

Evaluating the Economic Impact of EU Membership: A Synthetic Control Analysis

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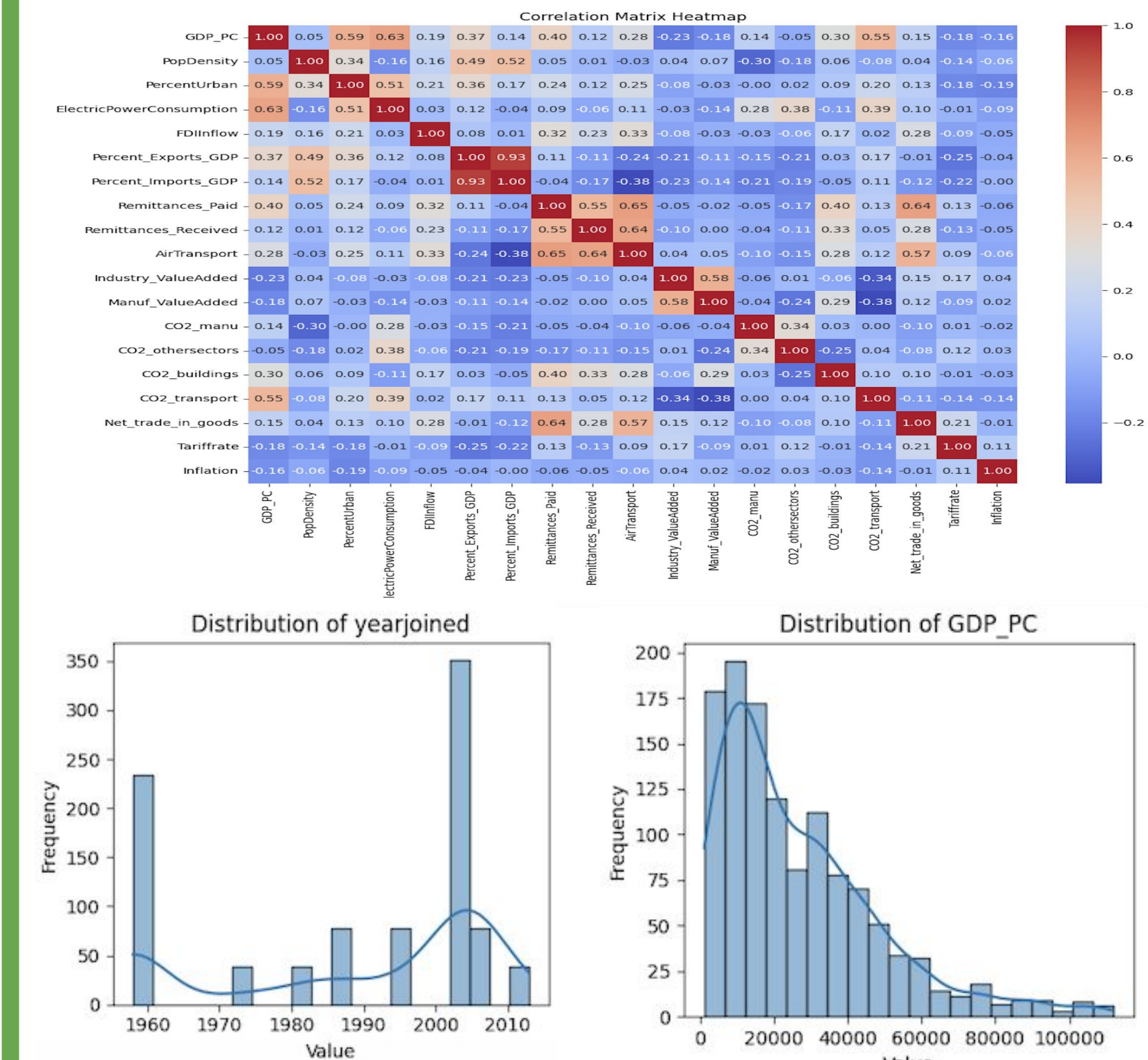


Introduction

- EU governs 27 European nations under social, economic, and security policies, aiming for political and economic unity since the Maastricht Treaty in 1993 (Gabel, 2021).
- Membership Benefits:** Promotes peace, freedom of movement, single market access, and global developmental aid.
- Economic Growth:** The EU's single market contributes to an average increase in GDP per capita by 12% upon joining the EU, according to Campos et al. (2014). However, the benefits varied, with Greece being a notable exception.
- Research Objective:** Investigate EU membership's impact on **GDP Per Capita (GDP_PC)**

Data

- Source: **World Development Indicators (WDI)** 1980-2018 for all countries from World Bank.
- Data Filtering:** Removed irrelevant or redundant variables. Include only European countries.
- Missing Data:** Dropped columns with over 50% missing values and filtered out countries with significant data gaps. Handled the rest by Histogram-based Gradient Boosting.
- EU Membership:** Created 'yearjoined' to mark the year countries joined the EU and 'inEU' to indicate EU membership status in given years.



Methods

Synthetic Control Method (SCM)

- SCM estimates **the effect of joining EU** by comparing the GDP_PC of a treated unit to a weighted combination of untreated units (**synthetic control**).
- Treated Units:** European countries that joined EU after 1980.

Optimization for Constructing Synthetic Control

$$\min_W \sum (X_i - X_D W)^2$$

- Create a **synthetic version of the treated unit** by finding weights that minimize the difference between the treated unit's pre-treatment characteristics and those of the synthetic control.
- Donor Pool (D):** non-EU countries that are not affected by the intervention (joining EU).
- Selection of Predictors (X):** covarites believed to influence the outcome, like FDI inflow and other WDIs before treatment
- Xi** are the pre-treatment characteristics of the treated unit, and **XD** are those of the donor pool. Weights **W** sum to one and are non-negative.

Weight Selection and Estimation

- Ex: Spain's Synthetic Control**
Optimizing the distance between pre-treatment outcomes and other covariates for the treated unit and its synthetic counterpart.

w.weights	control.names
0.269	Albania
0.158	Switzerland
0.052	Iceland
0	Moldova
0.073	North Macedonia
0.062	Norway
0.386	Russian Federation

Estimation of Treatment Effect

- Potential Outcomes:** Y_{1T} and Y_{0T} denote outcomes with treatment and without treatment if the unit is treated at time t
- Treatment Effect (τ):** $\tau_T = Y_{1T} - Y_{0T}$
The goal is to estimate **the effect of joining EU on GDP_PC** for the treated unit in the **post-intervention period**
- Since the outcome without treatment for the treated unit post-intervention is **unobservable**, we estimate it using the synthetic control: $\widehat{\tau_T} = Y_{1T} - \widehat{Y_{0T}}$

Placebo Tests

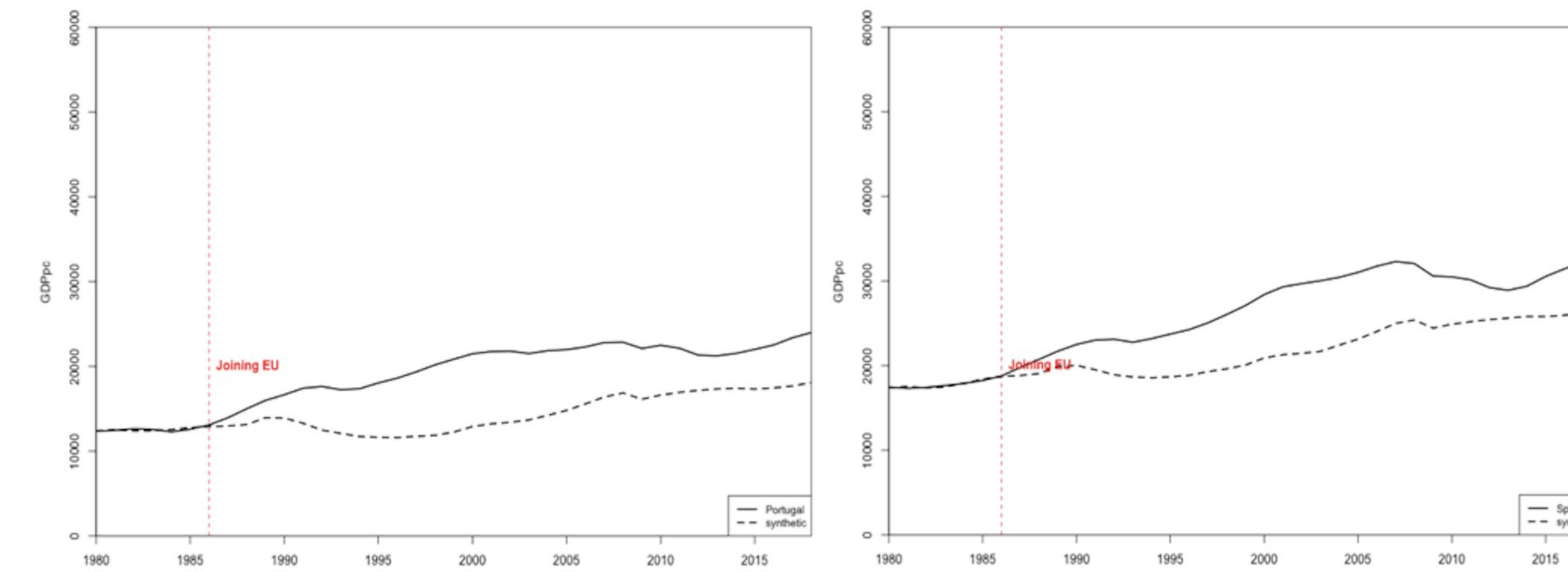
- Re-assign treatment** to units from the donor pool (control units) and re-estimate the model to generate a distribution of placebo effects.

Results

Country	Year Joined	Treatment Effect
Bulgaria	2007	1478.0343
Czech Republic	2004	532.292
Spain	1986	5063.9478
Estonia	2004	2178.9206
Finland	1995	3651.6778
Greece	1981	-457.8119
Hungary	2004	51.9585
Lithuania	2004	1772.611
Latvia	2004	2064.797
Poland	2004	-196.0478
Portugal	1986	5639.7199
Romania	2007	944.3368
Slovenia	2004	1600.0604
Sweden	1995	3822.2126

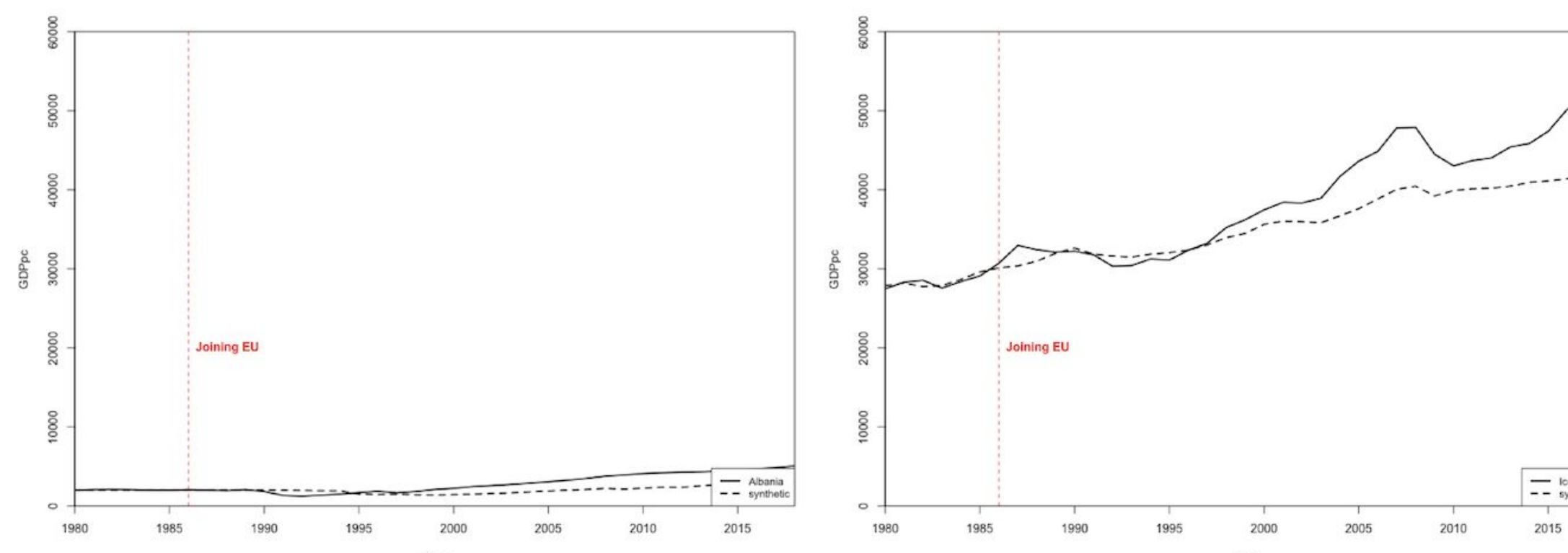
Positive Impact on GDP per Capita: The majority of the countries analyzed exhibited **positive treatment effects** after joining EU, indicating an overall beneficial impact on their economies. Notably, Spain and Portugal, which joined in 1986, show significant increases in GDP per capita.

- Varied Effects Across Countries:** While most countries benefitted from EU membership, Greece, which joined in 1981, had a negative treatment effect. This suggests that the impact is contingent upon a country's specific context.



Portugal and Spain: GPD_PC for treated and synthetic control with the intervention in red line (joining EU in 1986)

- Placebo Tests for Robustness:** for countries not in the EU such as Albania and Iceland, the placebo graphs do not show significant deviations post the treatment year 1986, supporting the validity of our SCM analysis. In contrast, the graphs for Portugal and Spain reveal clear divergences between the treated and synthetic control outcomes, especially after joining the EU, reinforcing **the causal inference** drawn from the study.



Placebo Tests: If Albania and Iceland joined EU in 1986

Conclusions

- The results underscore the **economic benefits of EU membership** for the majority of member states in terms of **GDP per capita**. However, the variation in effects across countries emphasizes the need for specialized approaches in integrating into the EU framework. The robustness checks via placebo tests provide further confidence in our results, indicating **a causal impact of EU accession** on economic performance.
- Limitations:** The accuracy of the Synthetic Control Method heavily depends on the **selection of predictor variables** used to construct the synthetic control units. There might be **unobserved factors** that could affect the accuracy of the synthetic controls. In addition, the SCM assumes the absence of spillover effects between treated and control units, which may cause **treatment effect heterogeneity**. In the context of EU membership, policy changes, trade agreements, or economic shifts in one member state could indirectly affect others, potentially blurring the distinction between treated and control units.

References

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