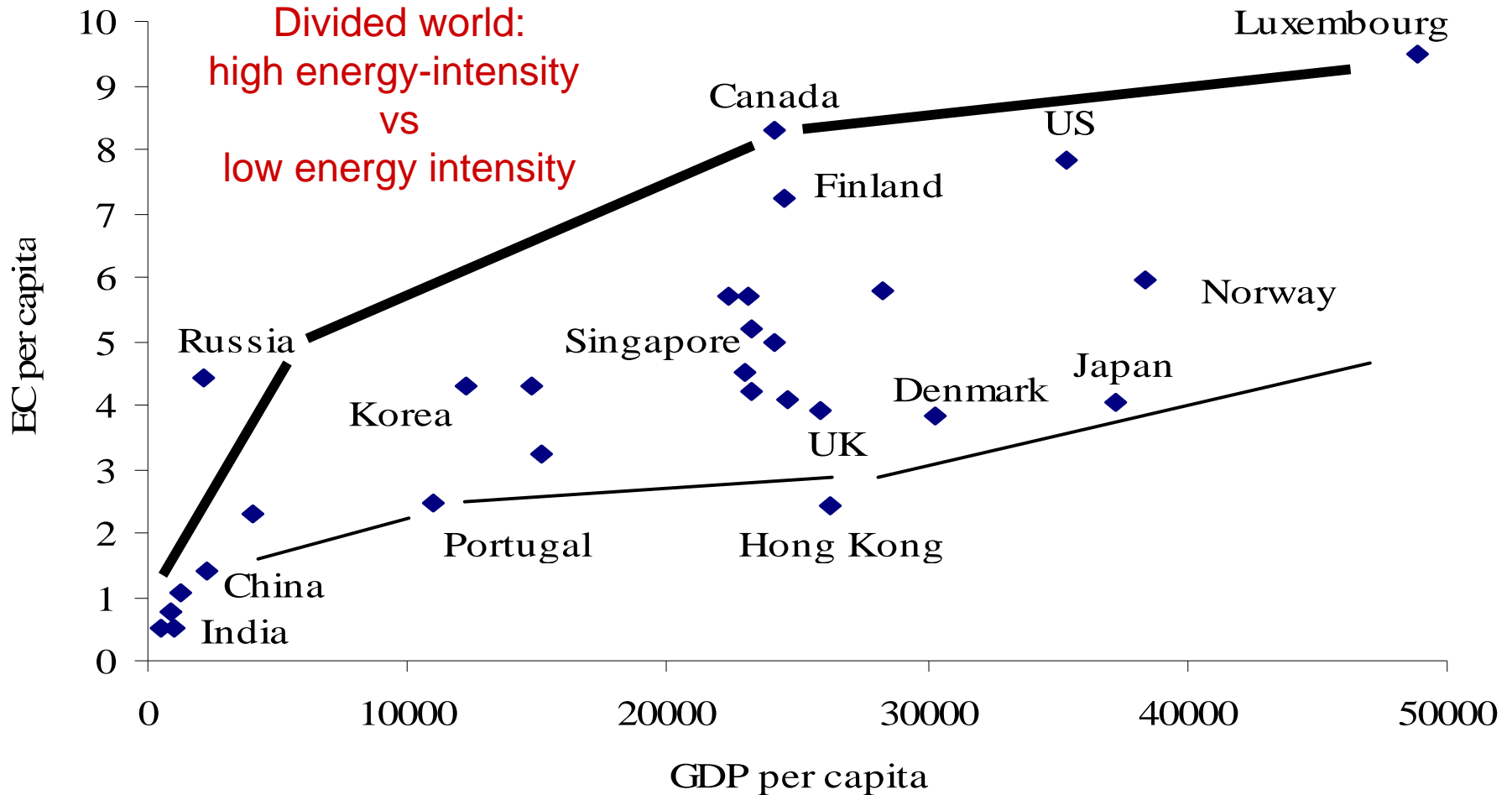
Findings

- Intensities affected positively by level of industrialization
- Negatively by the degree of urbanization and the development of services
- Energy intensity has an U-shaped relationship with income
- Emissions intensity follows an inverted U-shaped curve
- Environmental Kuznets relationship confirmed

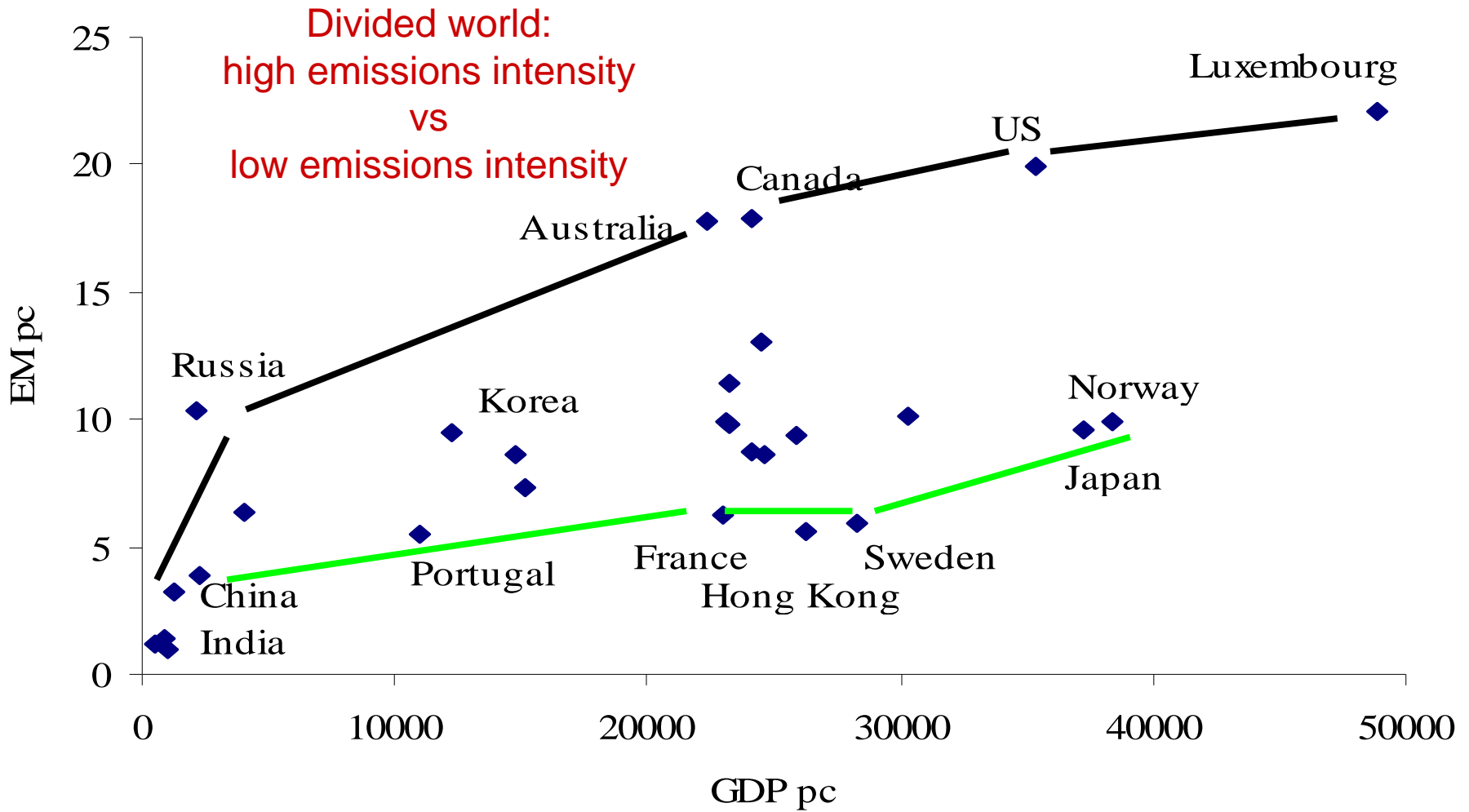


Implications

- Where are China and India heading?
- Is there an Asian model?



Energy Consumption and Income in Selected Economies 2003



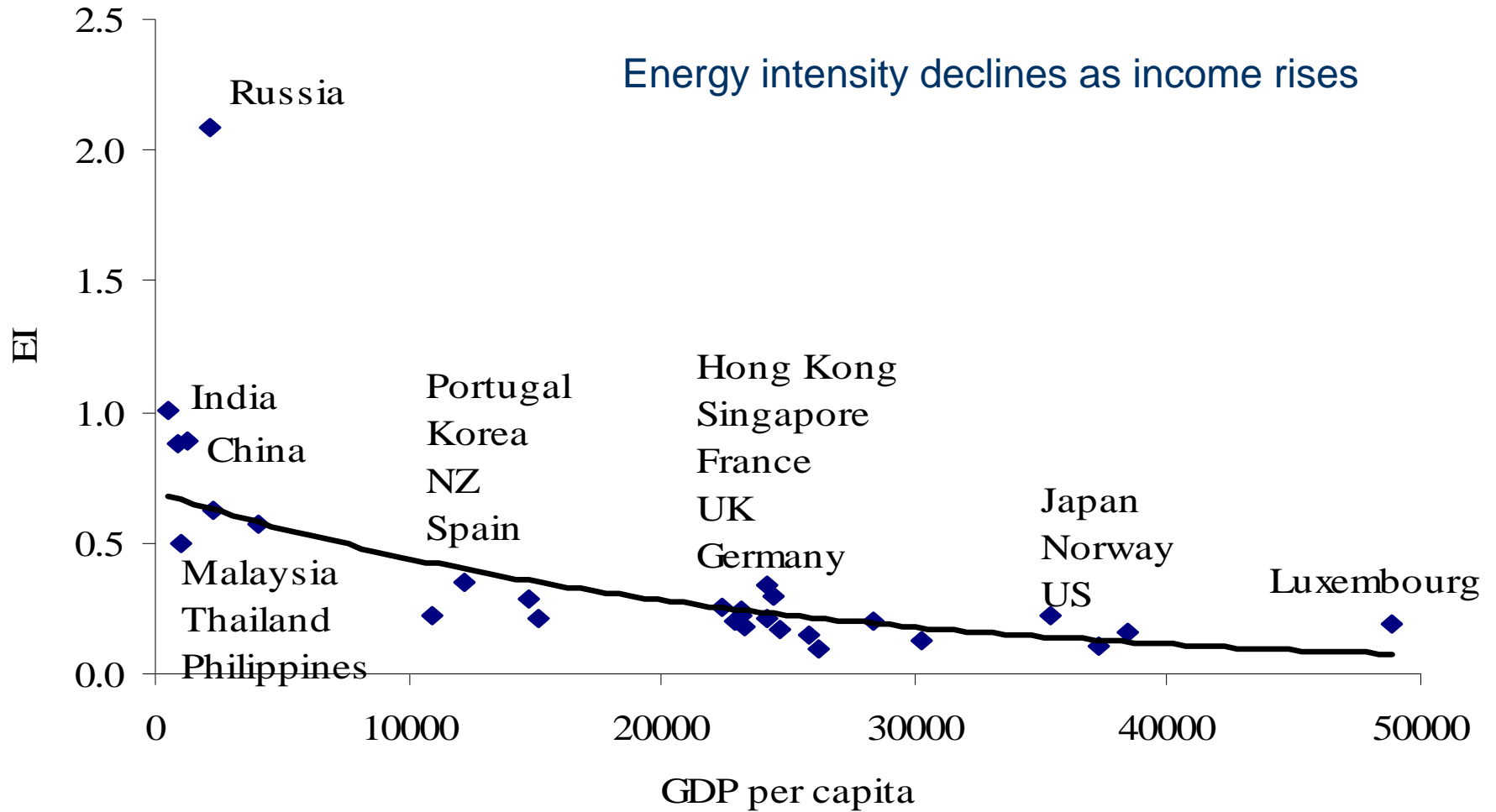
Emissions and Income in Selected Economies 2003



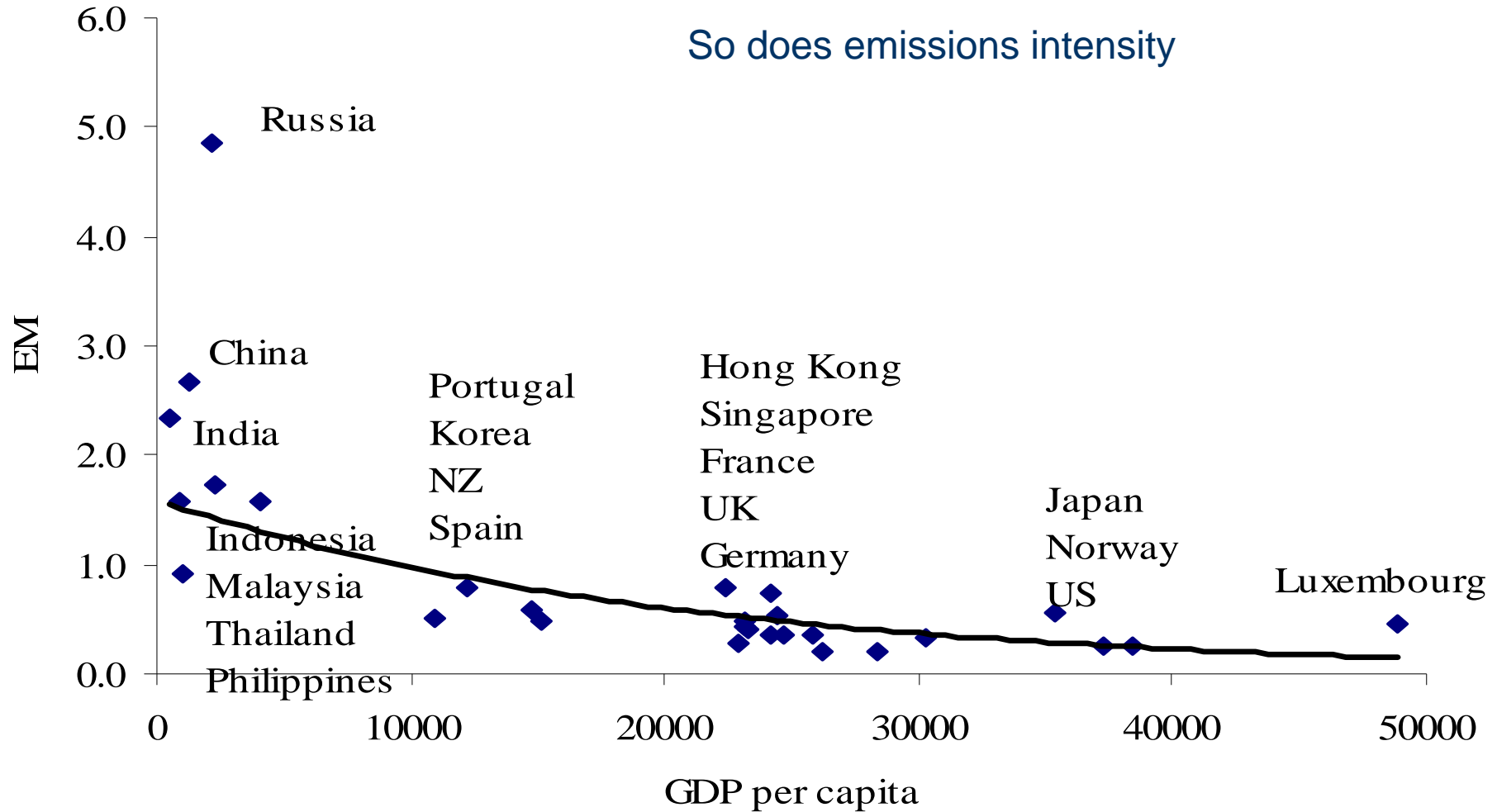
Summary Statistics of Selected Countries

Countries	GDPpc	ECpc	EMpc	EI	EM
India	511	0.515	1.196	1.008	2.339
China	1209	1.072	3.216	0.887	2.66
Sweden	28327	5.774	5.881	0.204	0.208
Denmark	30273	3.84	10.113	0.127	0.334
Japan	37244	4.041	9.641	0.108	0.259
Sub-mean	31948	4.552	8.545	0.146	0.267
Australia	22405	5.682	17.816	0.254	0.795
United States	35313	7.843	19.904	0.222	0.564
Luxembourg	48838	9.472	22.063	0.194	0.452
Sub-mean	35518	7.666	19.927	0.223	0.604

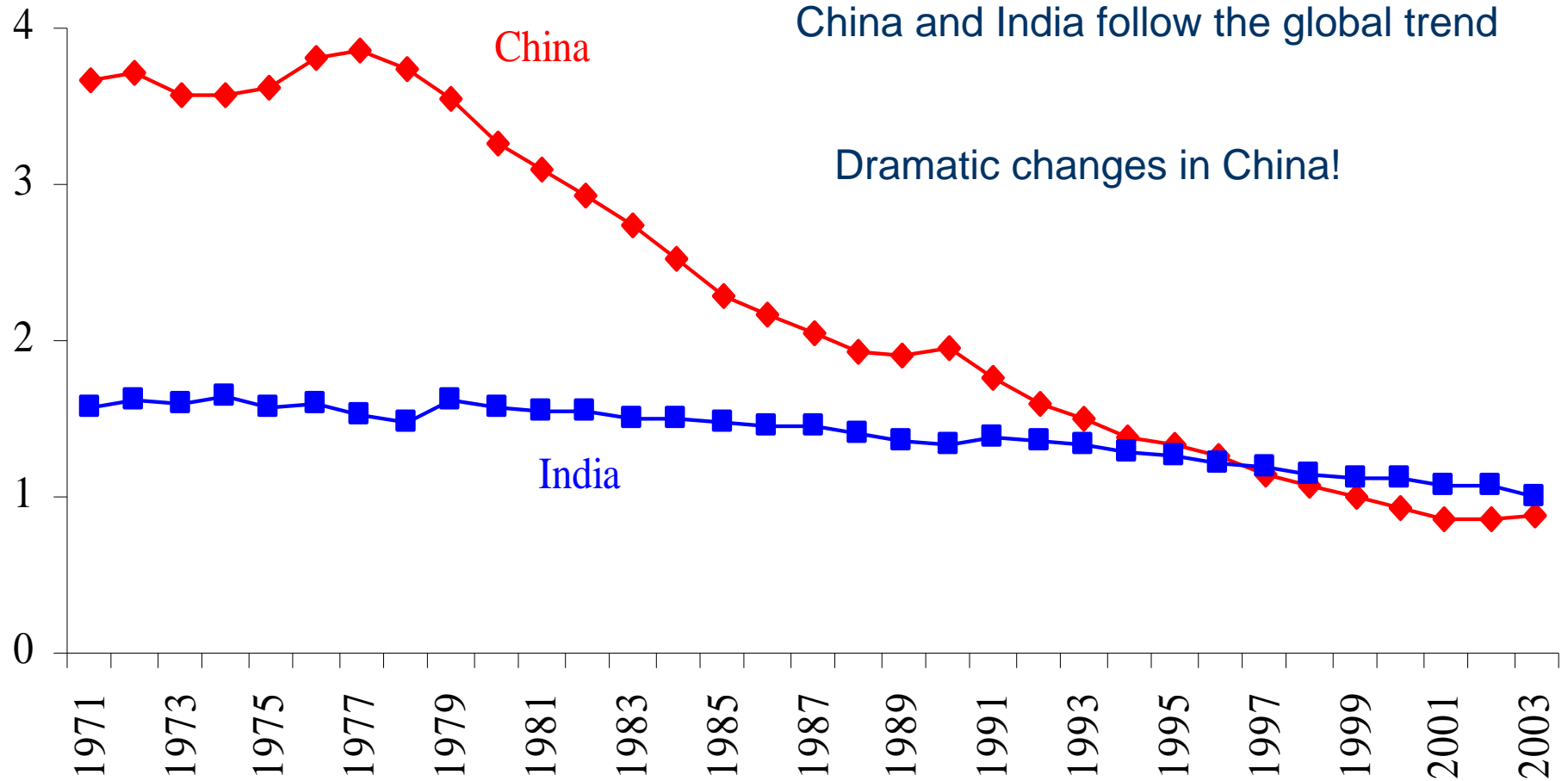
Notes GDPpc, ECpc and EMpc refer to per capita GDP (US\$), energy consumption (tons) and emissions (tons). EI and EM represent energy intensity (kg/\$) and emissions intensity (kg/\$)



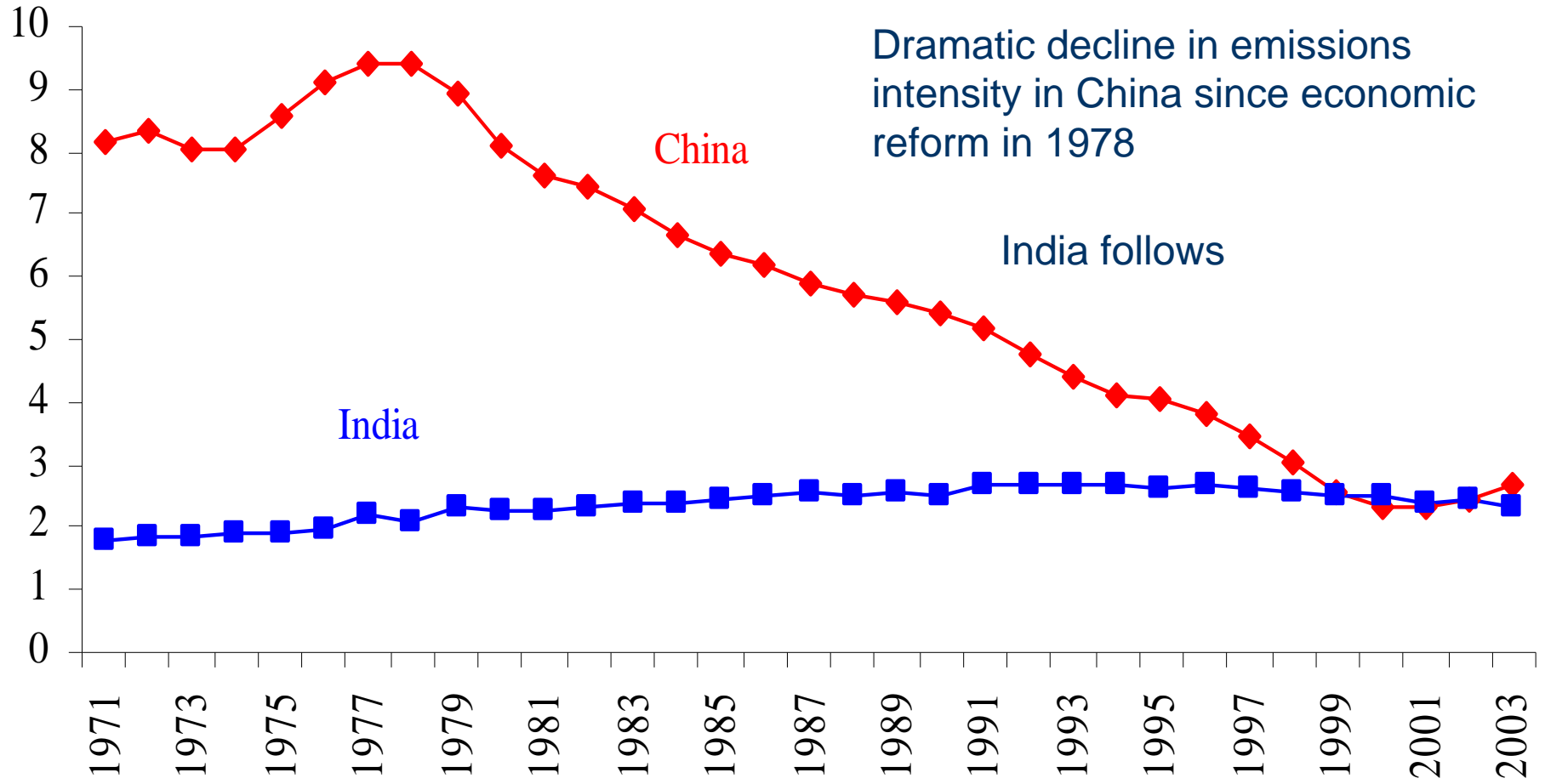
Energy Intensity and Income in 28 Economies, 2003



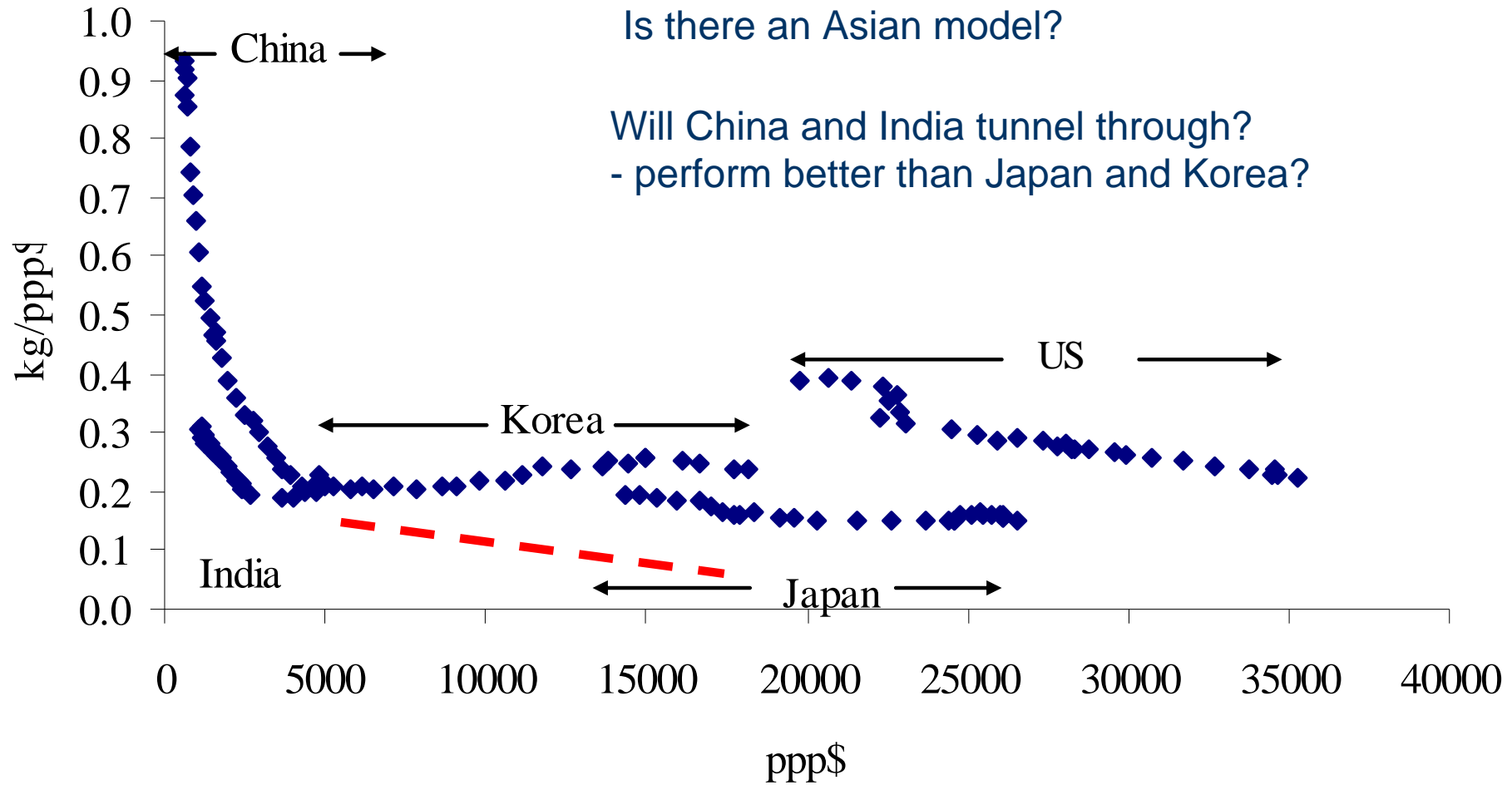
Energy Intensity and Income in 28 Economies, 2003



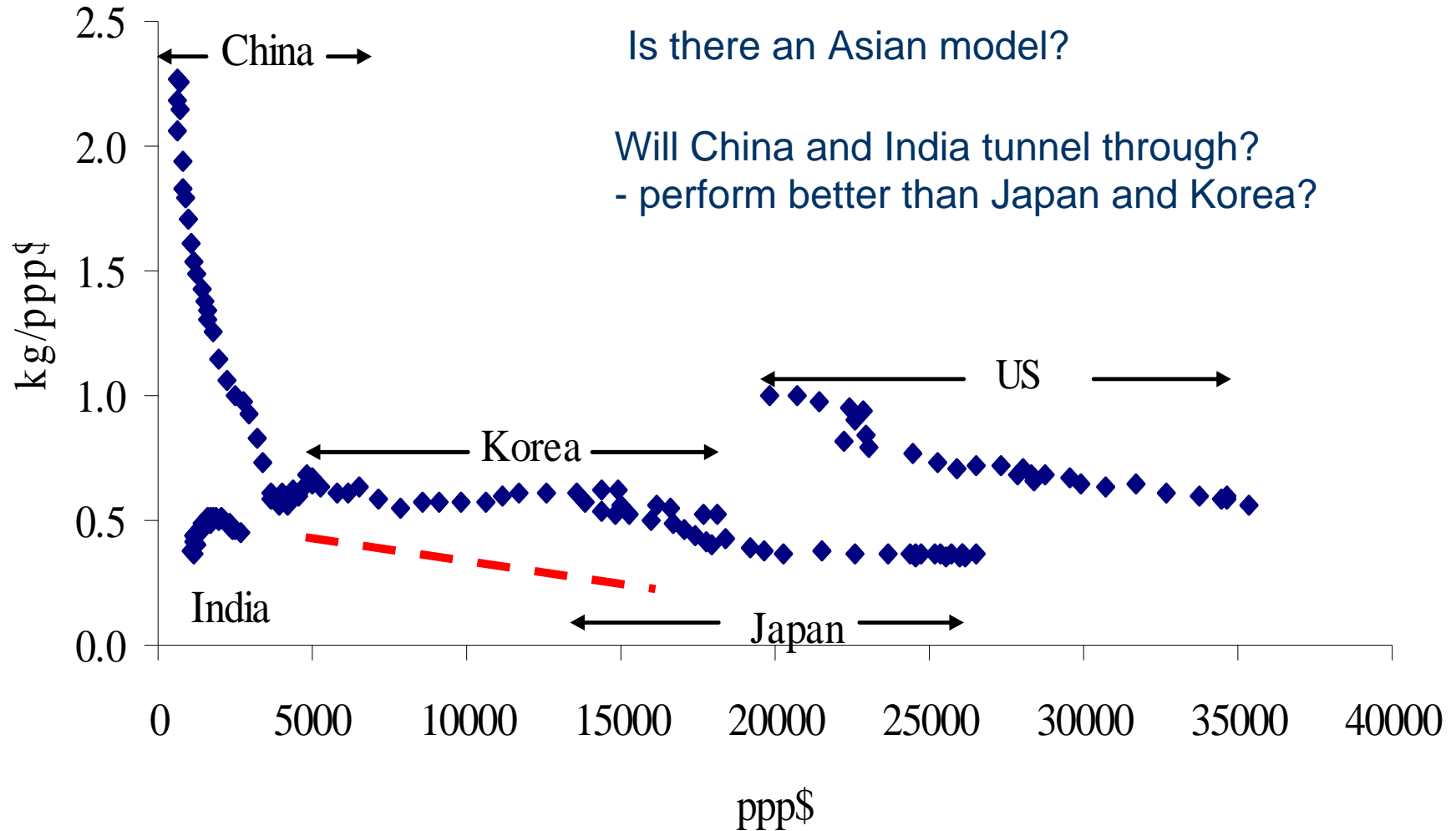
Energy Intensity in China and India, 1971-2003



Emissions Intensity in China and India, 1971-2003



Energy Intensity, 1975-2003: Asia vs US



Emissions Intensity, 1975-2003: Asia vs US



Conclusion

- World's biggest economies are also the largest energy consumers as well as emitters
- Considerable variation among the nations
- Major economies are divided into different clubs from less energy/emissions intensive to more energy/emissions intensive



Conclusion

- Energy and emissions intensities declined substantially in the two giants particularly in China
- Converging trends in energy and emissions intensities
- An Asian model?
- Will China and India tunnel through?



THANK YOU