What determines the turning point of CO2 emission related to Environmental Kuznets Curve ?

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42003 Energy Economics, Markets, and Policies

Overview & Determinants

PART 1
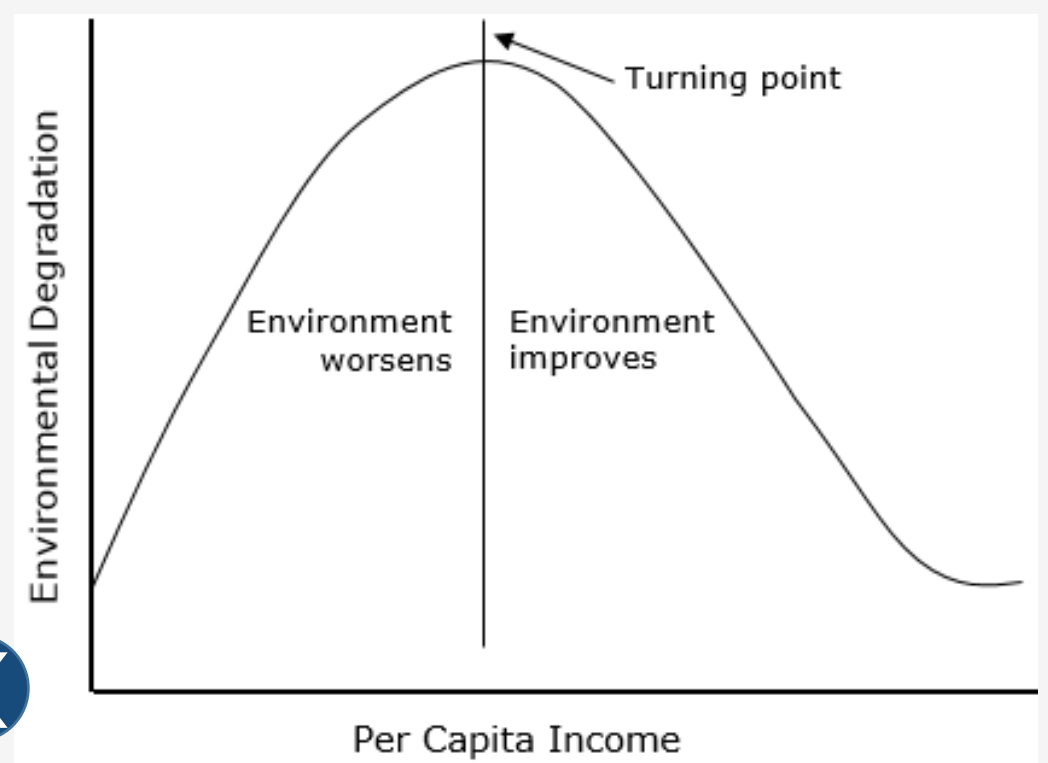ZhuLyu

Environmental Kuznets Curve

1950s - '60s Simon Kuznets

the idea of Kuznets Curve
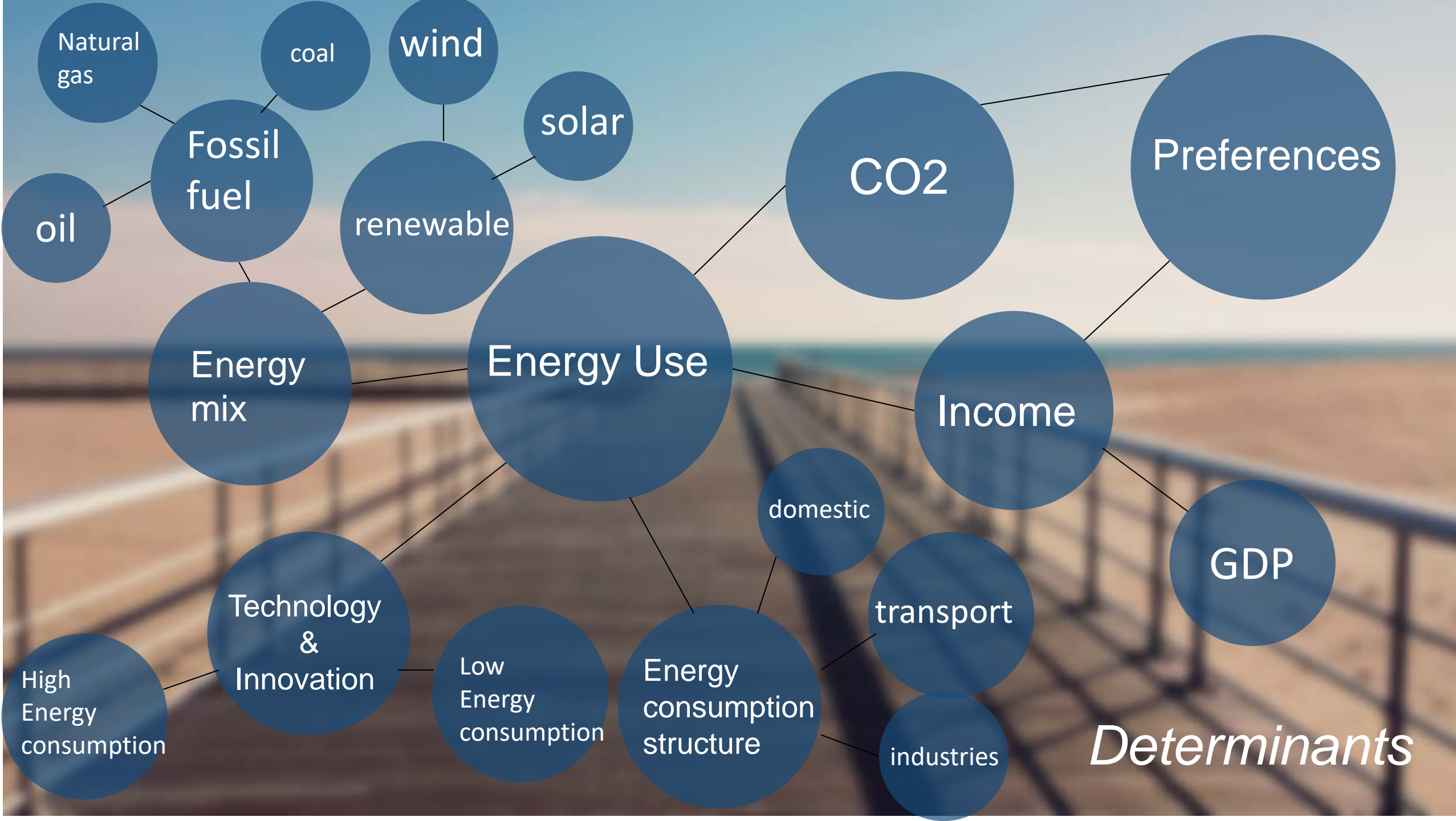
Grossman and **Early 1990s**

Krueger(1991) study

A hypothesized relationship between

environmental quality and economic

development → an inverted U-curve.

Resource:https://en.wikipedia.org/wiki/Kuznets_curve

Environmental quality

–individual pollutants: carbon, sulfur

dioxide, nitrogen oxide, lead, etc.

– changes in air/water quality

– index of pollutants

Natural gas · coal · wind · solar · oil · Fossil fuel · renewable · CO2 · Preferences · Energy mix · Energy Use · Income · GDP · domestic · Technology & Innovation · transport · High Energy consumption · Low Energy consumption · Energy consumption structure · industries · *Determinants*
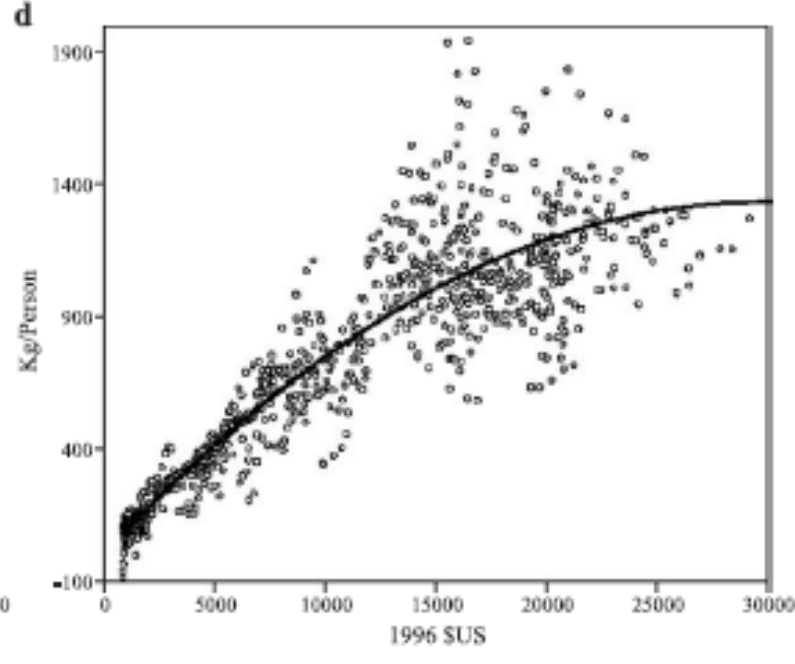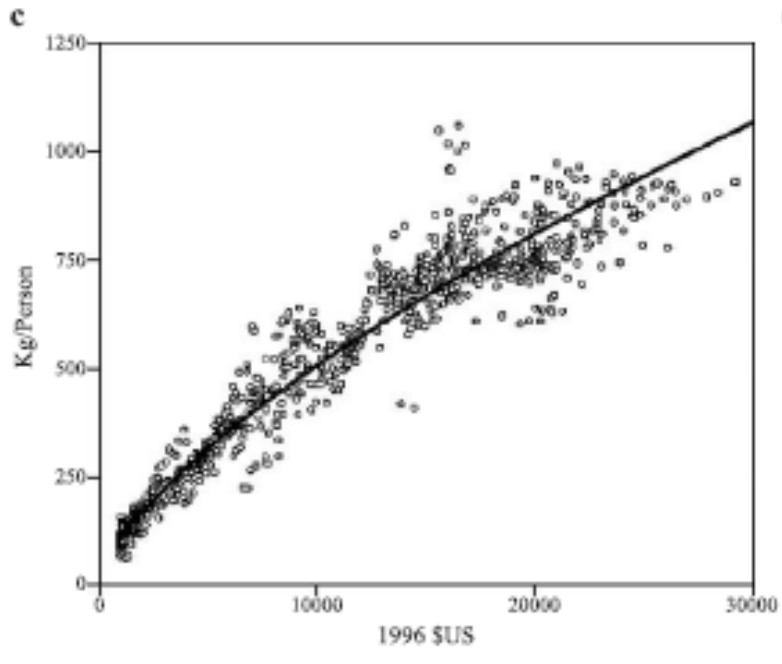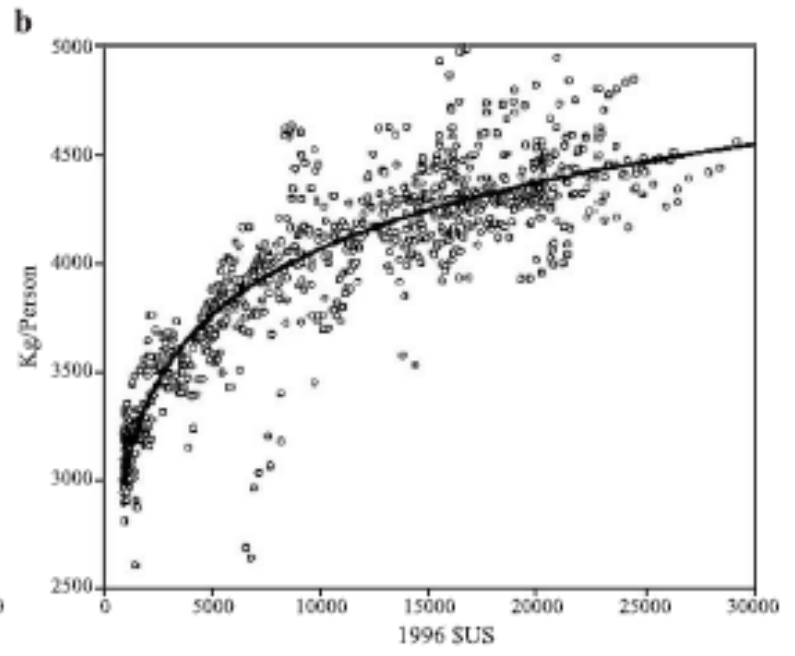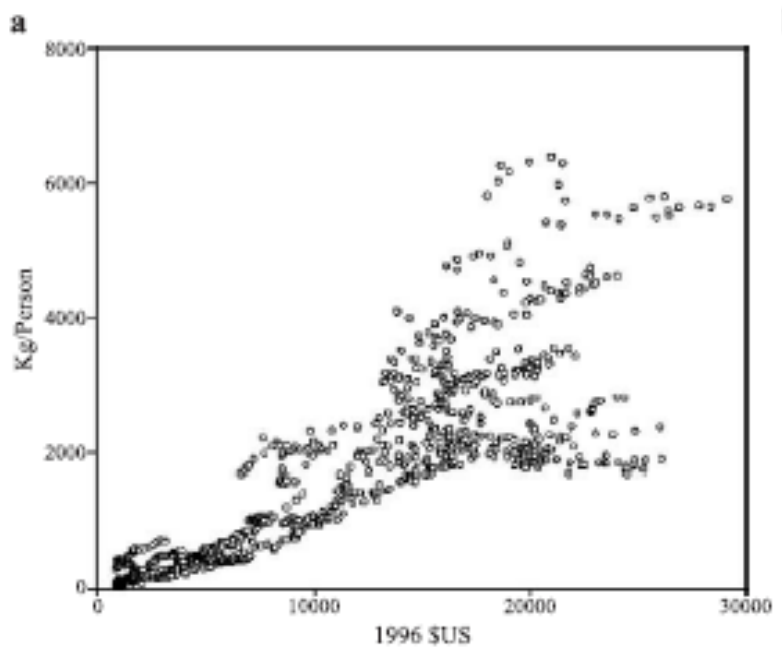
Statistics Analysis

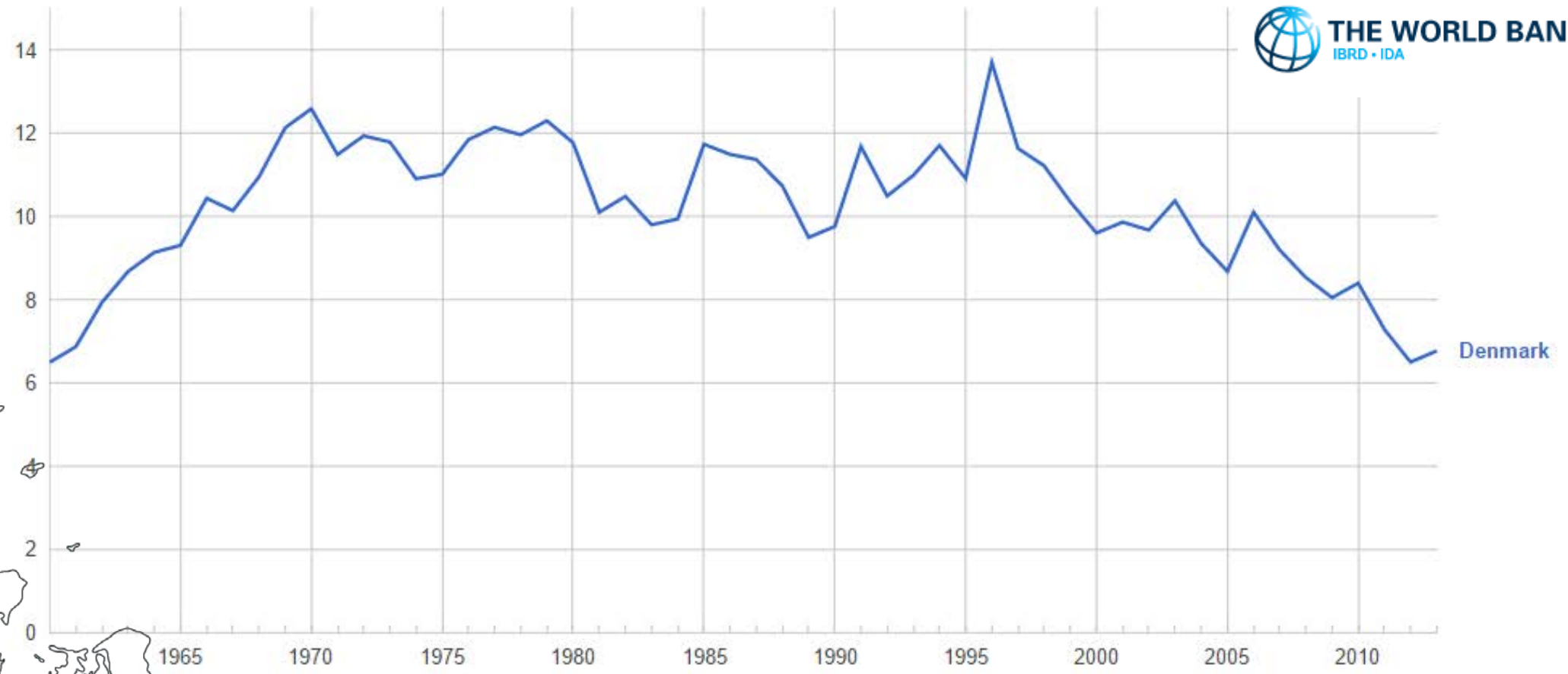The experience from the developed (OECD) countries who have passed the turning point can be learned by the developing countries .

Semi-log, double-log and quadratic model are used to fit the trend for the carbon emission in the U.S.

CO2 emission per capita in metric tons in Denmark from 1960--2013

Ambitious goal

Powerful actions

Public awareness

A case analysis about China

PART 2
Ziyi Liu

Discussion from a research paper

Hypothesis -- Regression equation

β3 > 0, if China's past CO2 emissions were consistent with the EKC hypothesis

$$\ln(CO_2/capita)_t$$
$$= \beta_1 + \beta_2 \ (ln\ GDP/capita)\ _t + \beta_3[(ln\ GDP/capita)_t]^2 + \beta_4(ln\ EC/capita)_t$$
$$+ \beta_5(ln\ trade\ openness\ ratio)_t + \varepsilon_t \ (1)$$

Unit root tests: verify the data stationarity
Least Square (LS) method: estimate the coefficients
Residual test: determine the results' reliability

$$y_t = -4.4647 + 0.6924(x_2)_t - 0.0459(x_3)_t + 1.4008(x_4)_t - 0.1770(x_5)_t$$

Reference： Xu, Bo, et al. "A projected turning point in China's CO_2 emissions–an Environmental Kuznets Curve analysis." International Journal of Global Warming 4.3-4 (2012): 317-329.

$$y_t = -4.4647 + 0.6924(x_2)_t - 0.0459(x_3)_t + 1.4008(x_4)_t - 0.1770(x_5)_t$$

Results analysis:
The stationary point of the CO2/capita to the factor of GDP/capita appears when the GDP/capita reaches 1874 RMB (1982 Year level)

Forecast the turning point:
Assumption--
(1) the growth in GDP is 10% per annum;
(2) population and primary energy consumption will increase at the same speed as their average levels in the past;
(3) trade openness ratio will remain at the average level.

The turning point in overall CO2 emissions will appear in 2078.

Reference： Xu, Bo, et al. "A projected turning point in China's CO$_2$ emissions–an Environmental Kuznets Curve analysis." International Journal of Global Warming 4.3-4 (2012): 317-329.

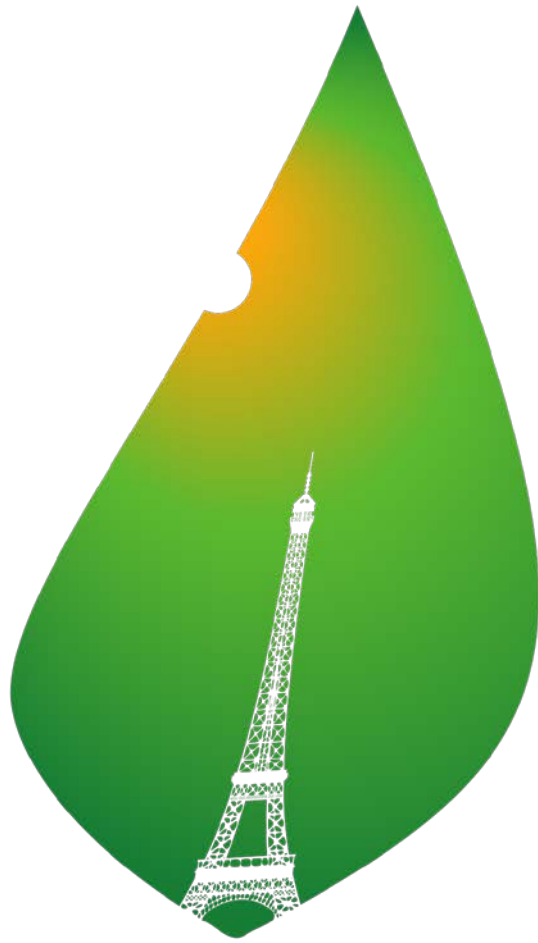# Influential factors

Wealth gap

Gini coefficient 0.47 (2010)

Income →Sustainable awareness

Role in international trade

From labour & resource intensive product

To capital & technology intensive product

Intended Nationally Determined Contribution

"China will cut its CO_2 emissions per unit of GDP by 60-65% from 2005 level by 2030, aiming to increase non-fossil fuel sources in primary energy consumption to about 20% by the same date. However, China 'will work hard' to peak its CO_2 emissions before 2030"--Prime Minister Li Keqiang .

Policy & Plan

➢ Supply-side structural reform：cut overcapacity and corporate costs

➢ " Made in China 2025 ": upgrading the manufacturing sector

➢ Electrical vehicle subsidy & Renewable energy

➢ National Carbon Trading Scheme

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Thanks for your attention

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Sustainable future