

Uhr, Daniel de Abreu Pereira; Weizenmann, Felipe; Uhr, Júlia Gallego Ziero

## Article

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## Kontakt/Contact

ZBW – Leibniz-Informationszentrum Wirtschaft/Leibniz Information Centre for Economics  
Düsternbrooker Weg 120  
24105 Kiel (Germany)  
E-Mail: [rights\[at\]zbw.eu](mailto:rights[at]zbw.eu)  
<https://www.zbw.eu/>

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# The impact of the Economic Adjustment Programme for Ireland: a synthetic control approach

Daniel de Abreu Pereira Uhr\*  • Felipe Weizenmann • Julia Gallego Ziero Uhr 

Universidade Federal de Pelotas (UFPel), Organization and Markets Graduate Program (PPGOM/UFPel), Brazil

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## Abstract

We examine the effect of the *Economic Adjustment Programme for Ireland* on the country's per capita income. We are the first to provide empirical analysis on the importance of the program to Irish economic recovery post-financial crisis. We employ the synthetic control approach with bias correction with World Bank Opendata and Irish Central Statistics Office data from 2000 to 2019. Our results indicate that the *EAP* had a positive and statistically significant impact on Ireland's per capita income, with an average effect of 5,626.27 US\$. These conclusions are robust to a placebo test and the Synthetic Difference in Difference estimator.

**Keywords:** per capita income, Economic Adjustment Program, Ireland, Financial Crisis

**JEL Classification Codes:** O43, O47, O57

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## 1. Introduction

The Republic of Ireland has exhibited notable GDP per capita growth rates since implementing the *Programme for National Recovery* in 1987 (Uhr et al., 2023). However, the 2007-2008 global financial crisis significantly affected the country. Investor confidence in the Irish real estate market began to erode in late 2007 due to concerns around overheated prices and oversupply, both consequences of the credit expansion post-2003. This context led to significant reductions in revenue from construction-related activities and sudden losses for the domestic banking system, increasing vulnerabilities when the international financial crisis hit

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\* Corresponding author. E-mail: [daniel.uhr@gmail.com](mailto:daniel.uhr@gmail.com).

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Ireland. After the loss of investor confidence, deposit outflows accelerated, and the cost of Government borrowing became unsustainable. Financial markets became concerned about the capacity of the Irish Government to deal with the growing fiscal deficit and support the banking sector. Consequently, the country experienced a lengthy economic recession with rising unemployment (Fitzpatrick & McQuinn, 2007; Beblavý et al., 2011; European Commission, 2011; Whelan, 2014; McQuinn, 2021).

The *Economic Adjustment Programme for Ireland (EAP)* was formally agreed upon in late 2010 to address the effects of the severe banking and financial crisis. Contributions came mainly from the European Financial Stabilization Mechanism, the International Monetary Fund, and the European Financial Stability Facility (€67.7 billion). Ireland also received bilateral contributions from the United Kingdom, Sweden, and Denmark (€4.8 billion). There was also an Irish contribution through the treasury and the national pension reserve fund (€12.5 billion). The objective was to restore market confidence in the Irish banking sector and Government. However, the financial assistance was conditional on austerity reforms to promote sustainable growth, such as the restructuring of the financial sector (downsizing and reorganization to lower perceptions of risk), the fiscal adjustment to correct the excessive deficit (expenditure reduction), and the structural growth reforms to remove caveats to competitiveness and employment creation. In late 2013, Ireland completed the program, with most policy conditions met and investor confidence restored (European Commission, 2011, 2015).

We are the first to provide an empirical analysis of the contribution of the *EAP* to Ireland's economic recovery after the international financial crisis. The ex-post evaluation promoted by the European Commission considered the program effective, but such conclusions are based on qualitative guidelines (European Commission, 2015). We employ World Bank data from 2000 to 2019 and the synthetic control methodology with bias correction (Abadie & Gardeazabal, 2003; Abadie et al., 2010, 2015; Abadie & L'Hour, 2021; Ben-Michael et al., 2021) to identify the effect of the program on Ireland's income trajectory. Results indicate that the austerity policies promoted significant increases in income in the following years, as supported by the estimated average gap of 5,626.27 US\$ in modified GNI per capita. These findings remain robust to a placebo test and the Synthetic Difference in Difference estimator (Arkhangelsky et al., 2021).

## 2. Methodology and data

Synthetic Control (SCM) is a data-driven methodology that estimates causal effects when one observational unit is exposed to an intervention (Abadie and Gardeazabal, 2003; Abadie et al., 2010, 2015). The estimator generates a best comparable unit comprised of an optimally weighted combination of data from other non-treated units (donors). This pool of countries provides a credible counterfactual because the predictor variables closely fit the data in the pre-intervention period (Abadie et al., 2015). Nevertheless, recent literature discusses the arbitrary choice of covariates to build such counterfactuals and the existence of bias in settings with many units in the donor pool (Ferman et al., 2020; Abadie & L'Hour, 2021; Ben-Michael et al., 2021). We combine SCM with bias correction (SCM-BC) with outcome lags as pre-

intervention covariates to mitigate those potential issues. We estimate the Irish per capita income trajectory without the *EAP* ('synthetic Ireland') and compare it to the 'actual Ireland' income trajectory so that the gap between them is attributable to the recovery program.

It is important to note that, as of 2015, GDP per capita in Ireland is not considered a good measure of income comparison with other countries<sup>1</sup> because it is distorted due to a combination of factors, such as a favorable tax regime for multinational companies, and possible financial transfers between foreign companies and Irish subsidiaries. Thus, as recommended by the European Union report<sup>2</sup>, we used the "Modified Gross National Income" (GNI\*) of the Central Statistics Office (CSO) as the dependent variable for Ireland. Data are deflated and adjusted to constant 2015 dollars at the per capita level. Values for other countries follow GDP per capita World Bank data from 2000 to 2019. The EAP was implemented during 2011-2013.

The outcome variable is Ireland's annual Modified GNI per capita (constant 2015 US\$). As Ferman et al. (2020) suggested, we choose outcome lags before the treatment period as covariates. The weighting of Estonia (36.2%), Kuwait (22.3%), San Marino (14.8%), United Arab Emirates (14.2%), Bermuda (7.5%), and Greece (5%) best reproduce the Irish economy prior to the intervention in the SCM-BC algorithm. The composition of synthetic Ireland does not contain countries belonging to Gran Britain. The weighting composition can be considered suitable for at least two reasons. Firstly, it statistically represents Ireland well in the pre-intervention period. Furthermore, it guarantees that the region's political issues do not influence the counterfactual trend (for example, political issues linked to "Brexit").

Table 1 presents and compares the descriptive statistics for 'Real Ireland' and 'Synthetic Ireland.' Prior to the intervention, their similarity indicates that 'synthetic Ireland' is a credible counterfactual to evaluate *EAP* effectiveness.

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<sup>1</sup> <https://www.cso.ie/en/interactivezone/statisticsexplained/nationalaccountsexplained/modifiedgni/>

<sup>2</sup> Ireland 2023 Country Report - Brussels, 24.5.2023 SWD(2023) 607 final, [https://economy-finance.ec.europa.eu/system/files/2023-05/IE\\_SWD\\_2023\\_607\\_en.pdf](https://economy-finance.ec.europa.eu/system/files/2023-05/IE_SWD_2023_607_en.pdf)

Table 1. Predictor Balance

	Real Ireland (per capita GNI*)	Synthetic Ireland (per capita GNI*)
2000	36,139.48	36,412.11
2001	36,606.98	36,970.30
2002	37,256.61	36,742.54
2003	38,684.20	38,778.00
2004	40,483.52	40,516.59
2005	41,783.92	41,553.28
2006	43,057.63	42,624.73
2007	43,326.55	42,782.63
2008	40,343.04	40,883.45
2009	35,938.02	36,233.28
2010	35,429.75	34,780.70
2011	34,343.53	34,448.18
2012	33,342.15	33,594.35

Notes: GNI\* per capita values are constant to 2015 in US\$.

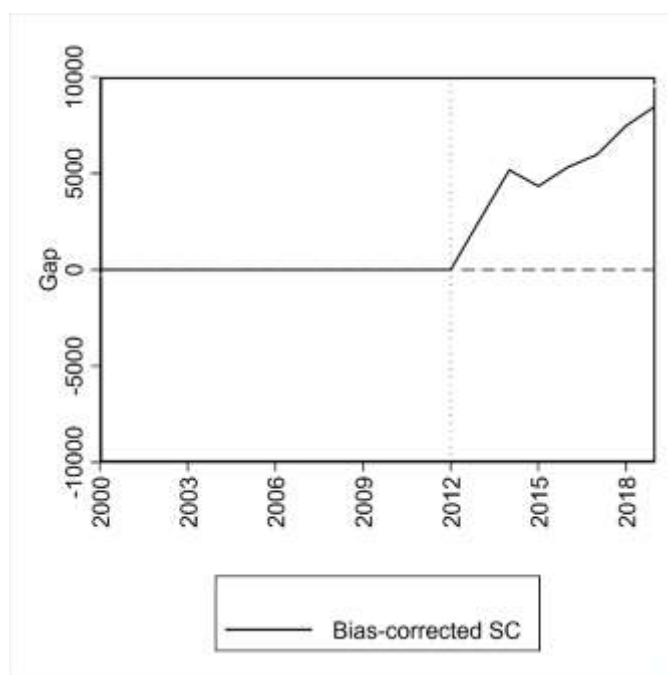
Source: Data from Irish Central Statistic Office (CSO) and World Bank Open Data.

### 3. Results

Figure 1 provides a Modified GNI analysis considering the SCM-BC estimator as expressed by the gap between actual and synthetic Ireland growth trajectories. The vertical line marks 2012, one year before the final year of assistance. The income gap is zero before the intervention. This gap reflects the Modified GNI expansion of 'Real Ireland' compared to 'Synthetic Ireland.' Both models present very close results for calculated gaps: an average income increase of 5,626.27 US\$. These estimated differences in Modified GNI per capita are statistically significant ( $p$ -values $<0.1$ ) for all years after 2013 (Figure 2). Therefore, we can infer that the austerity policies promoted by *EAP* significantly contributed to the Irish economic recovery by moving up the country's growth trajectory.

The empirical findings indicate that we cannot reject the hypothesis that the *Economic Adjustment Program* (EAP) played a significant role in the Irish economic recovery, implying that the program had discernible effects on the Irish economy. Given the program's explicit policy of austerity reforms to foster sustainable growth, including the restructuring of the financial sector, fiscal adjustments, and structural reforms, it is understood that such a policy was effective in the case of Ireland. However, a detailed investigation into the specific mechanisms that led to the increase in Ireland's income exceeds the scope of this article.

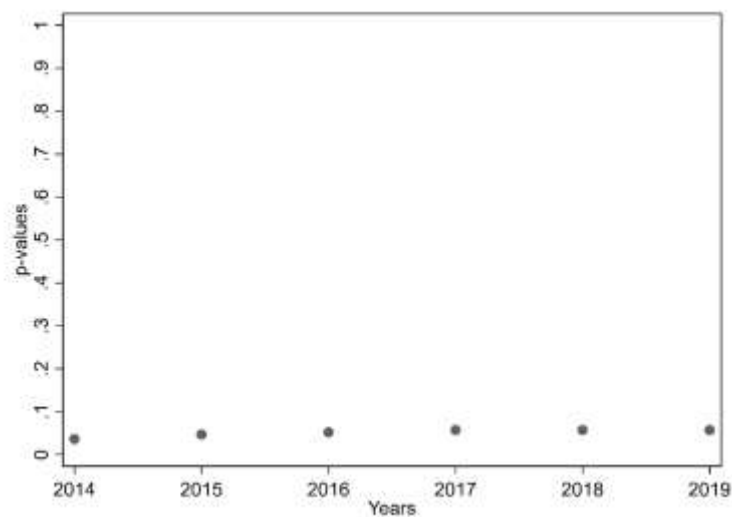
Figure 1. Modified GNI per capita Gap



Note: Modified GNI per capita values in US\$ constant 2015.

Source: Data from Irish Central Statistic Office (CSO) and World Bank Open Data.

Figure 2. Bias-Corrected Synthetic Control p-values



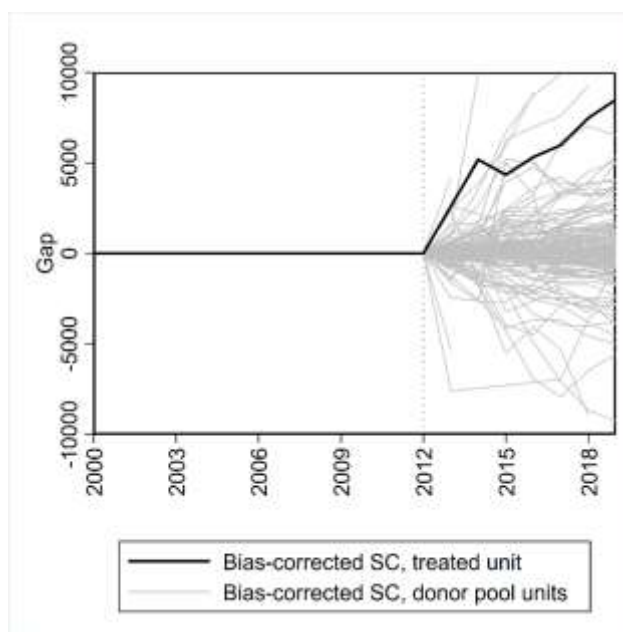
Source: Data from Irish Central Statistic Office (CSO) and World Bank Open Data.

## 4. Robustness Analysis

### 4.1. Placebo Test

The placebo test assumes that each country in the donor pool undergoes the same program as Ireland and then estimates the gaps in Modified GNI per capita of actual and synthetic trajectories. These differences are expected to be close to zero, not accompanying the Irish gap (Abadie et al., 2010). Figure 3 shows that most countries (lighter lines) consistently present negative or close to zero gaps between actual and predicted income, as opposed to Ireland (represented by the darker line). This analysis provides supporting evidence to reject the hypothesis that the positive estimated effects in the previous section are due to chance.

Figure 3. Placebo Test



Source: Data from Irish Central Statistic Office (CSO) and World Bank Open Data.

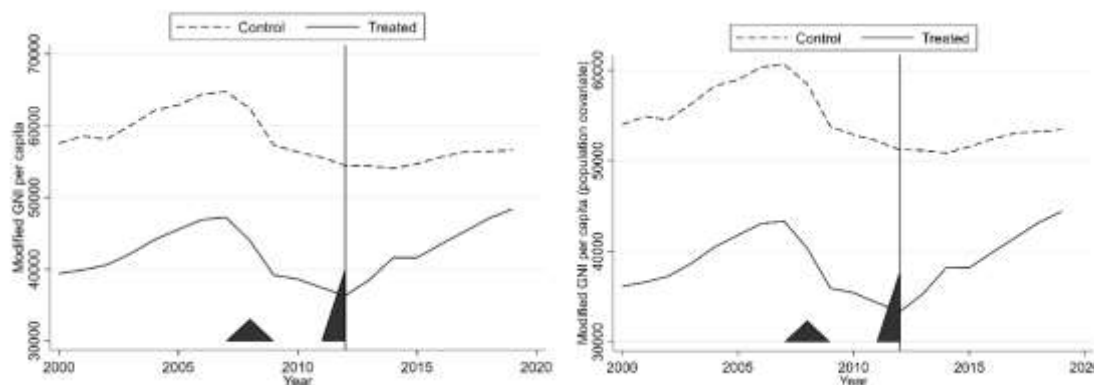
### 4.2. Synthetic Differences in Differences (SDD)

The Synthetic Differences-in-Differences (SDD) estimator proposed by Arkhangelsky et al. (2021) associates the Difference-in-Differences methodology with SCM by relaxing the hypothesis of parallel trends and by appointing weights to the untreated units while considering additive unit and time-specific fixed effects. SDD presents desirable robustness properties as it creates a control group that shares the same pre-intervention trend as the treated unit and estimates the treatment from the double differences between them.

Figure 4 presents the results of the SDD analysis. The solid line represents the Irish modified

GNI per capita trend. As in the previous analysis, the vertical line marks 2012, one year before the final year of assistance. The control group trend runs parallel to actual Ireland before the treatment. Trends inverted after 2013, increasing the gap between treated and control groups. The calculated treatment effect for the *EAP* (The graph on the left) is positive and statistically significant: 5,822.41 US\$ (with a standard error of 981.70).

Figure 4. Modified GNI per capita trends for Actual and Synthetic Ireland (SDD)



Note: Modified GNI per capita values in US\$ constant 2015. The graph on the left does not consider covariates. The graph on the right considers the population covariate.

Source: Data from Irish Central Statistic Office (CSO) and World Bank Open Data.

SDD allows the inclusion of covariates in the analysis. Thus, the second graph presents the results considering the population covariate. A possible criticism regarding emigration after the program's implementation can be mitigated by considering the population covariate in the analysis. The results show that when considering population as a covariate, the *EAP* effect is positive and statistically significant: 5775.35 US\$ (with a standard error of 981.36). The estimated Modified GNIs per capita gap values are close to the results estimated by the SCM-BC. Hence, we cannot reject the hypothesis that the *EAP* contributed significantly to the Irish economic recovery.

## 5. Final Remarks

Previous studies with a qualitative approach assess that the *Economic Adjustment Programme* effectively promoted sustainable growth (European Commission, 2015) but fail to provide conclusions based on empirical analysis. Using novel methodology (SCM-BC and SDD) to identify causal effects and data from the Irish Central Statistics Office and World Bank Opendata, we show that the austerity policies contributed to the Irish economic recovery by estimating the program's impact on income. Our findings indicate that the *EAP* had a positive



and statistically significant effect on Ireland's modified GNI per capita, as indicated by the estimated average gap of 5,626.27 US\$.

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