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**Institute of Agricultural and Food Economics –
National Research Institute, Warsaw, Poland**

ENVIRONMENTAL EXPENSES AND INNOVATIONS IN CONTRAST WITH ECONOMIC DEVELOPMENT

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***INTERNATIONAL CONFERENCE “ECONOMY VERSUS
THE ENVIRONMENT – COMPETIVENESS
OR COMPLEMENTARITY”***

Jachranka, 23-25 November, 2015



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Motivation

- The Conference Topic:
 - Short Run Development – Substitution?
 - Long Run Development – Complementarity?
 - Mixed relationship – Lack of uniformity?
- The Idea of “Green Growth”:
 - Environmental Limits to Grow
 - Possibility of compromising between economic growth and environmental protection
 - Measuring the green growth in the socio-economic context



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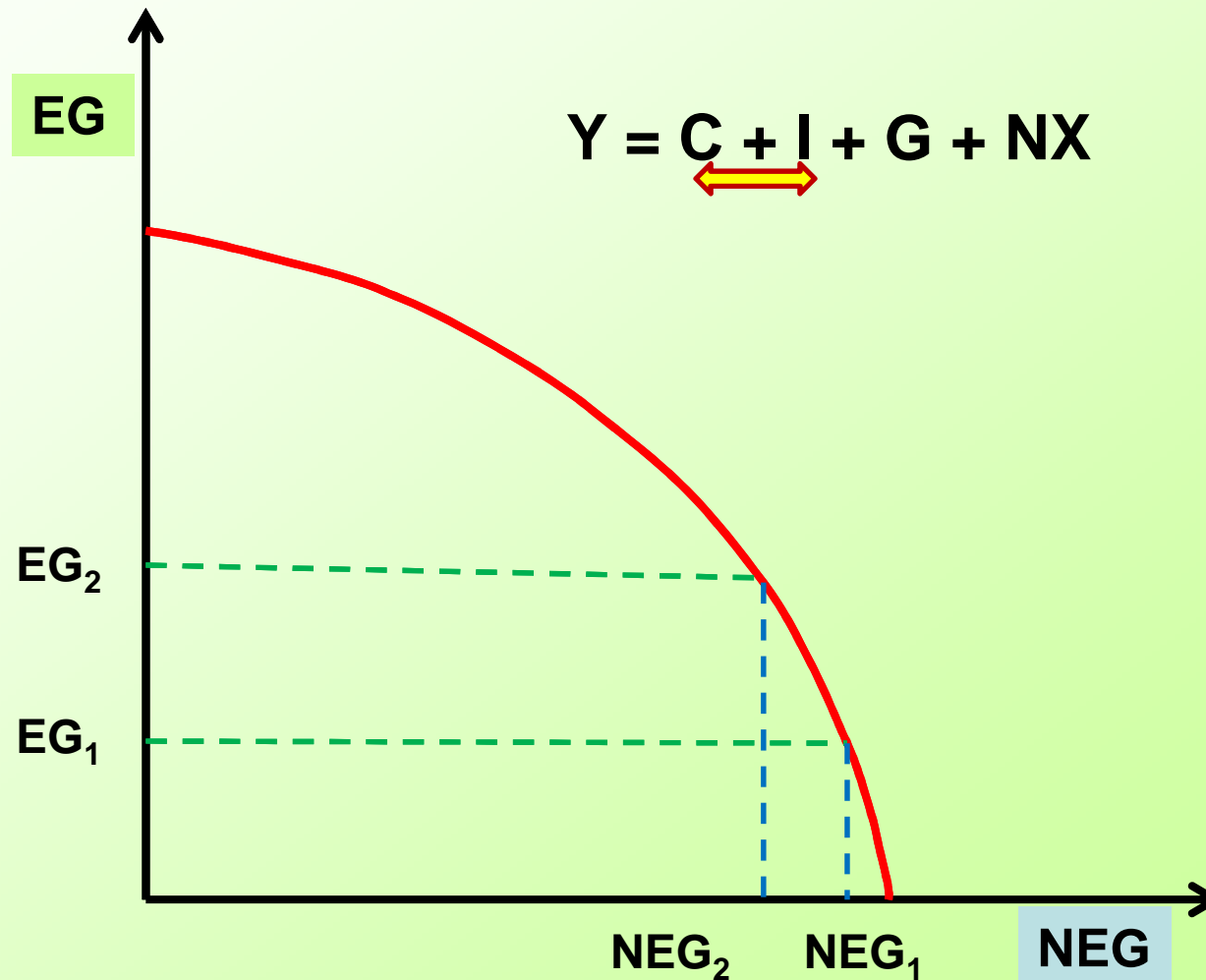
Objectives

- Discuss briefly some theoretical aspects of the problem with main focus on the mechanism potentially stimulating economic growth;
- Highlight the issue of the green growth and its measurement;
- Present preliminary results of an empirical analysis aimed at confirmation of formulated theoretical assumptions and identification of linkages between environmental expenses, environmental innovation and economic growth;
- Attempt to formulate recommendations how Poland's policies should be shaped in the context of the green growth, particularly in comparison with the EU countries.



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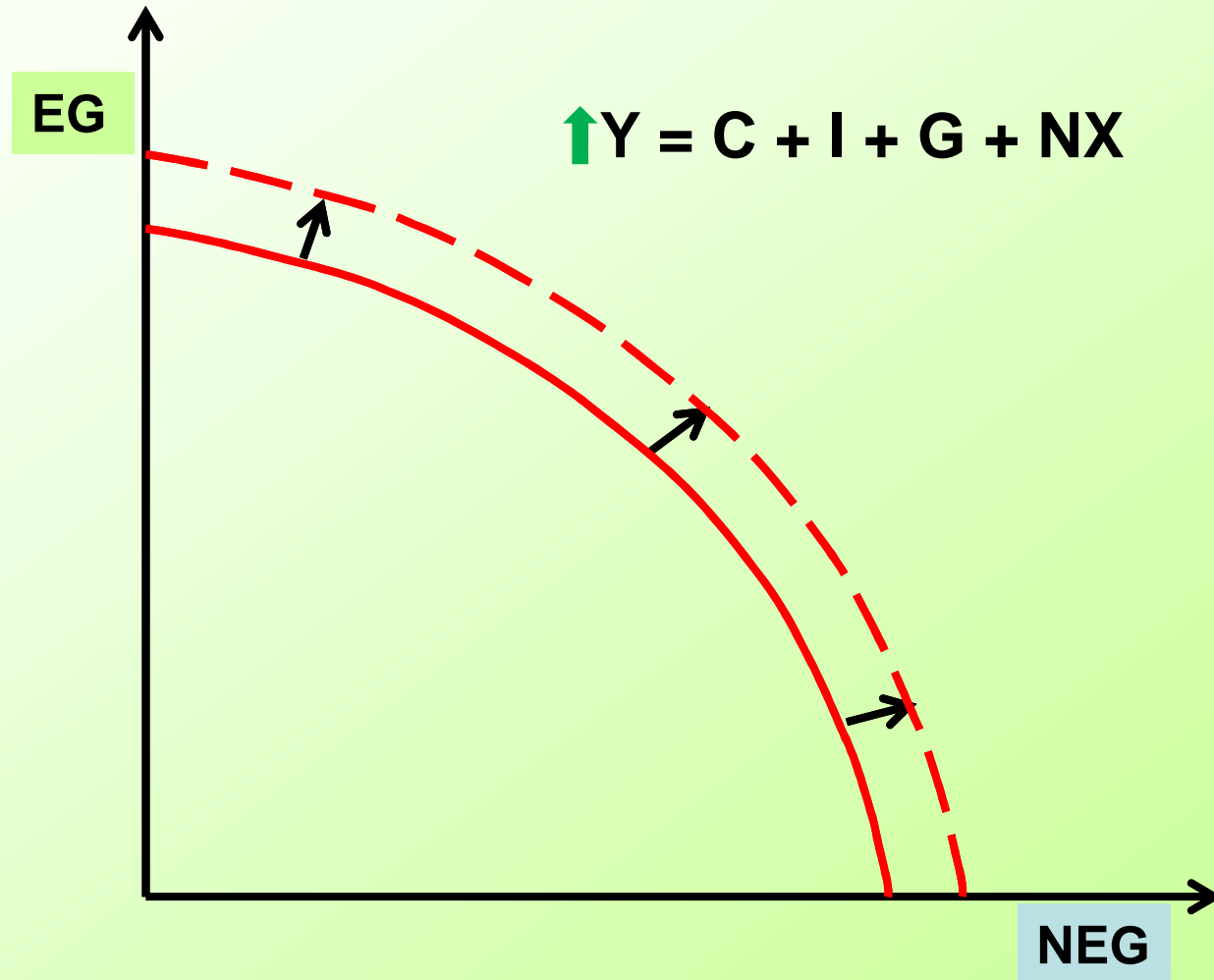
A Simple Theoretical Background (I)





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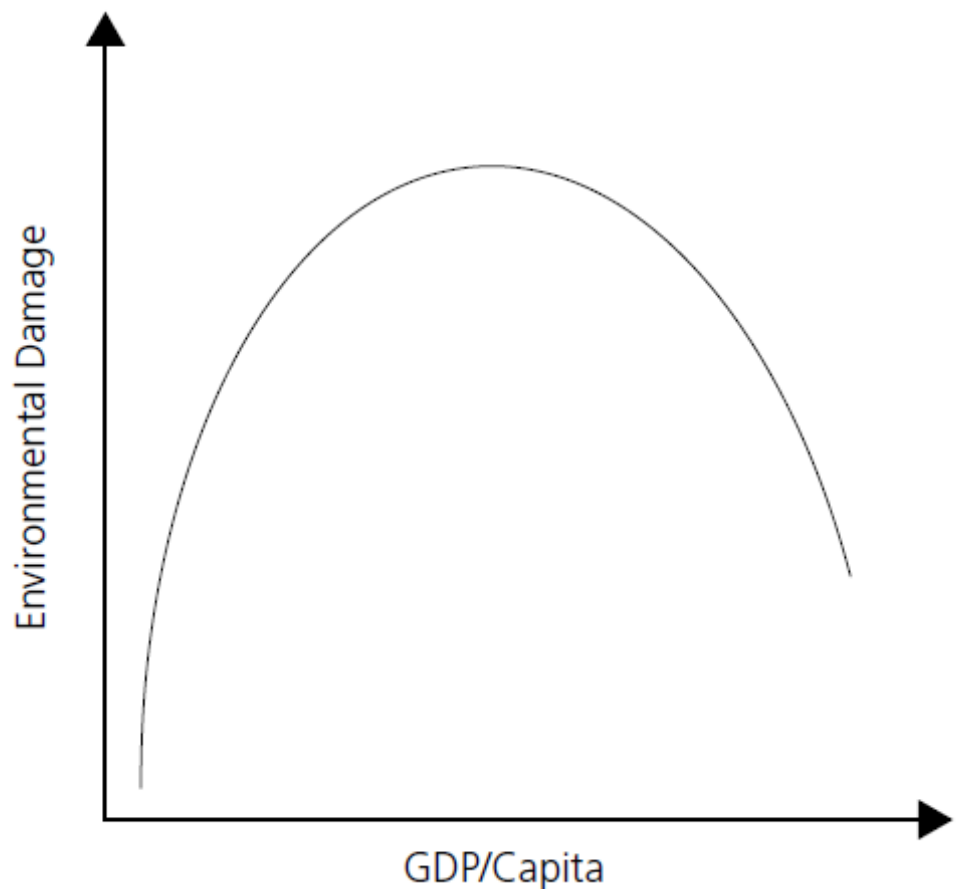
A Simple Theoretical Background (II)





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More advanced theoretical view on Economy vs. Environment Dynamics



Why?

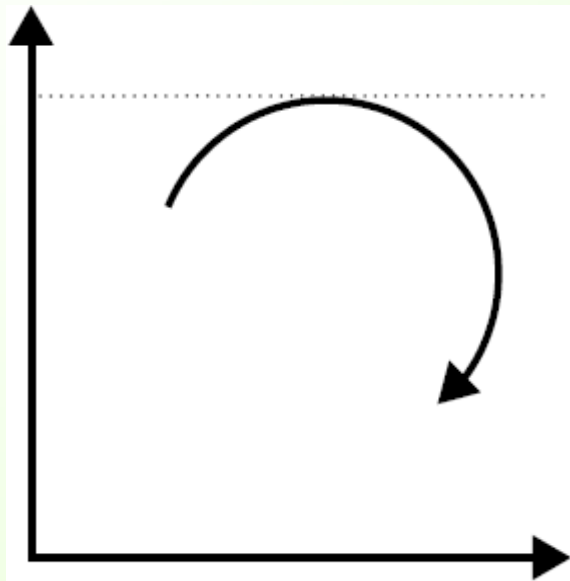
- at low incomes, pollution abatement is undesirable as individuals are better off using their limited income to meet their basic consumption needs;
- once a certain level of income is achieved, individuals begin considering the trade-off between environmental quality and consumption, and environmental damage increases at a lower rate;
- after a certain point, spending on abatement dominates as individuals prefer improvements in environmental quality over further consumption, and environmental quality begins to improve alongside economic growth.



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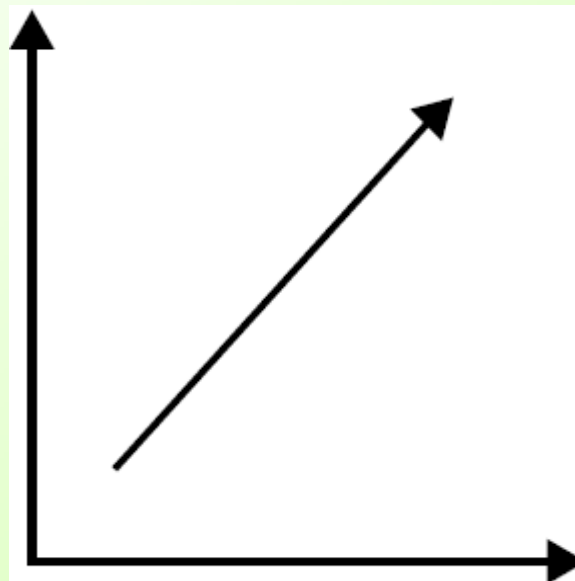
Alternative views of the GDP growth and environmental damage relationship

Limits Theory



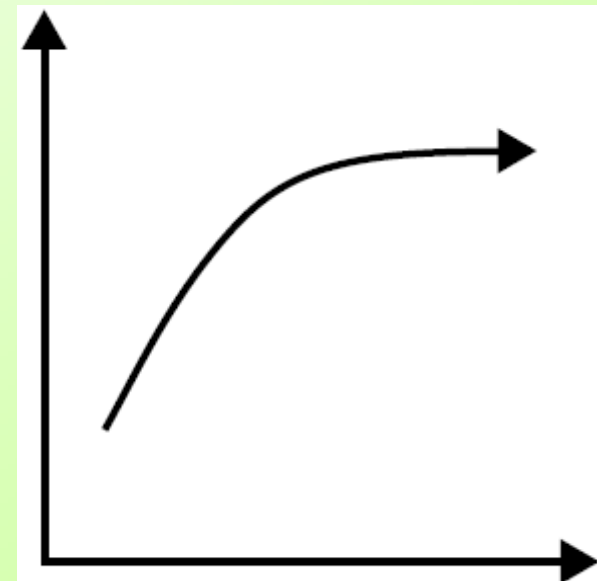
Possibility of breaching environmental thresholds before the economy reaches the EKC turning point.

New Toxic View



Possibility that environmental damage continues to increase as economies grow.

Race to the Bottom



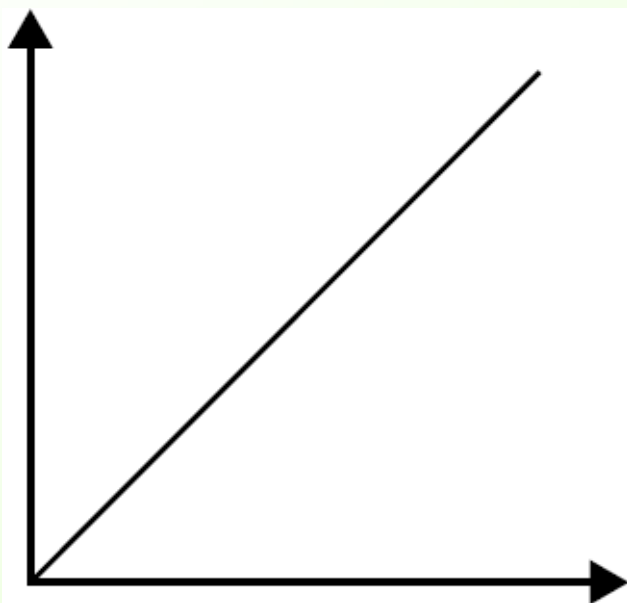
Environmental damage increases, up to the point when developed countries start reducing their environmental impact.



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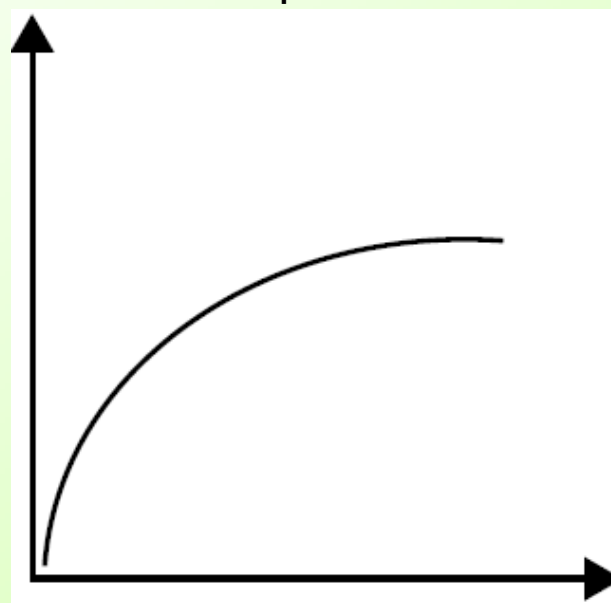
Drivers of the economy – environment relationship

Scale Effect



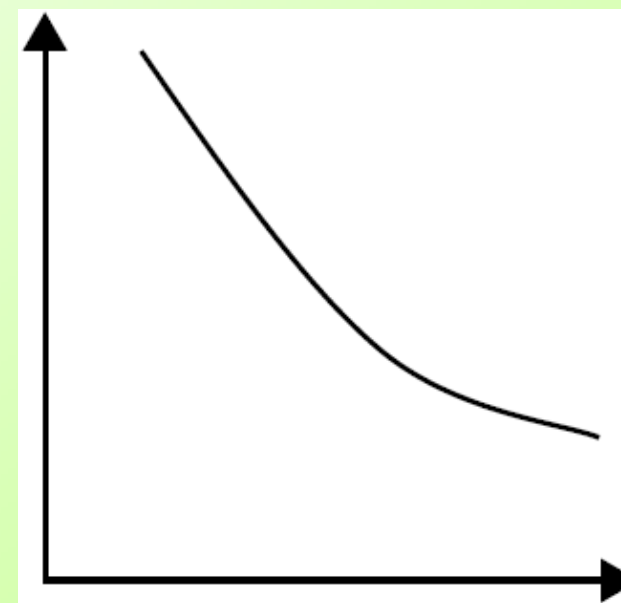
Economic growth has a negative effect on the environment along with increased production and consumption

Composition Effect



The composition of production changes along the growth path reducing domestic environmental damage

Technical Effect



Technological developments lead to a change in the environmental impacts of production.



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The idea of the Green Growth

"Green and growth go very well together. Green growth means we go for growth, we recover GDP... but we preserve and we actually enhance the endowment of natural resources that we were provided with, and which today are sustaining the economic activity on our planet."

Ángel Gurría, OECD Secretary-General

Two key challenges to be met:

- expanding economic opportunities for all in the context of a growing global population;
- addressing environmental pressures.

Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyze **investment** and **innovation** which will underpin sustained growth and give rise to new economic opportunities.



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The Green Growth Indicators by the OECD

- Environmental and resource productivity:
CO₂ productivity, energy productivity, non-energy material productivity;
- Natural asset base:
freshwater resources, land resources, wildlife resources;
- Environmental dimension of quality of life:
access to sewage treatment;
- Economic opportunities and policy responses:
technology and innovation (R&D), technology and innovation (patents),
international financial flows (official development assistance),
environmental taxes and transfers;
- Socio-economic context:
real GDP (index 1990=100), real GDP per capita, Population density
(inhabitants per km²), labor tax revenue (% GDP).



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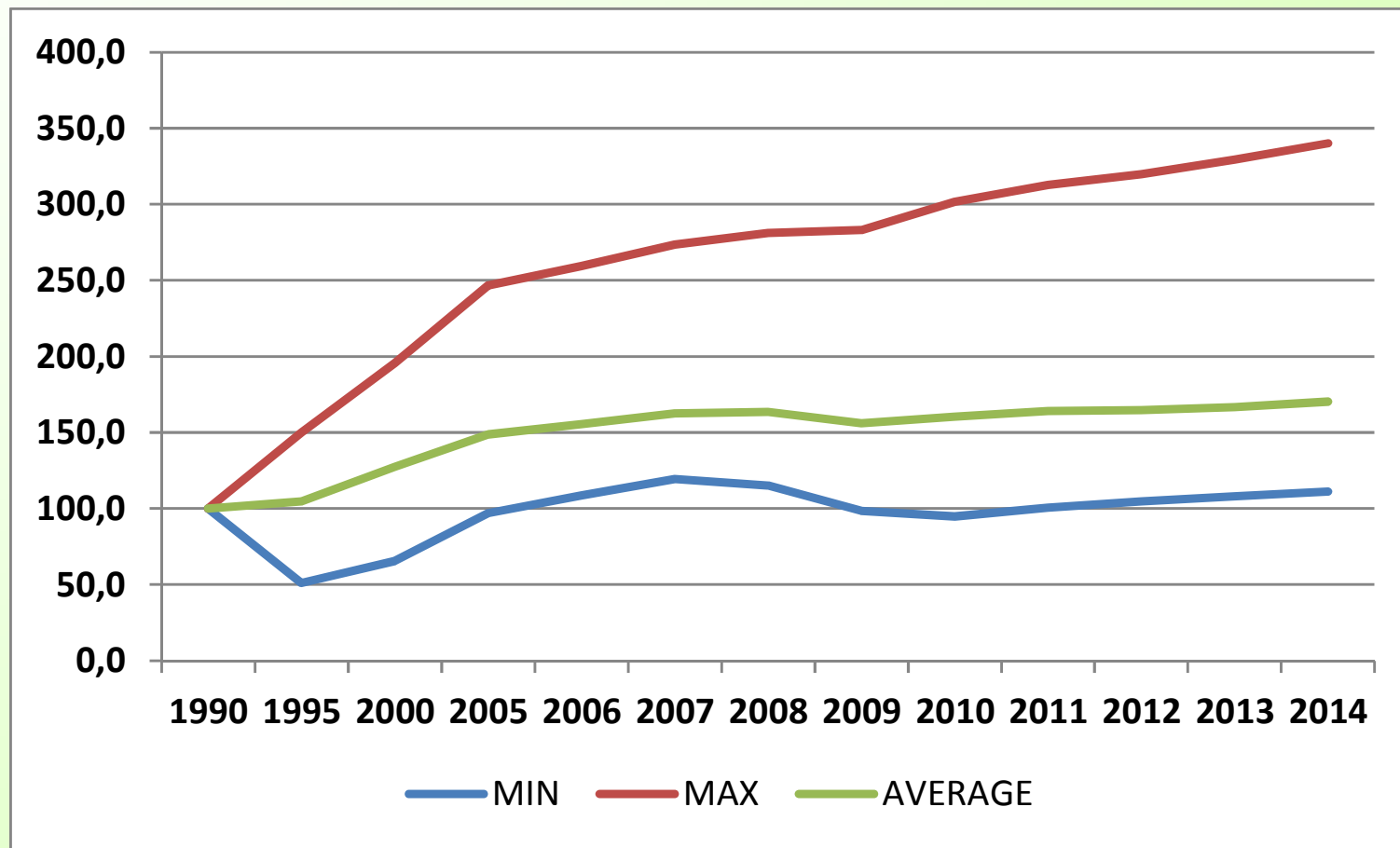
Scope of the analysis

- **Variables:** Development of environment-related technologies, inventions per capita (number) and total environmental protection expenditures in the context of the GDP growth and GDP per capita (real and PPP US dollar).
- **31 Countries:** Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.
- **20 Countries:** Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Korea, Luxembourg, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Turkey, and United Kingdom.
- **Period:** 1995-2014 and 1995-2012



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Results of the empirical analysis (I) Economic growth of the studied Countries, Real GDP (Index 1990=100)



Source: Own calculations based on the OECD data



Results of the empirical analysis (II)

Real GDP per capita (US Dollar) and development of environment-related technologies, inventions per capita (number)

Item	Number of countries	Names of countries
Lack of statistically significant correlation	8	AUS, DNK, GRC, LV, LTU, SVK, SVN, SWE
Moderate correlation (0,5-07)	8	EST, HUNG, IRL, ITA, LUX, NLD, CHE, TUR
Strong correlation (> 0,7)	15	AUT, BEL, CAN, CZE, FIN, FRA, DEU, JPN, KOR, NOR, POL, PRT, ESP, GBR, USA

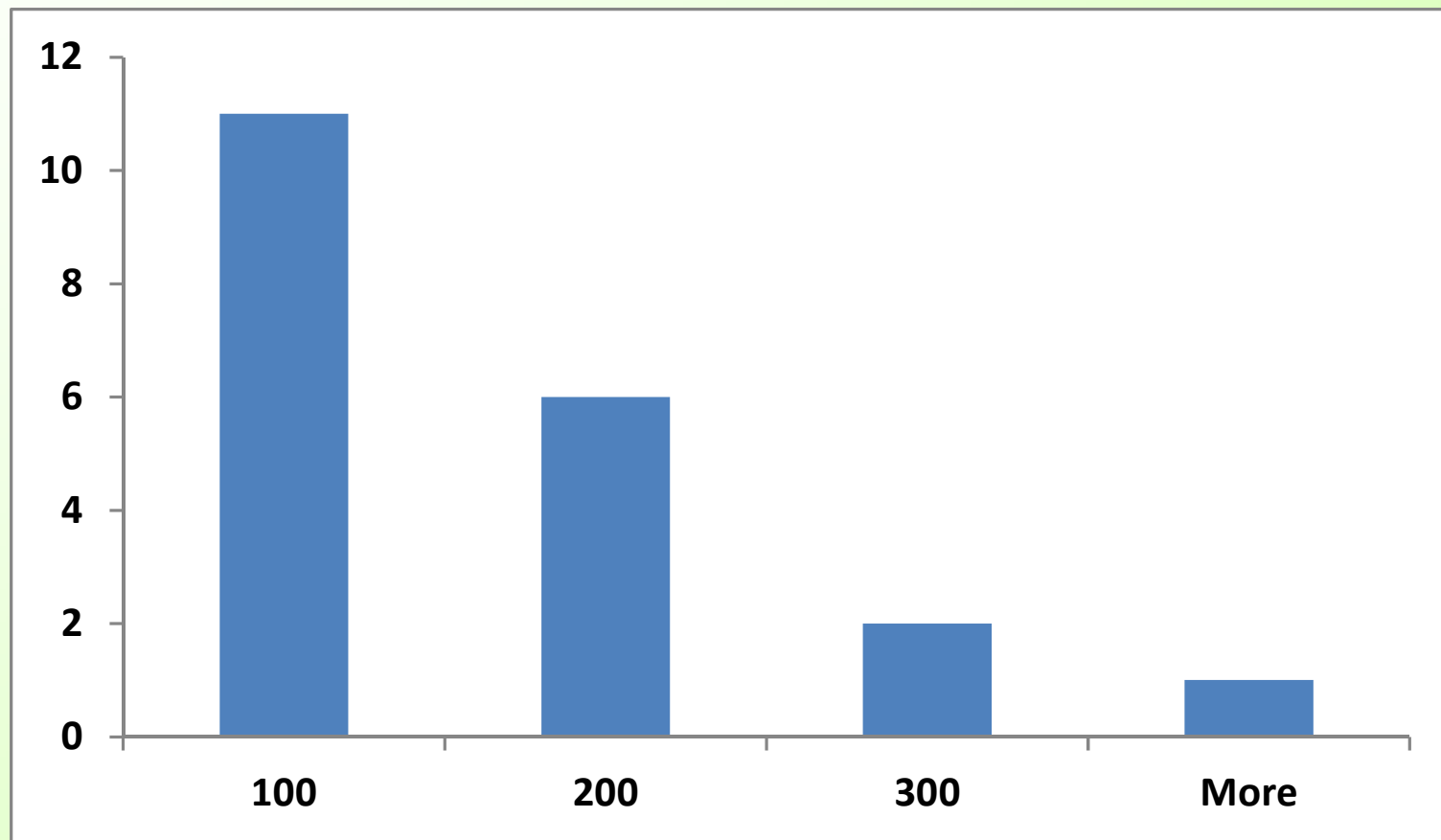
Source: Own calculations based on the OECD data



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Results of the empirical analysis (III)

Empirical distribution of the TEPE (USD 2010 PPP per capita)



Source: Own calculations based on the OECD data



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Results of empirical analysis (IV) The TEPE and GDP per capita (US Dollar)

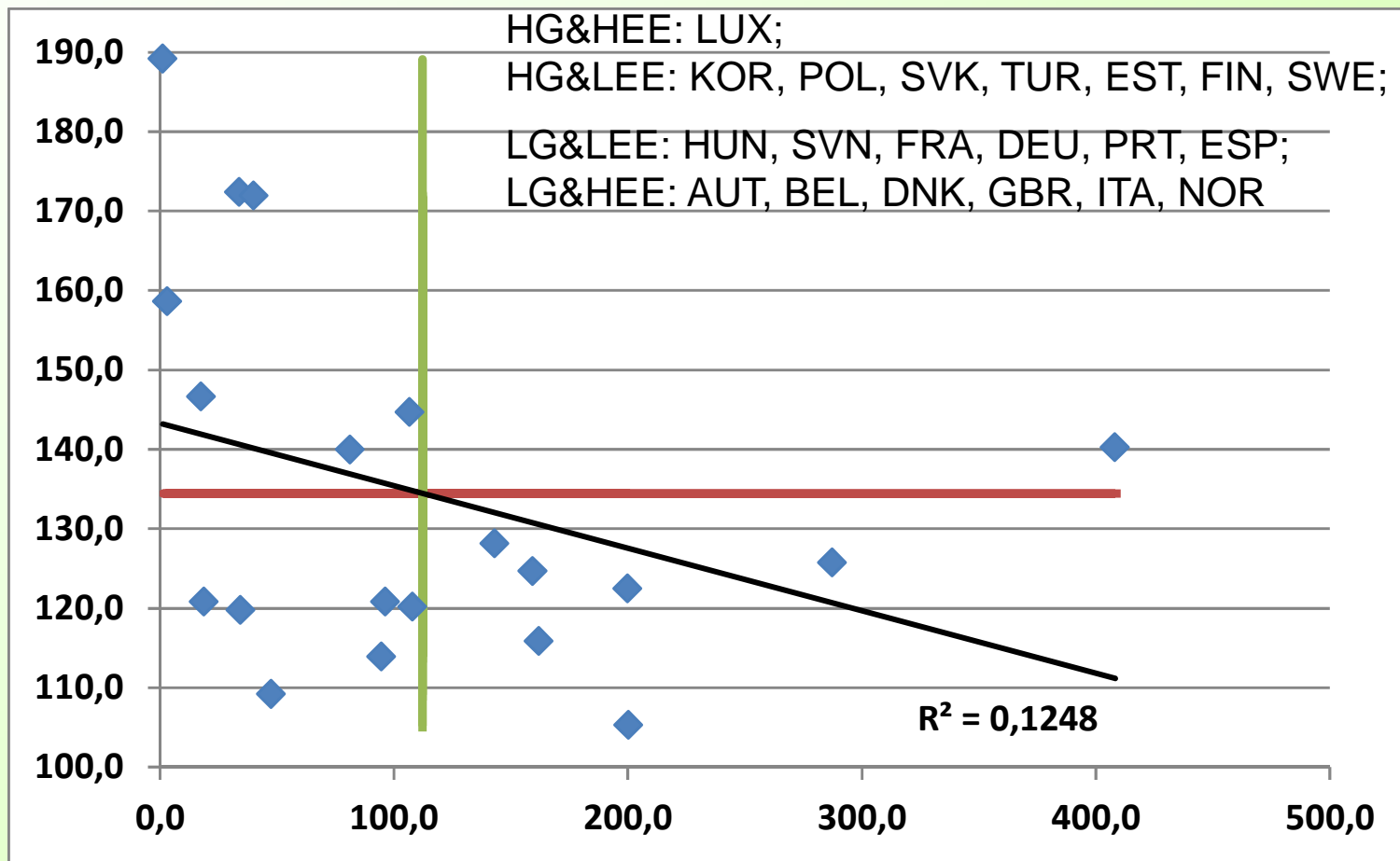
Item	Number of countries	Names of countries
Lack of statistically significant correlation	6	AUS, EST, HUN, ITA, LUX, POL
Moderate correlation (0,5-07)	4	DNK, PRT, SVK, SVN
Strong correlation (> 0,7)	10	BEL, FIN, FRA, DEU, KOR, NOR, ESP, SWE, TUR, GBR

Source: Own calculations based on the OECD data



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Results of the empirical analysis (V) The TEPE and the GDP Growth



Source: Own calculations based on the OECD data



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Final Remarks & Conclusions

- The issue is complex and interrelations between the economy and the economic growth are multidimensional, therefore drawing straightforward conclusions is virtually impossible;
- The demand for a clean and healthy natural environment provides opportunities for employment and wealth creation;
- A short run should be distinguished from a long run approach – clear connectedness with the level of a country economic development;
- The outcomes depend on prevailing economic growth orientation – exploitation vs. preservation policies;



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Final Remarks & Conclusions

- Results of our empirical suggest:
 - Higher GDP per capita favors environment friendly economic activities and more efficient use of natural resources (e.g. innovations);
 - High economic grow rates are being usually achieved in expense of the natural environment (low environmental protection expenditures);
 - The green growth approach offers some opportunities for economic development
- Poland seem to be “stuck” between pursuing a high growth rate and moderately moving towards a green growth model



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Thank you for your attention