# Natural Capital and Regional Growth: Insights from the EU

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# Acknowledgement and disclaimers

Based on a paper prepared by Giannakis Elias[1],Grammatikopoulou Ioanna[2], Zurbaran Nucci Mayra[2], La Notte Alessandra[2] and Pisani Domenico[2], Maes Joachim[3]

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*Work in progress*

# Context



The European Green Deal
Striving to be the first climate-neutral continent

- The European Green Deal and the green transition as a new growth strategy

- Natural capital (NC) plays a key role but evidence is lacking about its relationship with economic growth

- Production functions incorrectly attribute the productive contribution of NC to capital and labour productivities and Total Factor Productivity (TFP)

- Limited research has examined the spatial spillover effects of NC

- We aim to integrate NC into a growth accounting framework and assess its contribution to regional growth

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# The request

A policy request has been submitted by DG REGIO with reference to the:

1. the dependency of regions on NC and the contribution of regional ecosystem services to the regional GDP.

2. The support of rural regions to urban or cities in terms of ecosystem services provision considering interregional flows.

**Aim**: provide evidence for increasing the cohesion policy funds planned for biodiversity investments that would shape the next EU Cohesion Policy programming period (2028 to 2035).

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# Natural capital and growth

Definition of NC

- resources (finite and renewable) + ecosystem assets (ref: SNA 2025)

- Stock of assets that provide flow of services

- Within and outside production boundary (use and non-use values)

NC and growth

- NC as resource curse (e.g. Qiang and Jian, 2020)

- NC as catalyst into economic development and well-being (e.g. Barbier, 2021)

# Objectives and main findings of paper

## Objectives

- Integrate NC into a growth accounting framework

- Asses direct contribution and the spatial spillover effects

## Main findings

- Detect local spatial patterns

- Positive and statistically significant contribution of NC in own (direct) and in neighbouring regions (indirect)

- High investment return in regions with high direct and indirect contribution

- Targeted intervention in regions with low contribution

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# Methods

**Theoretical model**: Cobb-Douglas aggregate production function

$Y = AL^a N^b K^c$ where **Y**: total output, **L**: labor, **K**:produced capital and **N**: the flow of ecosystem services provided by the natural capital stock

**Specification:**

$$\ln y_{it} = a_0 + a \ln \ell_{it} + \boxed{b \ln n_{it-1}} + c \ln k_{it} + \varepsilon_{it}$$

Spatial dependency: global and local Moran's **I** statistic

W: spatial weights matrix
Ω: region-specific fixed effects

**Spatial Durbin Model (SDM):**

$$\ln y_{it} = a_0 + a \ln \ell_{it} + b \ln n_{it-1} + c \ln k_{it} + \rho W y_{it} + W \ln \Omega_{it}\theta + a_i + \delta t + \varepsilon_{it}$$

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# Data

**Regional economic output:**

- Gross added value of EU NUTS 2 regions

**Labour:**

- Sum of the compensation of employees and the compensation of self-employed

**Natural capital:**

- The monetary estimates of **the flow of seven ecosystem services** (sourced from INCA project)

- Variables are measured in million euros at constant 2015 prices.

- Panel data of 222 Nuts-2 regions, covering **three accounting years: 2006, 2012, 2018**

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# Results: Geographical distribution and spatial dependency

- Geographic distribution of NC value in year 2000 and in year 2012

- **Hot spot** areas indicate concentrations of high-value regions adjacent to other high-value regions in year 2000 and in year 2012

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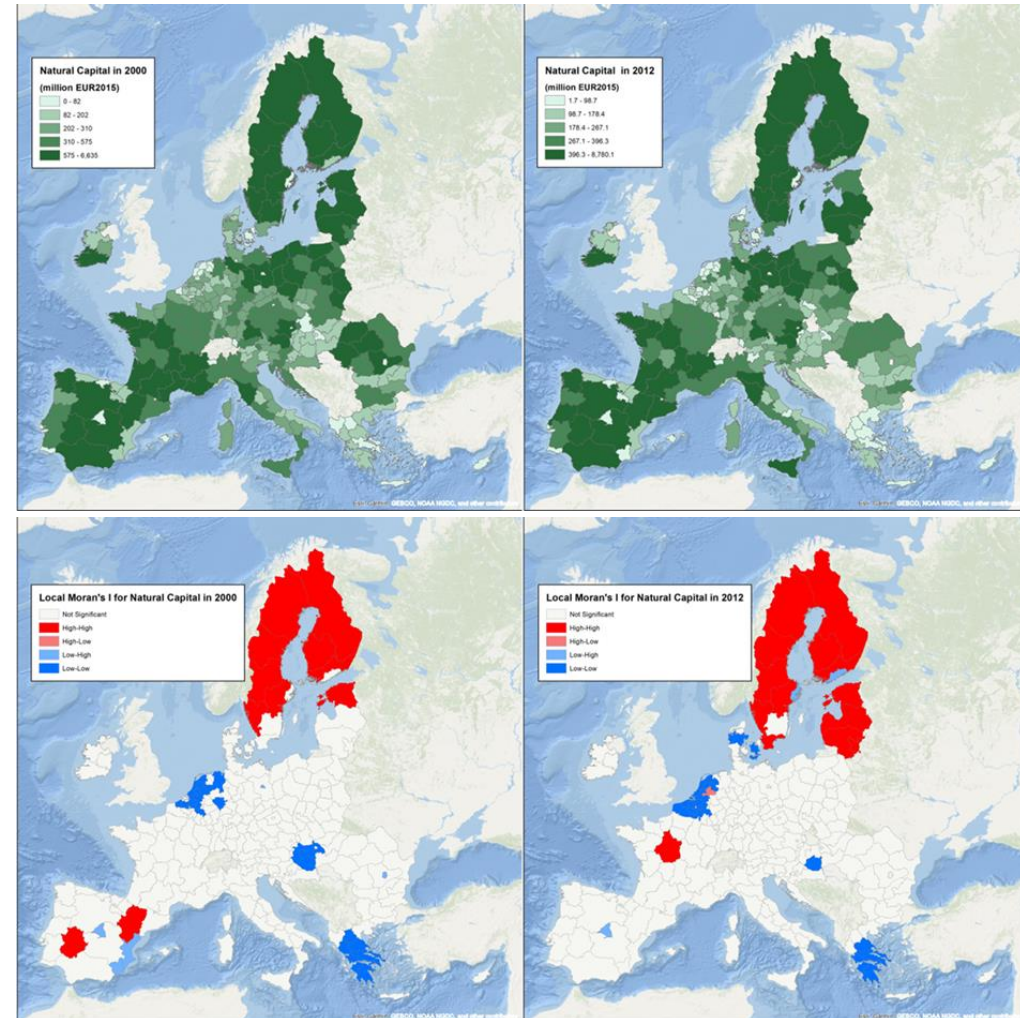
# Results: Spatial regression models

| | (a) | | (b) | |
|---|---|---|---|---|
| | Coef. | Robust Std. Err. [1] | Coef. | Robust Std. Err. [1] |
| **Direct effects** | | | | |
| Labour | 0.764*** | 0.034 | 0.733*** | 0.037 |
| Capital | 0.236*** | 0.034 | 0.227*** | 0.034 |
| Natural capital | | | 0.039** | 0.016 |
| Time | -0.003** | 0.002 | -0.003 | 0.002 |
| **Indirect effects** | | | | |
| Labour | 0.083 | 0.098 | 0.096 | 0.099 |
| Capital | -0.098** | 0.040 | -0.069 | 0.045 |
| Natural capital | | | 0.032* | 0.019 |
| **Spatial autoregressive parameter (ρ)** | -0.018 | 0.087 | -0.041 | 0.085 |
| R-squared (within) | 0.793 | | 0.797 | |
| Log-pseudolikelihood | 1142.37 | | 1154.33 | |
| Hypotheses | | | | |
| Hausman Test | $x_2^2 = 219.82$*** | | 239.92*** | |
| $\theta = 0$ | $x_2^2 = 6.12$** | | $x_3^2 = 8.62$** | |
| $\theta = -\beta\rho$ | $x_2^2 = 5.15$* | | $x_3^2 = 8.48$** | |

An increase of **9.3 billion Euro** in natural capital value* would boost the GVA of regions by **71.4 billion Euro**

*roughly corresponds to the biodiversity investment in the 2014-2020 cohesion policy*

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# Results: Direct and spillover effects on NC

- Investing in **green** regions yields higher returns

- Targeted interventions are needed in **red** regions
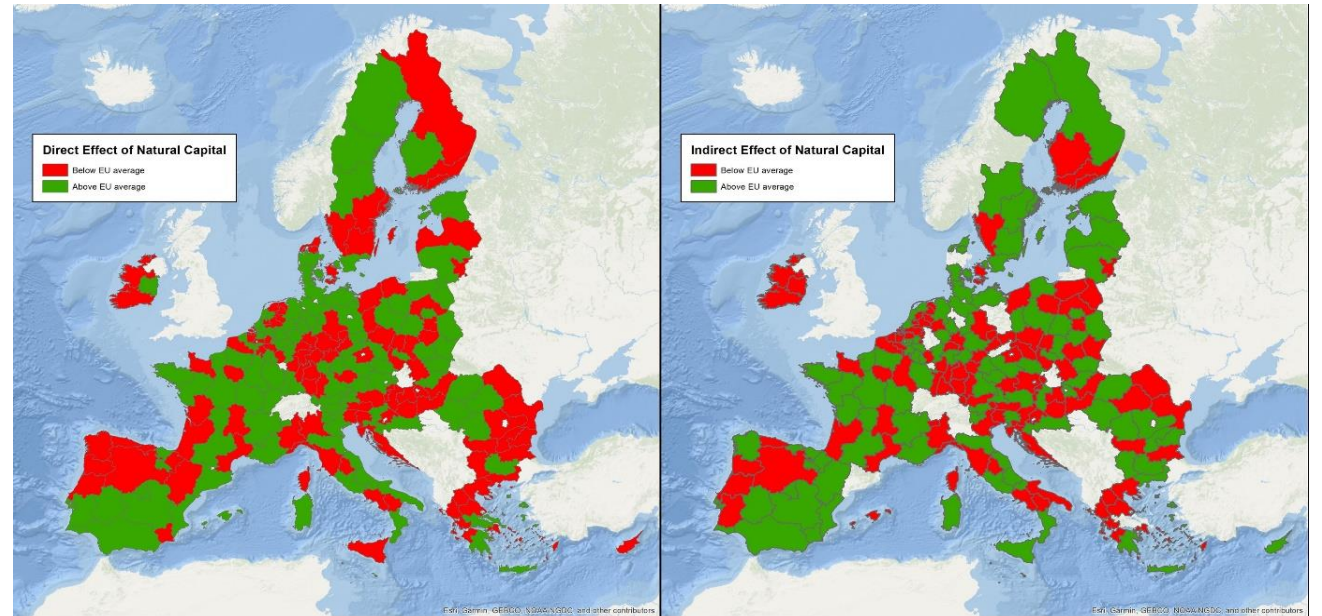
# Policy implications

- Positive direct effect of NC on regional economic output underlines the economic advantages for regions rich in natural resources.

- Investments in NC, such as biodiversity protection and ecosystem restoration, can help narrow the gap between more and less prosperous regions

- Positive spatial spillover effects of NC show that its benefits extend beyond regional boundaries

- Need for coordinated cross-regional approaches

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# Conclusions and the way forward

- A key challenge in the literature lies in measuring and incorporating natural capital into growth accounting frameworks

- NC plays a critical role in driving regional economic growth

- Our findings support investing in NC so as to accelerate the EU's green transition and ensure sustainable economic growth across all regions

- To model economic growth  including NC we need access to time-series data; ecosystem service accounts can serve as a reliable data source

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# Thank you

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