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The role of China after COP21

Sustainable Production and Consumption issues and green technological dynamics

Massimiliano Mazzanti

Turin, May 10th 2016

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Macroeconomy

Environment and development: insights from UNIDO and EEA

Structural change and techno-dynamics

Trade

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GDP path reducing

Current account surplus reducing

HDI ranking 90th, -7 vith respect to GNI per capita

59% MVA global, 5th UNIDO competitiveness index (DE, USA; JP, kor)

Growth dependent less on capital and population, more on technology?

R&D target 2020
2.5%

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Energy related CO2 emissions stay flat over 2014-2015 worldwide

Emissions fell by 1.5% in China in 2015

Coal consumption has been reduced worldwide (2.3%, biggest)

and in China, from 80 to 70% electricty input (down to 2.6% growth from 9%)

(but coal uncertainty, NYT reports 600 more millions of coal used, 70% of coal used in the USA)

Cap coal by 2020 and carbon by 2030
(ZhongXiang, 2015)
With regional variation in targets

Peak Co2 level 10.6Gt 2030
(from 9.1 in 2013)

Figure 5.3
CO_2 emission intensity and GDP per capita, worldwide, 1960–2011

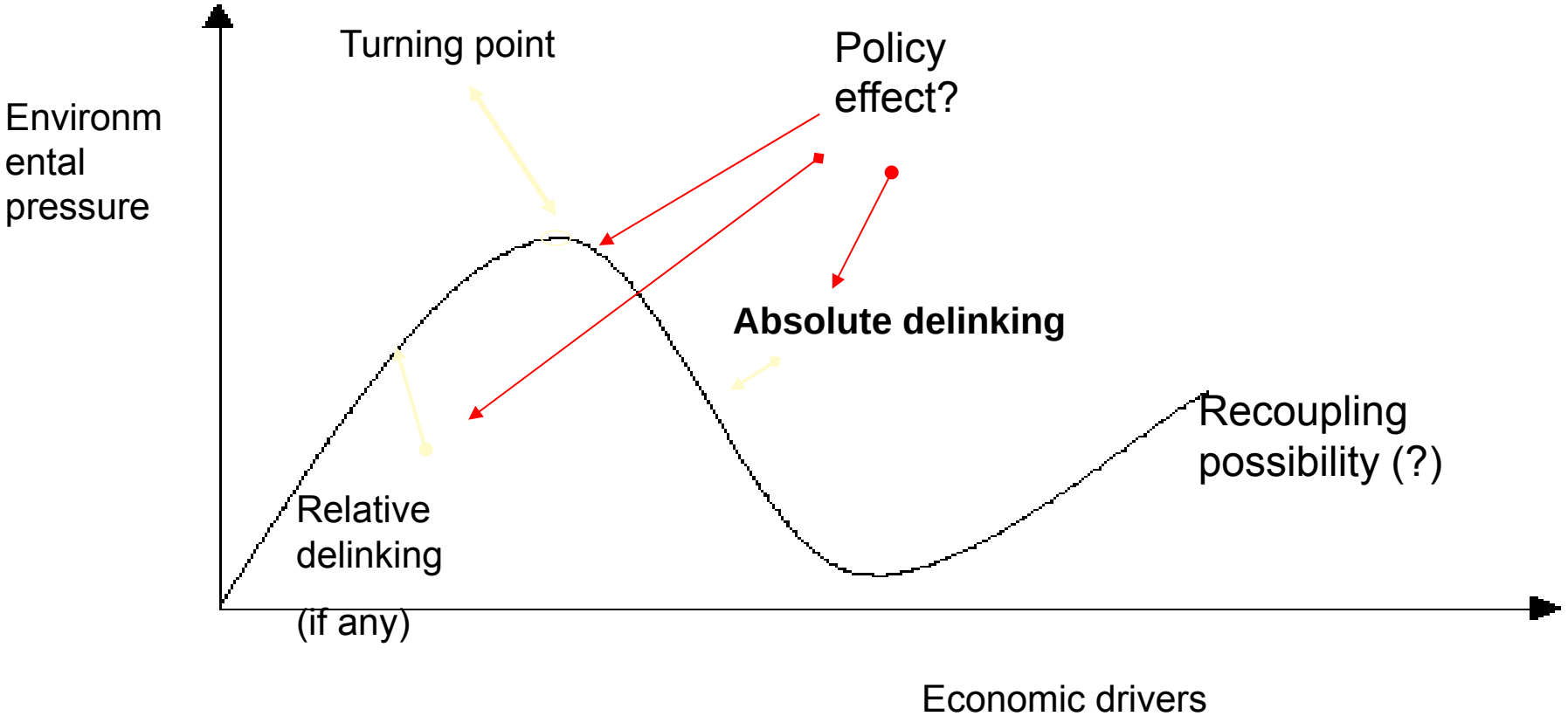
Note: GDP is gross domestic product. Carbon dioxide emission intensity is calculated as emissions over GDP.
Source: Adapted from Mazzanti and others (2015) based on World Development Indicators (World Bank 2015a).

The production process changes through

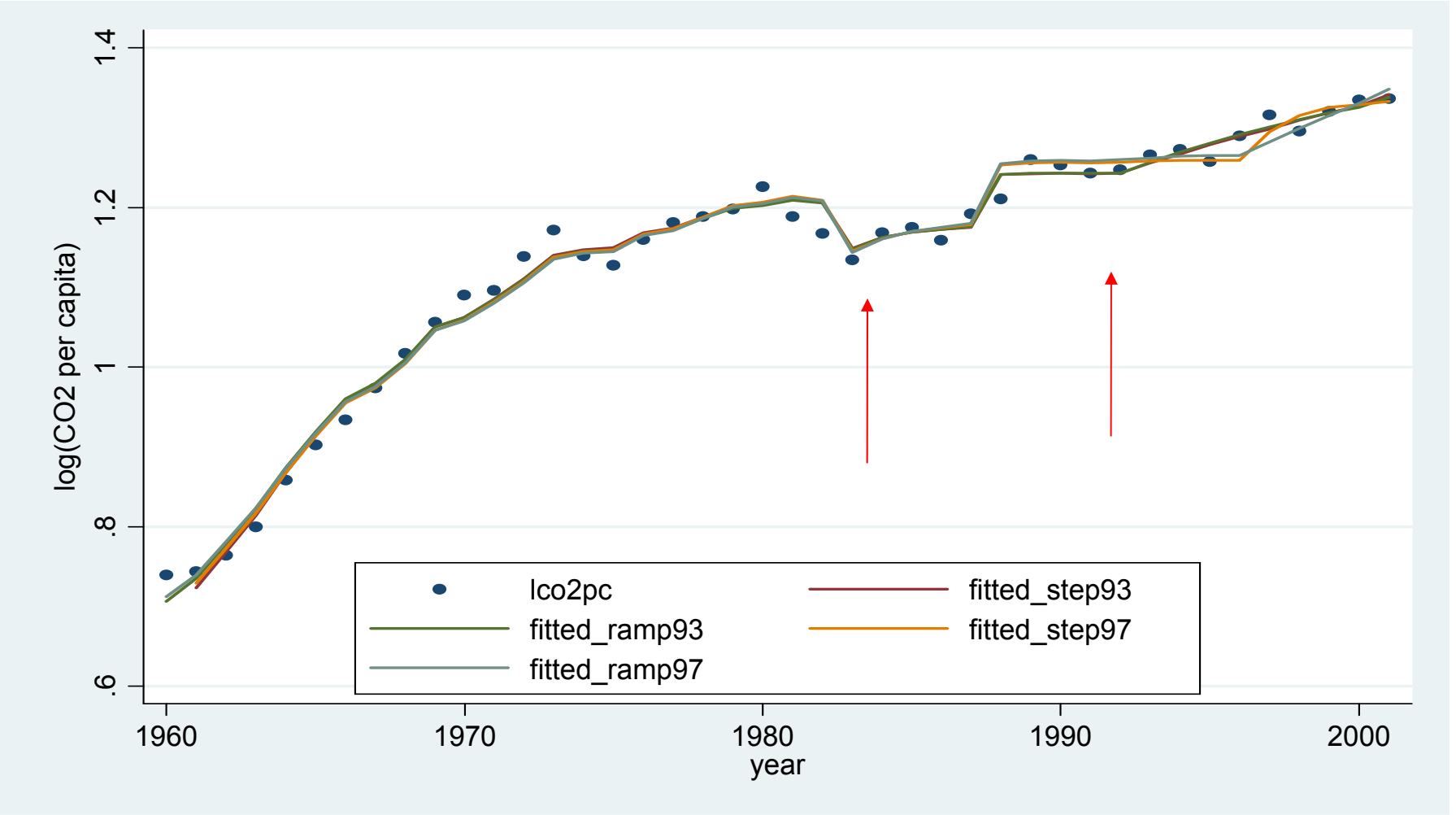
IPAT identity

- I≡PAT
- Impact≡ Population*GDP/Population*Impact/GDP

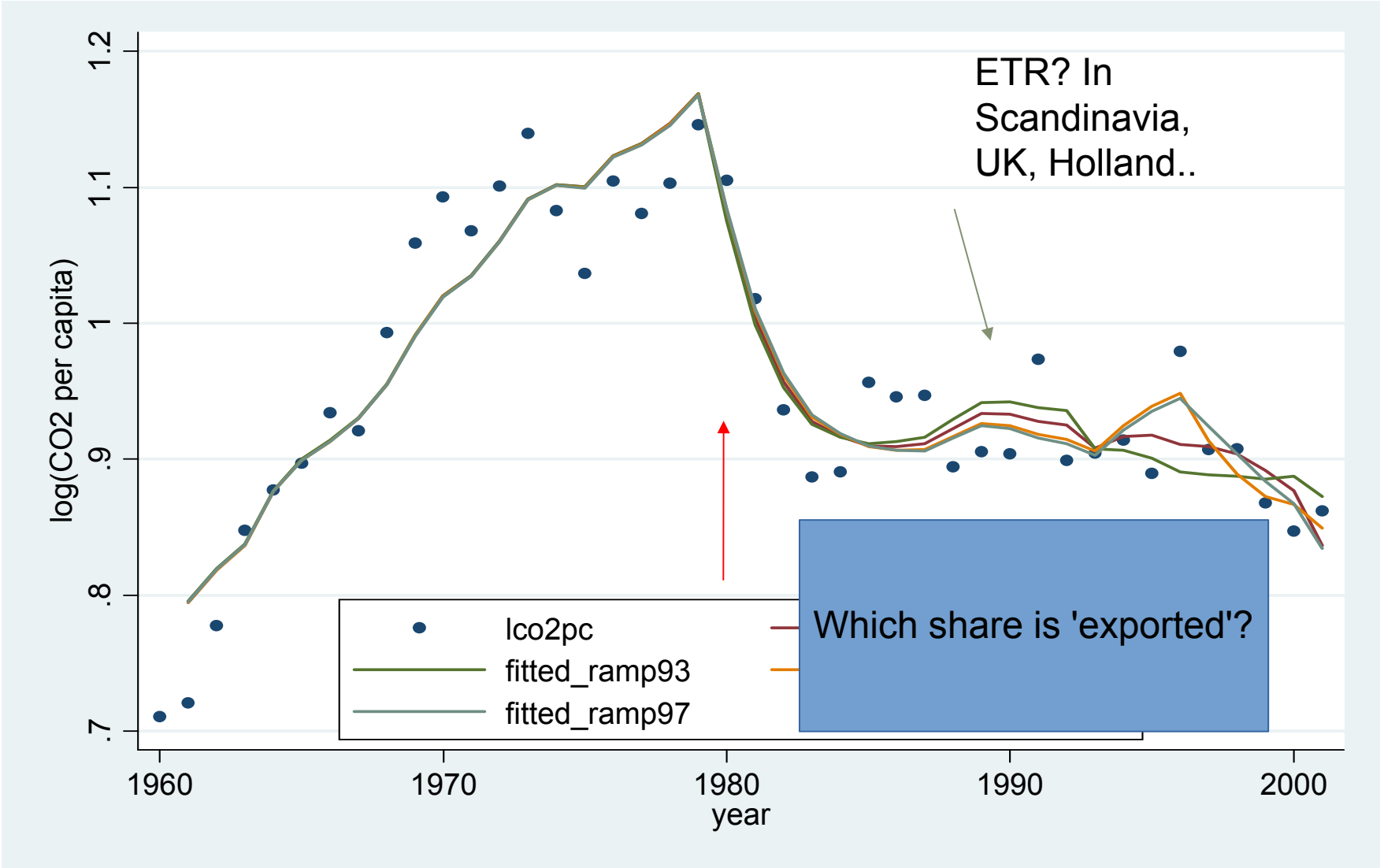
Delinking and Kuznets curves



North america and Oceania



Co2 trends, EU North



Mazzanti M. Musolesi A. (2014), Non linearity, heterogeneity and unobserved effects in the CO_2 economic development relation for advanced countries, *Studies in non linear Dynamics and Econometrics*, 18, 521-41.

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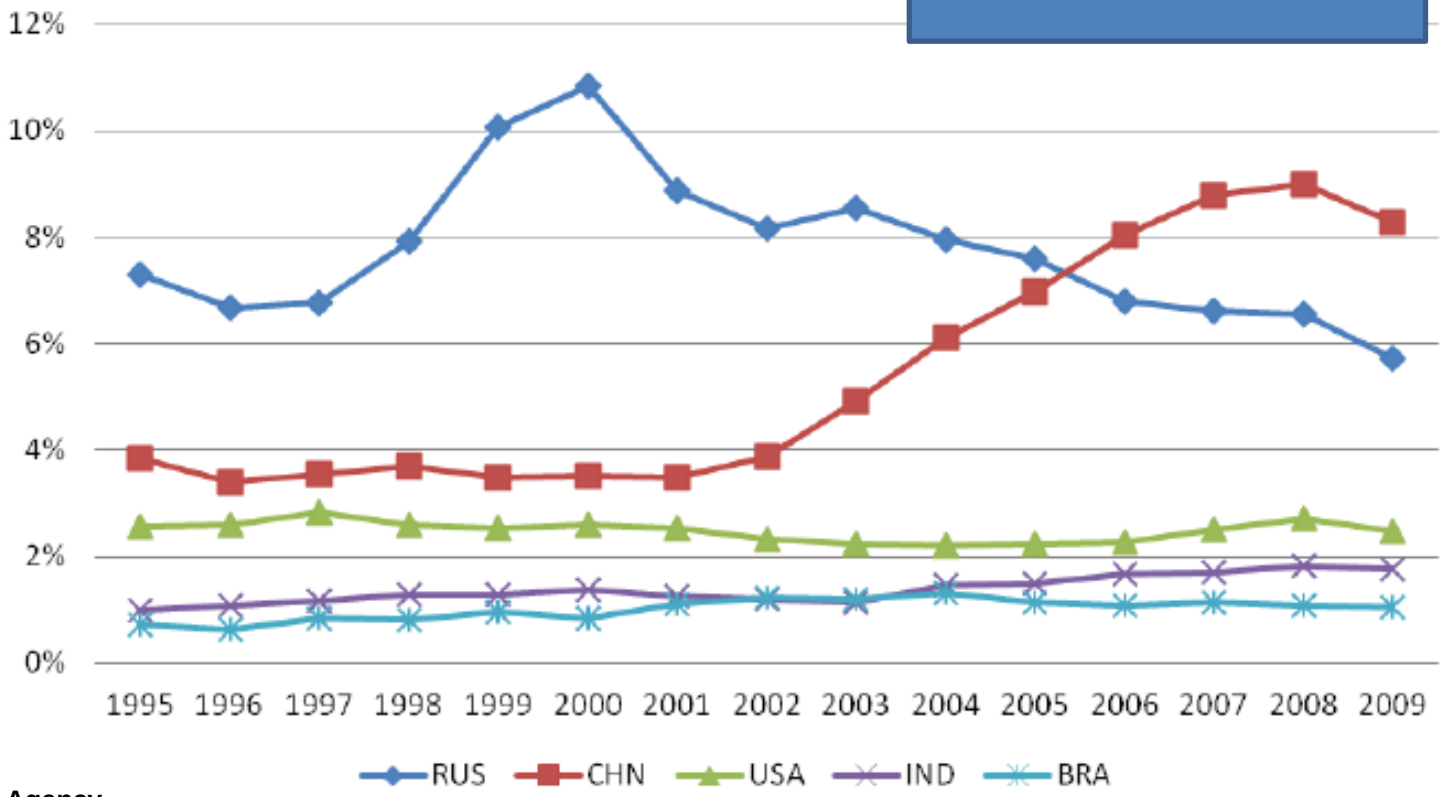
Sustainable consumption and production

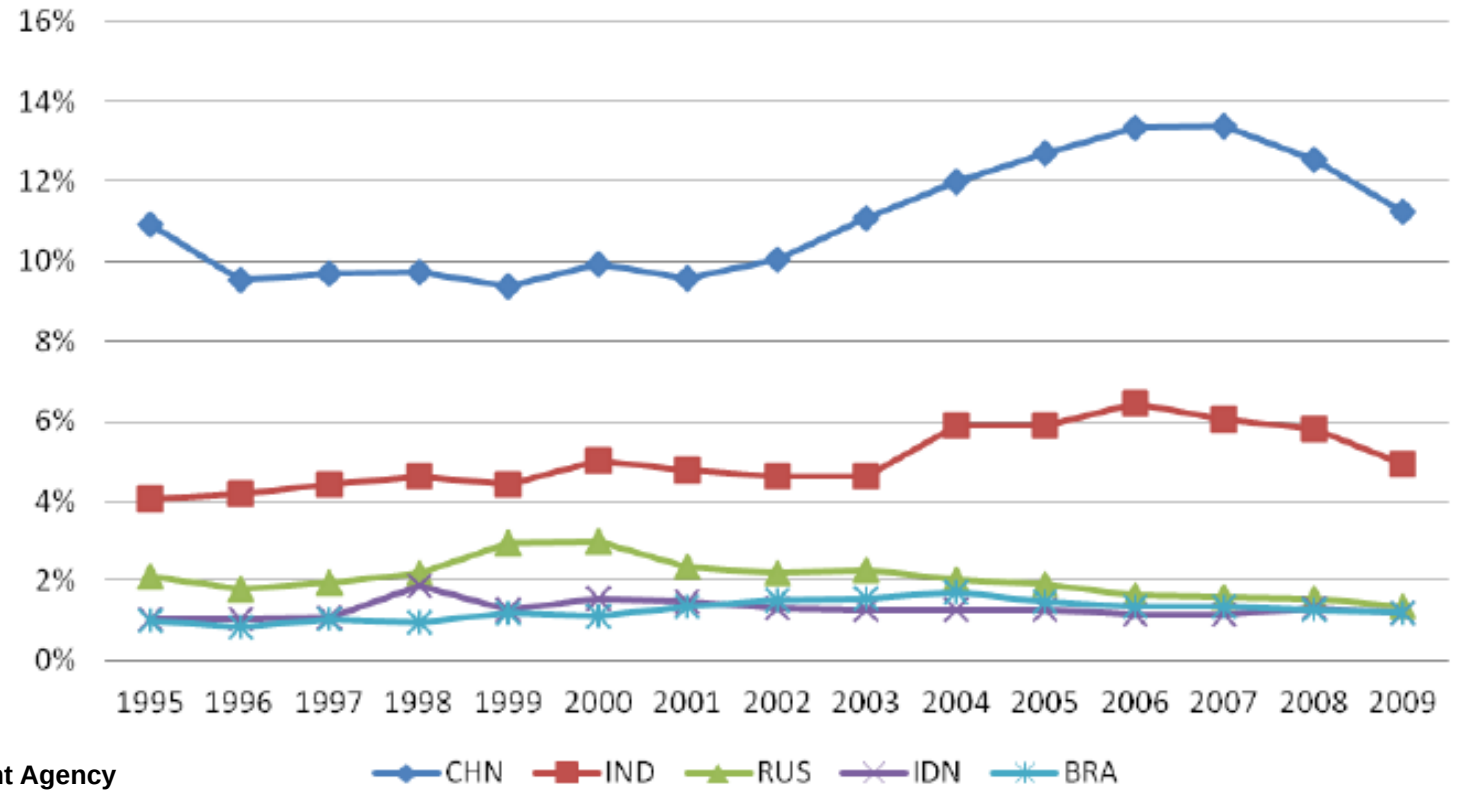
Requirement of GHG emissions to satisfy EU final demand - top 5 non-EU countries

Emissions embodied in IMPORTS to the EU



- **Domestic GHG** emissions linked to the production of domestically-consumed final goods has remained rather **stable** (and declined in recent years)
- **Rapid increase** in the level of **GHG emissions** occurring **abroad** to satisfy domestic final demand
- '**Foreign dependence**' increased from about **25%** in 1995 to about **40%** in 2008
- **Declining** role of big players in **Western Europe** (Germany, UK, France, Italy)
- Spectacular **increase** in the role of **China** (and India to a lesser extent), while Russia first rose and then collapsed

Requirement of employment to satisfy EU final demand - top 5 non-EU countries



Greenhouse gas dynamics and EU demand: environmental, labour and social implications

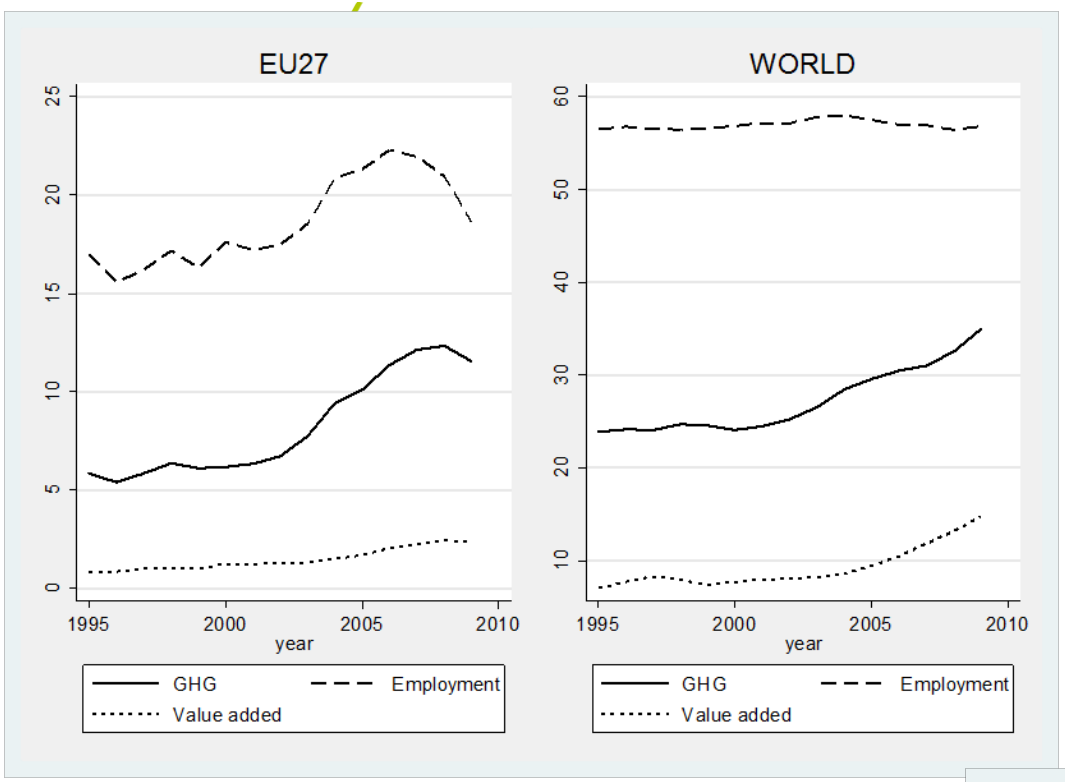


Figure 1- Share of environmental pressures and economic activity occurred in China, India, Indonesia and Bra the final demand in the EU27 and the World. Source of data: WIOD.

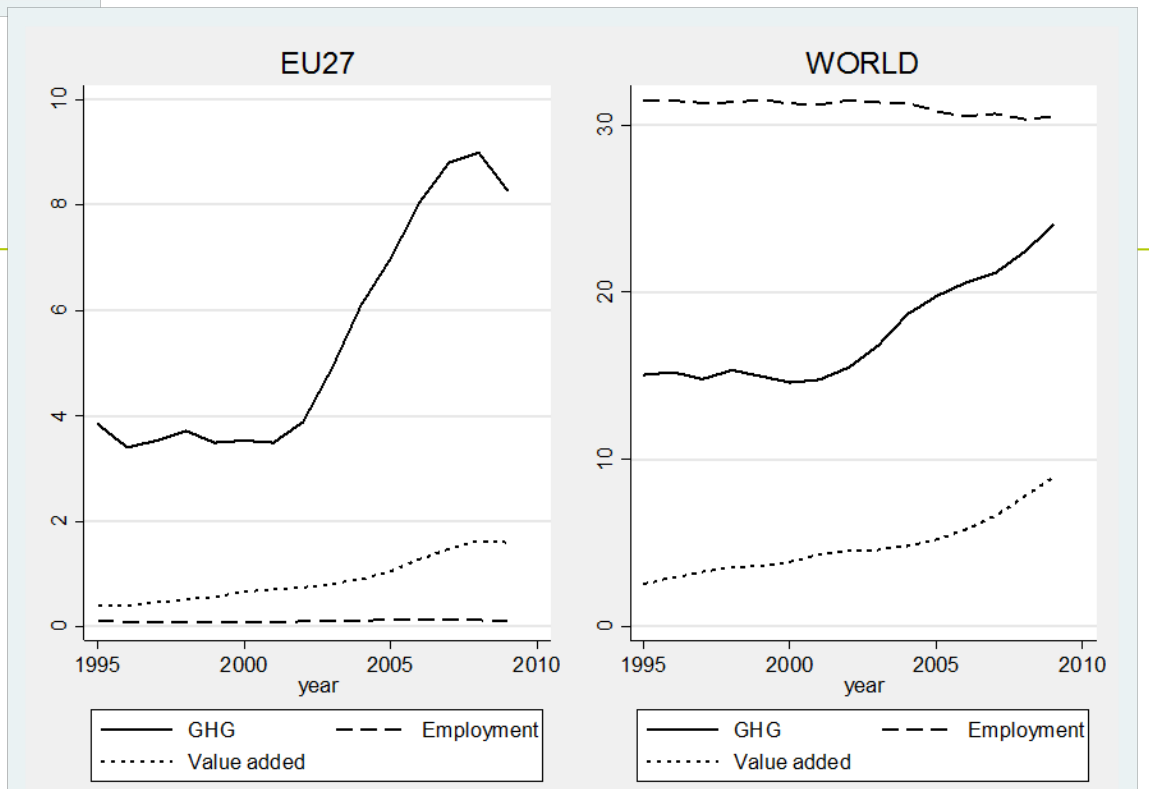


Figure 2- Share of environmental pressures and economic activity occurred in China to satisfy the final demanc and the World. Source of data: WIOD.

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Only in Brazil and Indonesia European demand had a more positive impact on employment

In Asian countries such as China and India, European demand induced a faster growth in GHG emissions than demand from the rest of the world, while the induced employment was nearly 0 and value added increased only between 0 and 5% over the period. On the contrary, in Brazil and Indonesia European as well as world demand had a positive social

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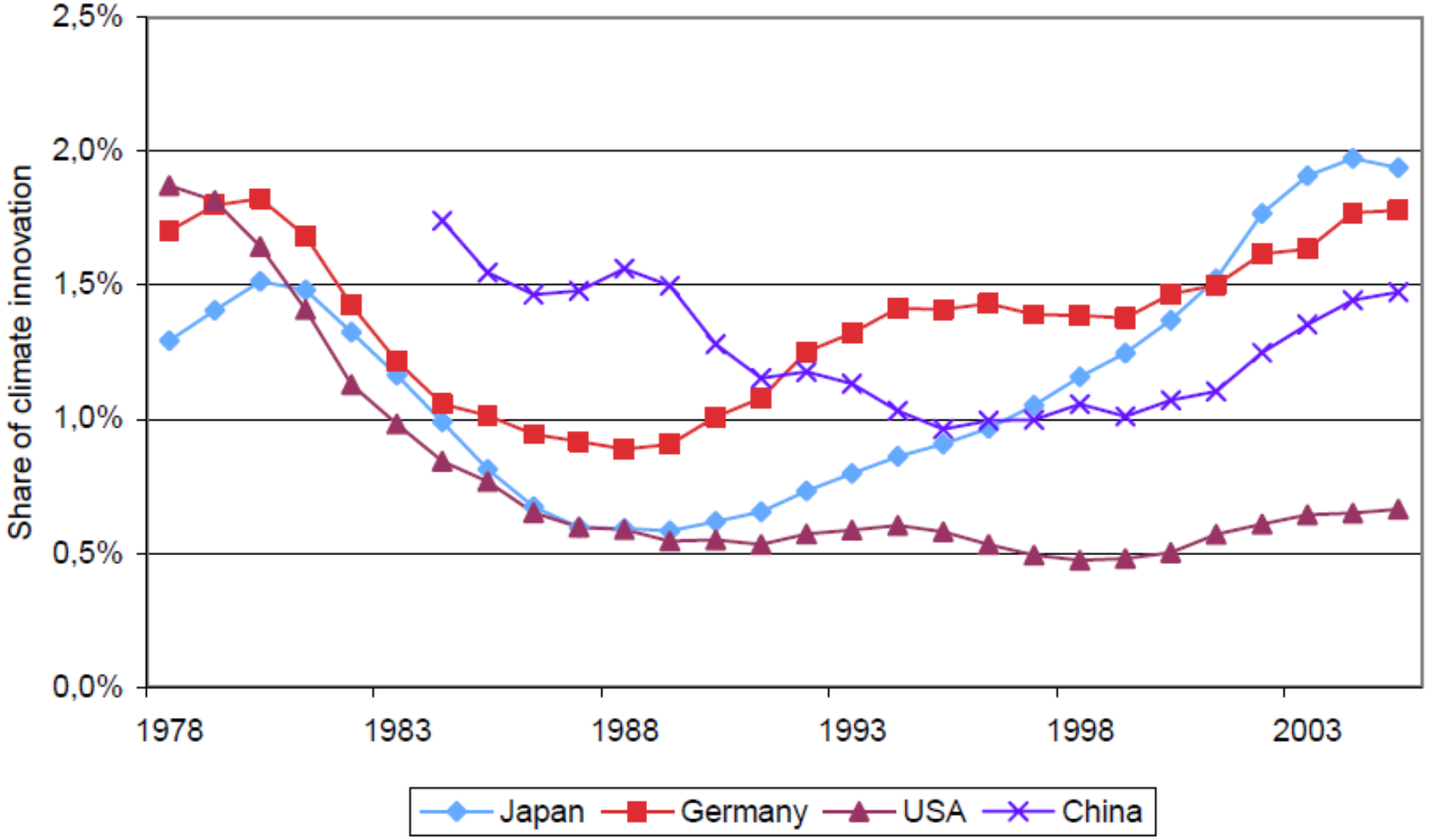
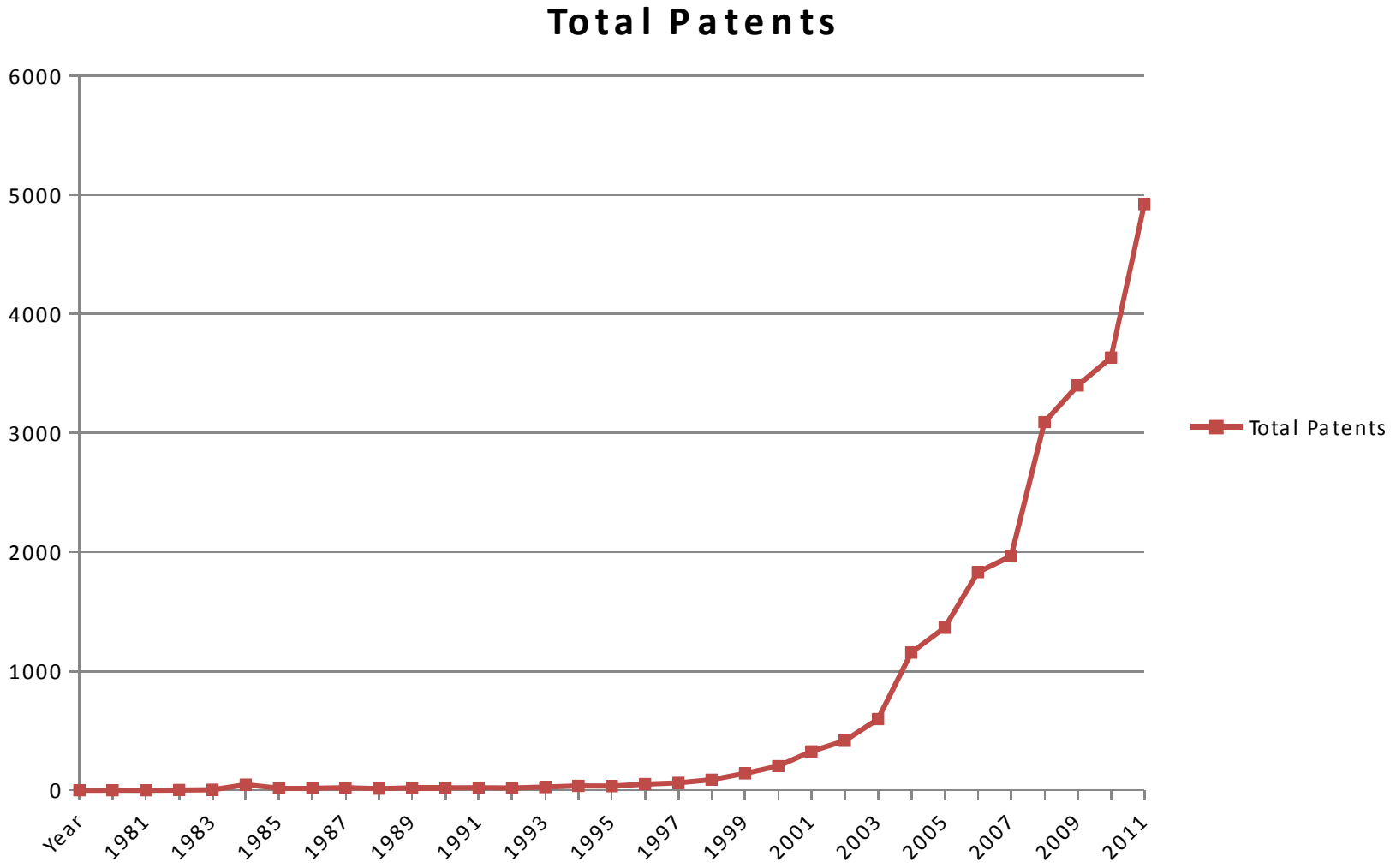
Green Technology

Wei & ZhongXiang, 2016,
China s pursuit of environmentally sustainable development: harnessing the new engine of technological innovation

Figure 2: Share of climate-related innovation in the top 4 inventing countries

Source: Authors' calculations, based on PATSTAT data. Chinese patent data is not available before 1985.





GREEN Patents (EU applications)

Capture, storage, sequestration or disposal of greenhouse gases

Climate change mitigation technologies related to buildings

Climate change mitigation technologies related to energy generation, transmission or distribution

Climate change mitigation technologies related to transportation

Environmental management

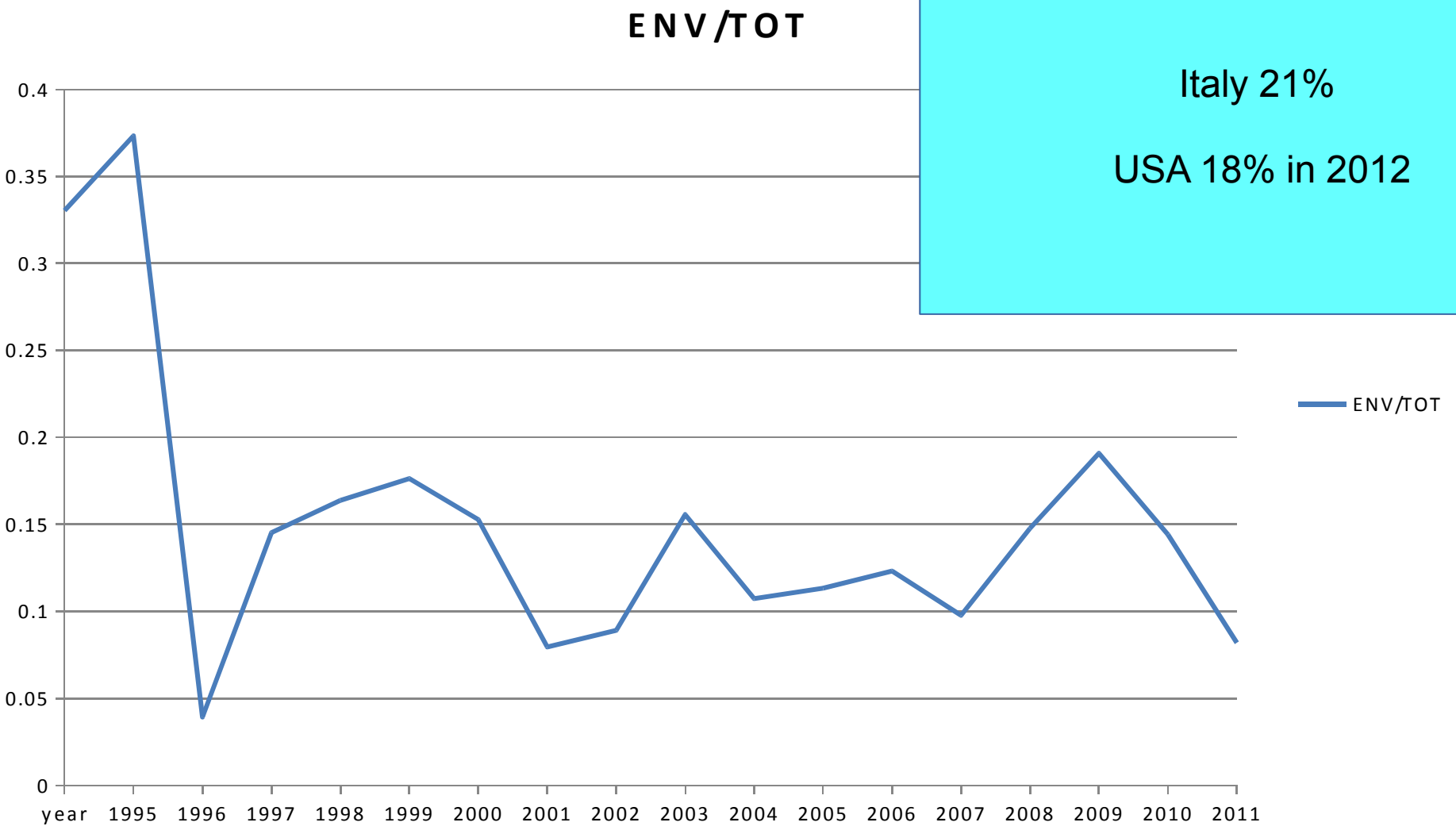
Selected environment-related technologies

Water-related adaptation technologies

Germany 26%

Italy 21%

USA 18% in 2012



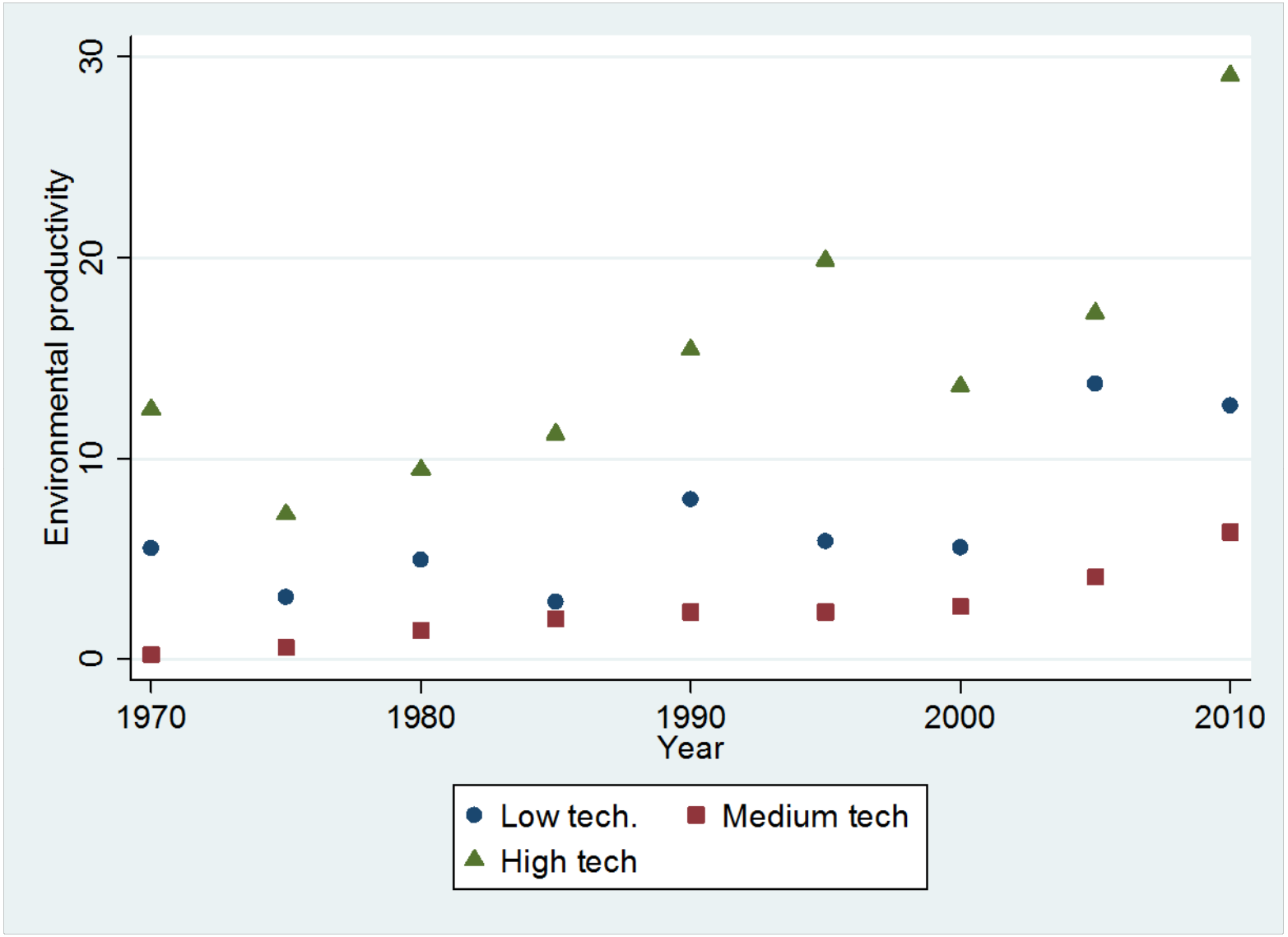
Glachant et al (2011), Review of environmental economics and policy

Country	Rank	Average % of world's inventions	world's high-value inventions	Top 3 technologies (decreasing order)
Japan	1	37.1 %	17.4 % (2)	All technologies
USA	2	11.8 %	13.1 % (3)	Biomass, insulation, solar
Germany†	3	10.0 %	22.2 % (1)	Wind, solar, geothermal
China	4	8.1 %	2.3 % (10)	Cement, geothermal, solar
South Korea	5	6.4 %	4.4 % (6)	Lighting, heating, waste
Russia	6	2.8 %	0.3 % (26)	Cement, hydro, wind
Australia	7	2.5 %	0.9 % (19)	Marine, insulation, hydro
France†	8	2.5 %	5.8 % (4)	Cement, electric & hybrid, insulation
UK†	9	2.0 %	5.2 % (5)	Marine, hydro, wind
Canada	10	1.7 %	3.3 % (8)	Hydro, biomass, wind
Brazil	11	1.2 %	0.2 % (31)	Biomass, hydro, marine
Netherlands†	12	1.1 %	2.1 % (12)	Lighting, geothermal, marine

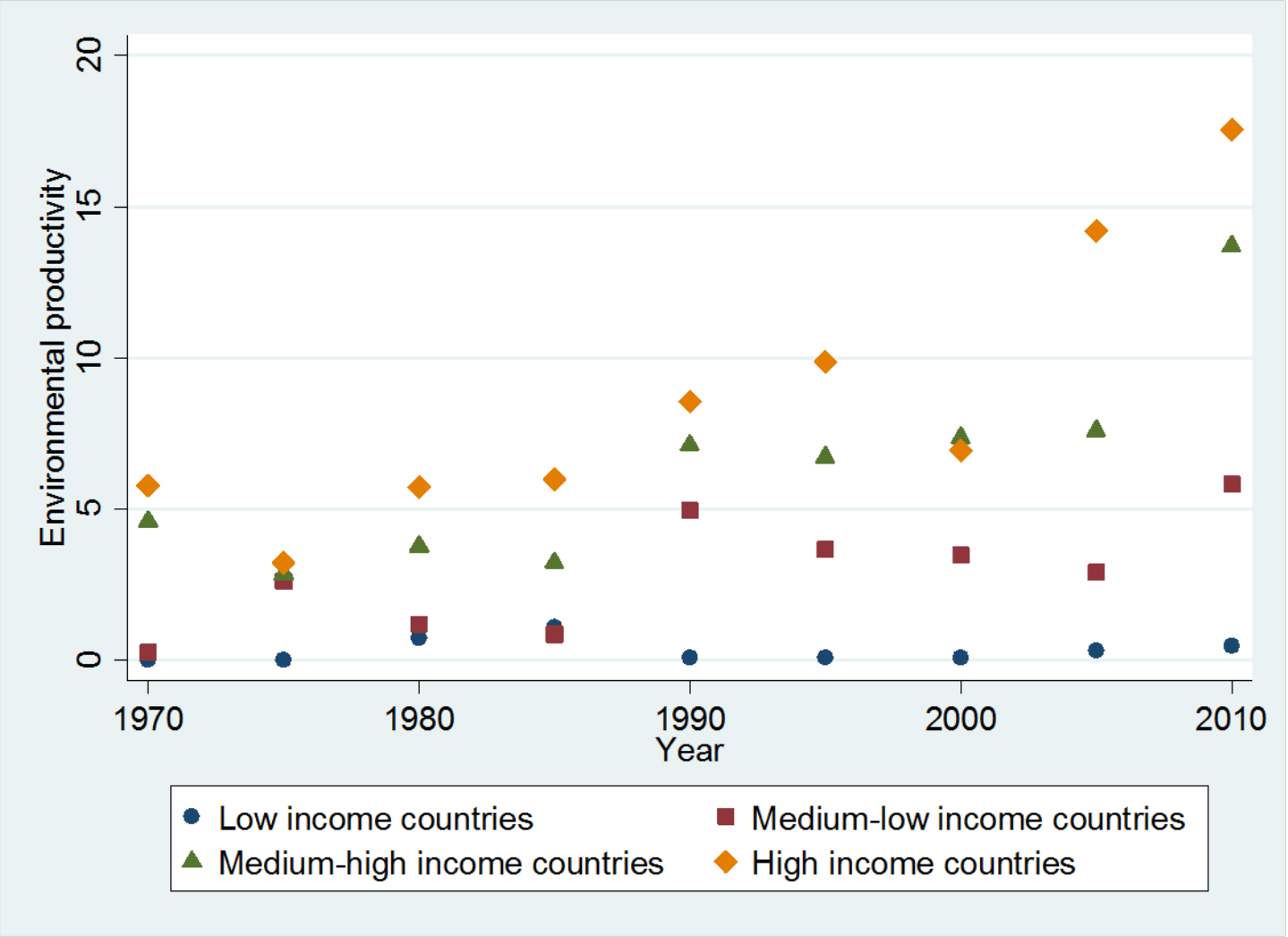
China now leads the **global solar photovoltaic sector.** Seven of the top 10 global solar panel manufacturers in 2013 were based in China. In 2013, a record 13 giga-watts (GW) of capacity were added to a total of 20 GW existing capacity, and the target capacity for 2017 is 70 GW Projections indicate that by 2050,
China will account for about 37 percent of total pho-tovoltaic capacity globally, maintaining its position as world market leader (IEA 2014b).
Solar photovoltaic prices decreased from around $4 in 2008 to $0.8 per watt in 2012. They are forecast to drop to $0.40 per watt by 2035, assuming that big efforts are still made to increase solar photovoltaic capacity. (IEA 2014b). In the Chinese solar photovoltaic value chain, 1.6 million people were employed in 2013, up from 0.3–0.5 million in 2011

UNIDO IDR 2015

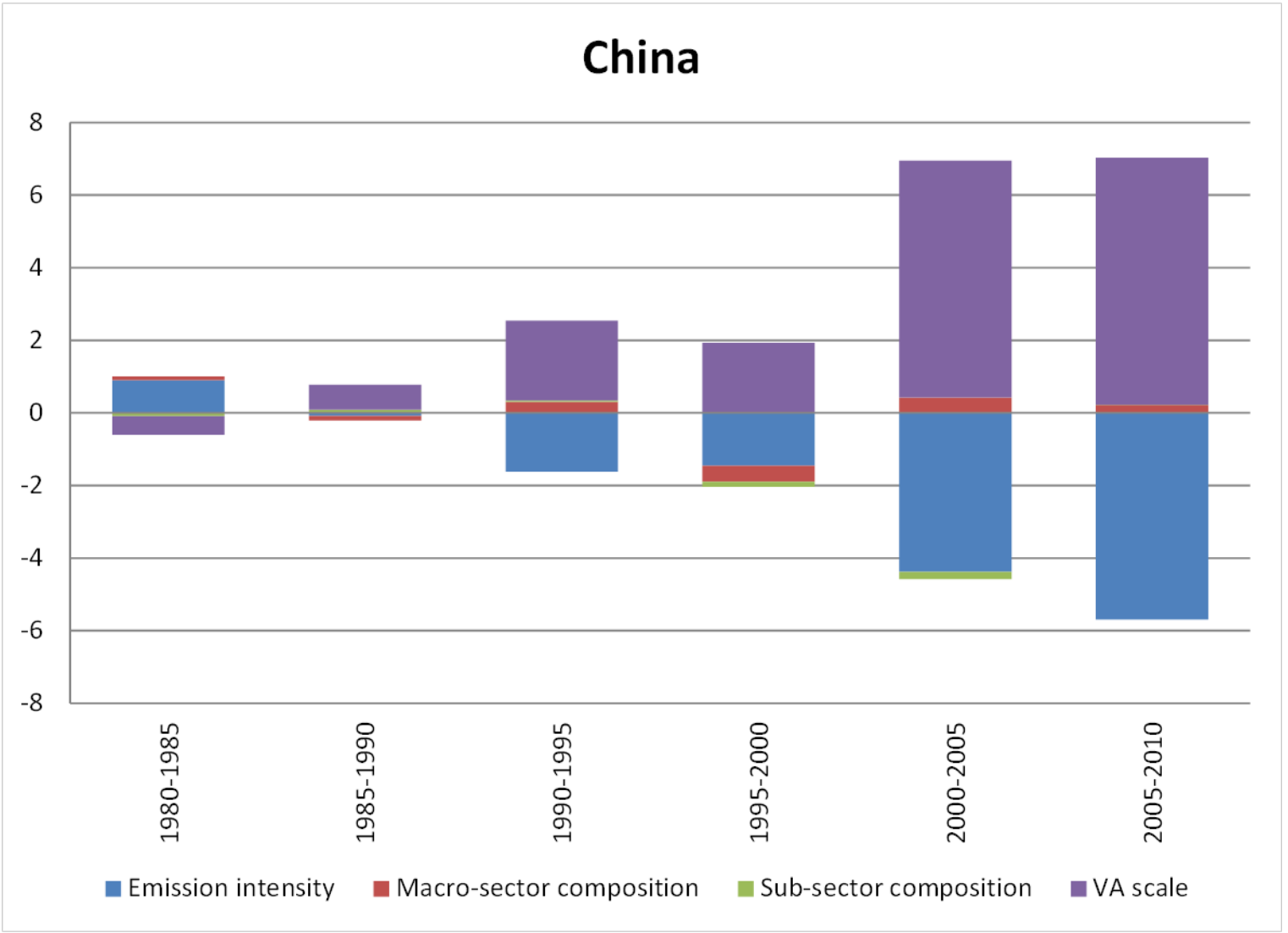
Environmental productivity (VA/CO2) by technology classes (UNIDO categori

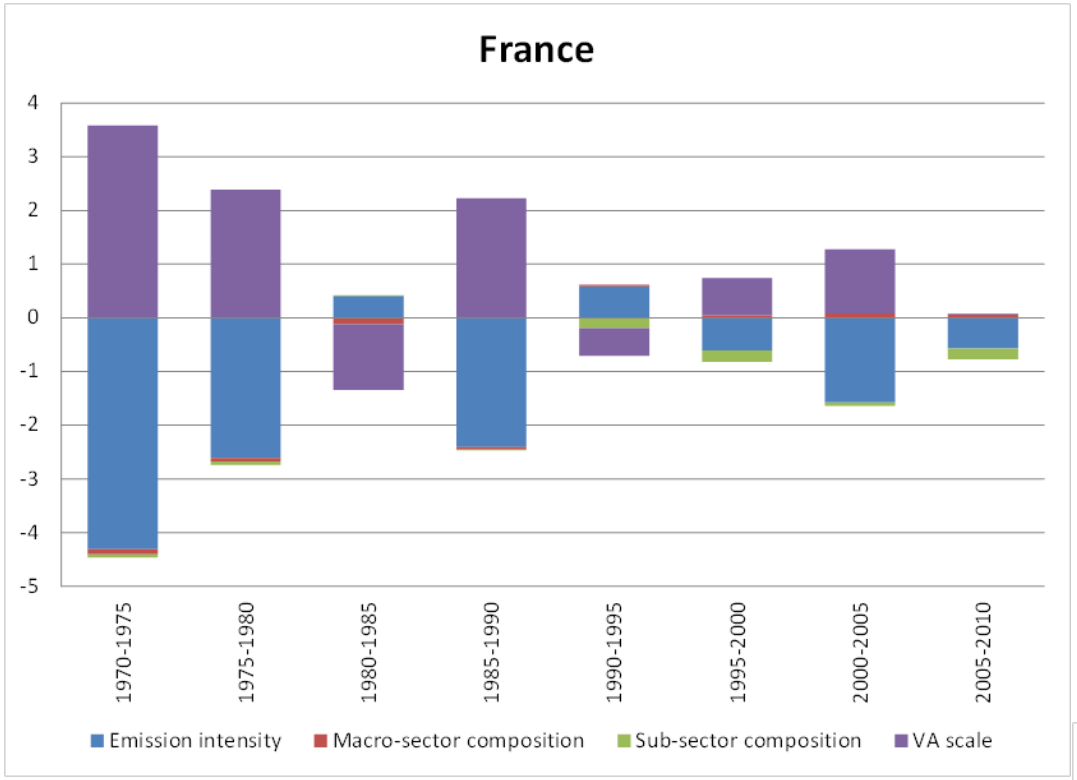


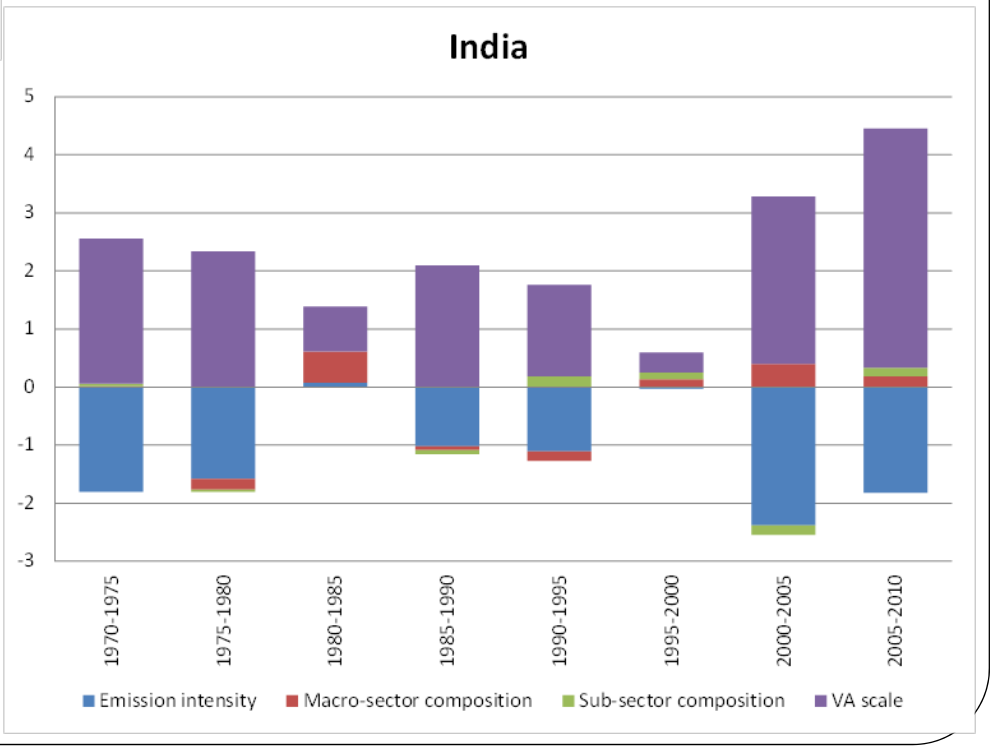
Environmental productivity (VA/CO2) by income level (World Bank categorie

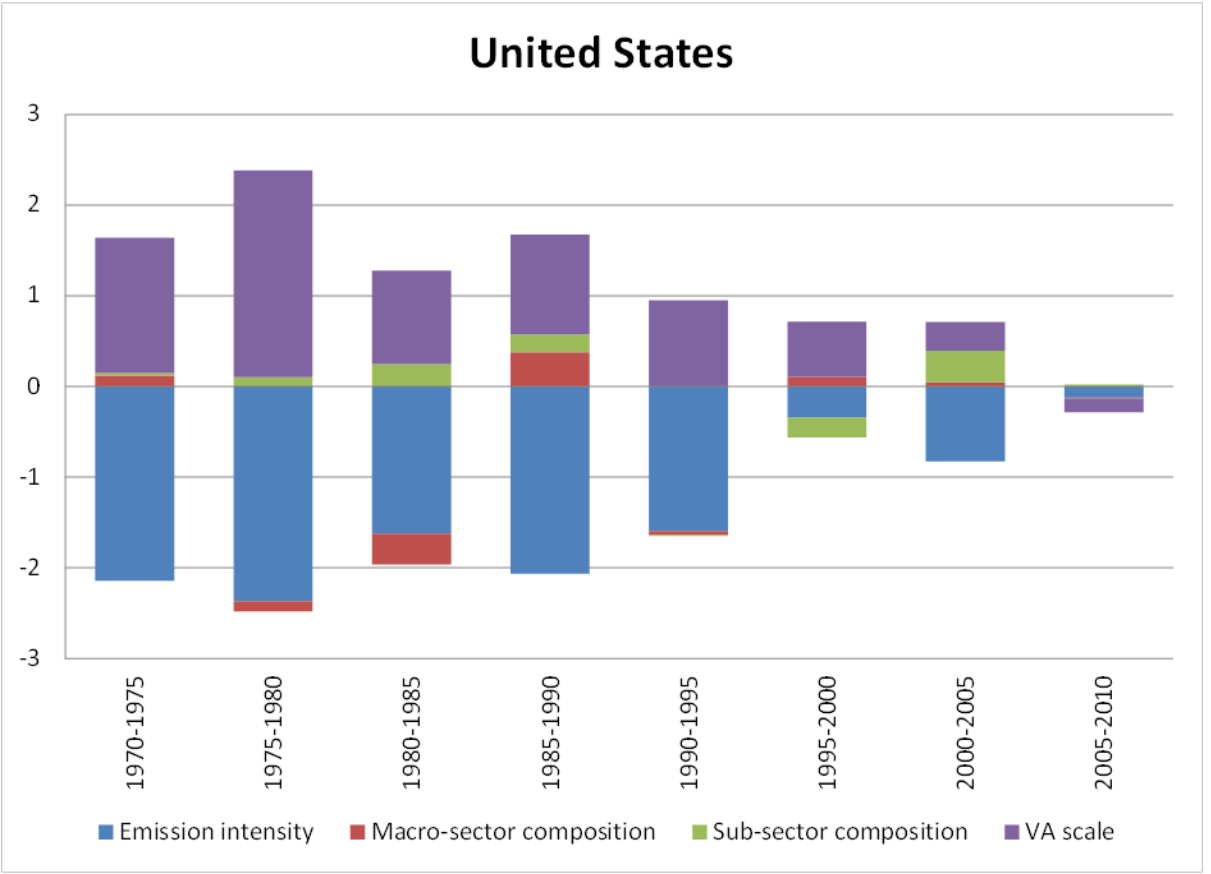


Decomposition of CO2 emissions from manufacturing sectors in selected countries




France
4
3
2
1
0
-1
-2
-3
-4
-5
1970-1975
1975-1980
1980-1985
1985-1990
1990-1995
1995-2000
2000-2005
2005-2010
Emission intensity
Macro-sector composition
Sub-sector composition
VA scale


India
5
4
3
2
1
0
-1
-2
-3
1970-1975
1975-1980
1980-1985
1985-1990
1990-1995
1995-2000
2000-2005
2005-2010
Emission intensity
Macro-sector composition
Sub-sector composition
VA scale


United States
3
2
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-2
-3
1970-1975
1975-1980
1980-1985
1985-1990
1990-1995
1995-2000
2000-2005
2005-2010
Emission intensity
Macro-sector composition
Sub-sector composition
VA scale

two high income countries, such as France and the United states, they have been characterized by a relevant role of the emission intensity component in reducing emissions up until the beginning of the 1990s, *but after that date the technological effect tends to lose relevance*. Similarly, the scale effect is initially big and positive, and then starts to decline in the last two decades.

On the contrary, India and especially China show the *opposite evidence, having the increasing trend of the scale effect linked to the strong industrialisation experienced in the last decade by these two countries and being associated by an increasingly relevant role of the emission*

- creating a ***green catching up*** for those countries that are exposed to green knowledge

to use such knowledge to avoid the rise of a "pollution haven"

China towards 2030 targets

Green remanufacturing and reskilling

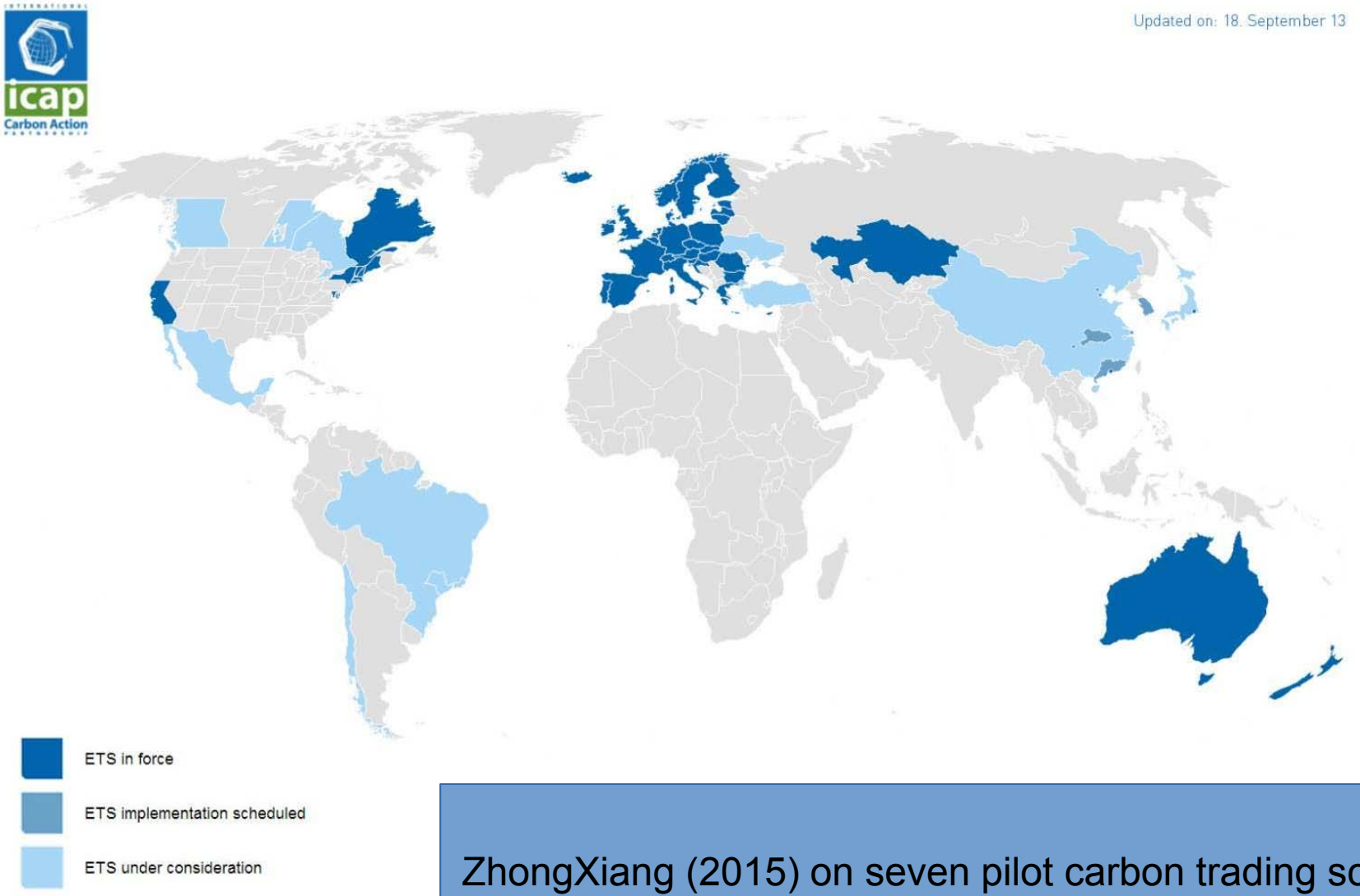
(strict connection with EU climate policy and remanufacturing strategy)

Emission intensity-Technology link and composition 'drivers' to be assessed often

Investing on input output data and regional data to inrepret better the economy

Climate policy regionalised implementation as well…..

Borghesi S. Cainelli G. Mazzanti M. (2015),
Linking emission trading to environmental innovation, Research Policy, 44



ZhongXiang (2015) on seven pilot carbon trading schemes: china opts for trdaing rather than taxes

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www.sustainability-seeds.org/

H2020 eco innovation project

www.inno4sd.net/Team/