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Club convergence in the eurozone: A look at inequality dynamics

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ABSTRACT

This paper examines the convergence of eurozone countries' inequality indicators between 1995 and 2020. The Phillips and Sul (2007, 2009) methodology is used to determine the existence of convergence clubs. Our findings show that eurozone countries follow a similar trajectory in terms of the income of the richest 1% of the population and are divided into two clusters based on other inequality indicators.

1. Introduction

The eurozone member states' economic and monetary integration has increased their vulnerability to asymmetric endogenous shocks, exacerbating structural imbalances between them. Bayoumi and Eichengreen (1993) identified their disparities, demonstrating that eurozone countries could be divided into a synchronized core and a less coordinated periphery.

Efforts to reduce differences in per capita income, which nevertheless persist (Campos and Macchiarelli, 2016; Alcidi, 2019), have failed to prevent the rise in income inequality that has characterized these countries. Today, one could question if inequality in income distribution is becoming the new common denominator between European countries.

The literature on this topic is scarce, as it has not been focused on the eurozone. Chambers and Dhongde (2016, 2017) conclude that convergence in inequality has been faster between developed than developing countries since advanced economies are more homogeneous in their economic fundamentals. Income distributions between countries are becoming more unequal and similar over time, suggesting that countries' policies are intertwined. Espoir (2022) demonstrated that income inequality across 142 countries is converging towards five distinct clubs rather than a single global convergence pattern and that inequality between clubs increased while inequality within each club decreased during the study period. Kvedaras et al. (2020) examine the 27 EU countries and find convergence in income distributions between Central and Eastern Europe and Southern Europe, whereas Savoia (2024) shows that EU regions are converging by becoming more unequal, a process that may have been accelerated by the EU's cohesion policy.

This paper investigates the extent to which eurozone countries' income distributions are converging. The study contributes to the literature by using a log *t*-test (Phillips and Sul, 2007, 2009) to determine whether the eurozone has a single long-term equilibrium in terms of inequality indicators to which all countries converge, or if there are multiple equilibria (i.e. convergence clubs).

This issue has significant political implications. If long-term inequality between countries converges to an equilibrium level, short-term deviations will be transitory and tend to disappear, making common regional policies effective in eliminating them. However, if inequality dynamics are decoupled, deviations caused by exogenous shocks will have long-term consequences, demanding policies tailored to regional trends. In any case, the European goal of social cohesion must prioritize eradicating inequality (Filauro and Parolin, 2019).

Our main findings point to the existence of a single equilibrium for the income of the top 1% and two clusters for other inequality indicators. These clusters cannot be classified into traditional divisions such as Core and Periphery and challenge the possibility of adopting common policies for the whole.

The work is organized as follows. The next section presents the data. Section 3 describes the methodology, while Section 4 applies it to inequality in the eurozone. The last section concludes.

2. Data

Data on the Gini coefficient for disposable and market income are obtained from SWIID (Solt, 2020), income shares from WID (Alvaredo

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Table 1
Descriptive statistics for 17 eurozone countries between 1990 and 2020.

Variable	#Obs	Mean	Std. Dev.	Min	Max
Gini coefficient disposable income	527	29.2962	3.867637	16.8	36
Gini coefficient market income	527	47.39146	3.920763	34.3	56.4
GDP top 1%	527	4440.483	3333.7	693.2281	23,860.45
GDP top 10%	527	14,115.07	8115.558	3076.012	54,433.26
GDP bottom 50%	527	8442.863	4362.515	1953.26	24,553.49
S80/S20 ratio	336	4.714583	0.9901282	3	7.4

Note: the S80/S20 ratio covers the 12 eurozone founders between 1995 and 2022.

et al., 2022), and the S80/S20 ratio from Eurostat. Each income share is multiplied by GDP, retrieved from the same database. The yearly data covers 17 eurozone countries (Croatia, Cyprus and Malta were excluded due to their short time series), with descriptive statistics shown in Table 1.

Fig. 1 shows a negative relationship between the Gini coefficient for market income and its percentage reduction after taxes and transfers, indicating the heterogeneity of fiscal measures aimed at correcting market inequality in eurozone countries.

During this time, the income shares of the richest 1 and 10% increased, in tandem with the decline in the share of the bottom 50% of the income distribution, implying that the latter group may have transferred income to the former, as illustrated in Fig. 2.

Fig. 3 depicts the dynamics of the S80/S20 ratio for 12 eurozone countries, revealing that Central and Northern Europe has more egalitarian income distributions than Southern Europe.

3. The Phillips and Sul algorithm

The Phillips and Sul (2007) procedure tests for relative convergence, i.e., convergence toward a cross-sectional average, while also allowing for the testing of club convergence, which is consistent with the concept of multi-speed Europe.

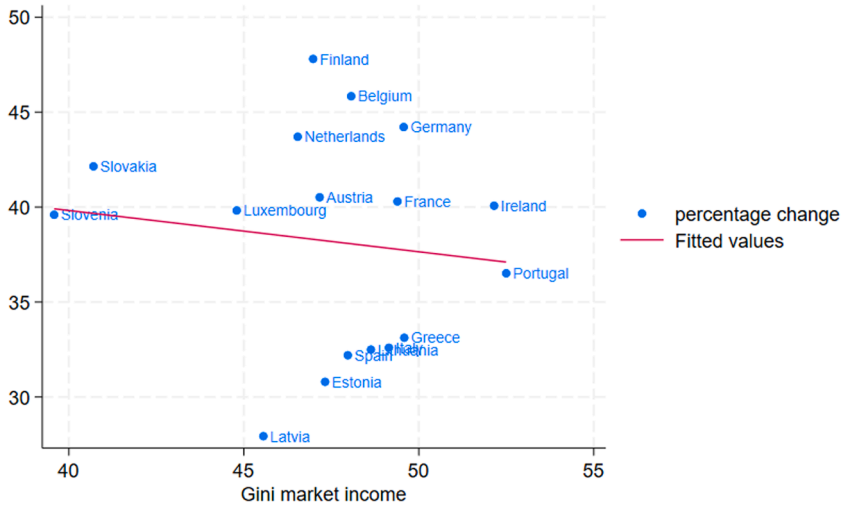

Fig. 1. Gini coefficient for market income and percentage change after taxes and transfers, 17 Eurozone countries, average 1990–2020.
Source: author's calculations using SWIID (2020) data.

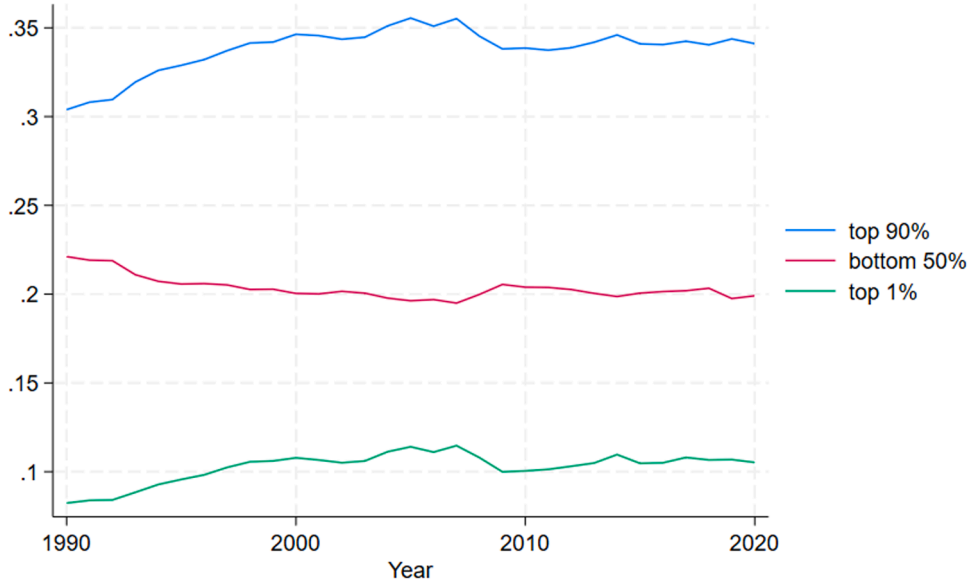

Fig. 2. Tops 1 and 10% and Bottom 50% national income share, average of 17 eurozone countries, 1990–2021.
Source: authors' calculations using WID data.

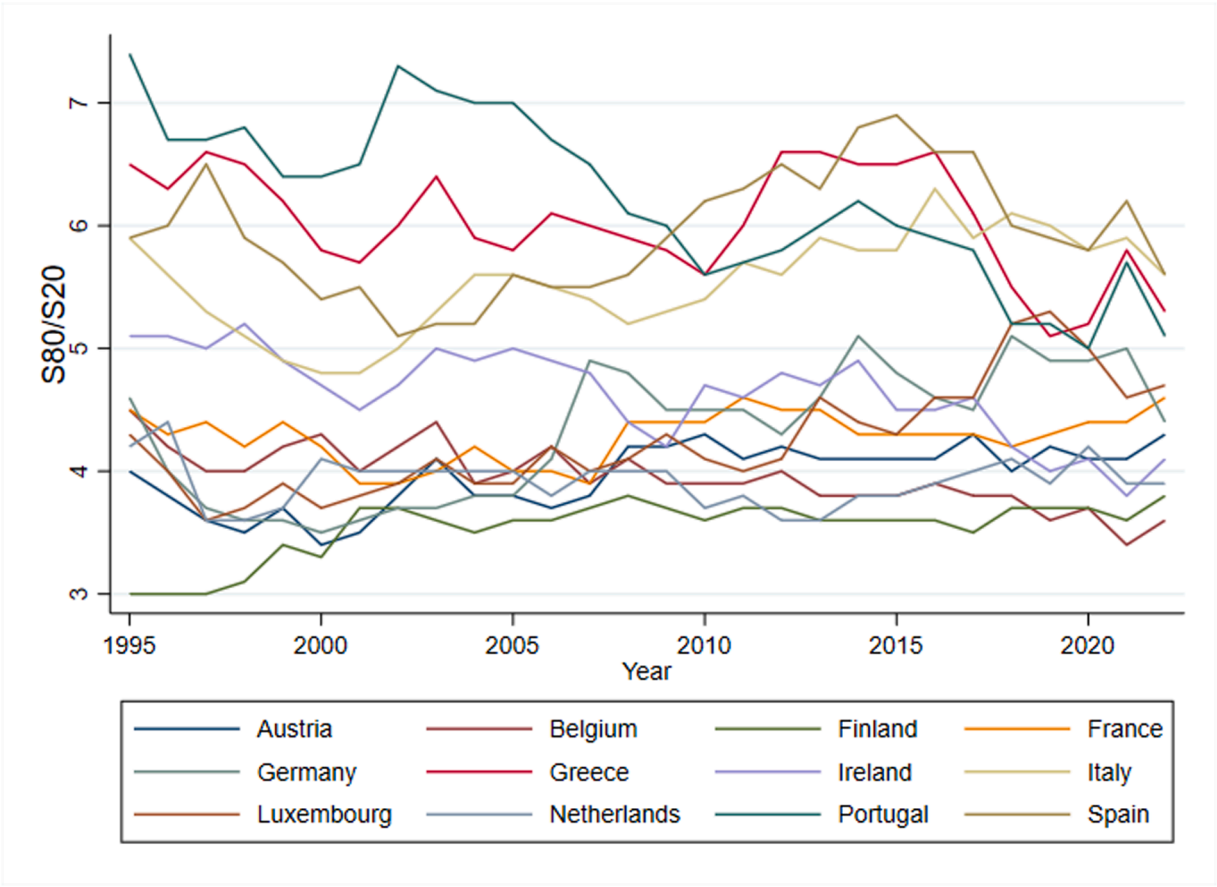

Fig. 3. The S80/S20 ratio, 12 eurozone founders, 1995–2022.
Source: author's calculations using Eurostat data.

The method decomposes the transition dynamics of the variable of interest (Y_{it}) for country i at time t into:

$$Y_{it} = x_{it} + a_{it} \tag{1}$$

where x_{it} represents the idiosyncratic time paths and a_{it} the transitory component. Eq. (1) is rewritten as a time-varying factor representation:

$$Y_{it} = \left(\frac{x_{it} + a_{it}}{\mu_t}\right)\mu_t = \delta_{it}\mu_t \tag{2}$$

with δ_{it} the idiosyncratic distance between μ_t and the systematic part of Y_{it}. δ_{it} has the following semi-parametric specification:

$$\delta_{it} = \delta_i + \sigma_i \xi_{it} L(t)^{-1} t^{-\alpha} \tag{3}$$

where δ_i is time-invariant across panels, ξ_{it} is an i.i.d (0,1) random variable across i, but is weakly dependent on t, $L(t)$ is a slow-varying function, e.g., log$t$, tending towards infinity as t approaches infinity, and α is the decay rate of the cross-section variation over the transitions.

Convergence is assessed through the log-t-test:

$$\begin{array}{lll} H_0 : \delta_i = \delta & and & \alpha \geq 0 \\ H_1 : \delta_i \neq \delta & for\ all\ i\ or & \alpha < 0 \end{array} \tag{4}$$

A cross-sectional variance ratio, (H_1 / H_t), is built where:

$$H_t = \frac{1}{N}\sum_{i=1}^{N}(h_{it} - 1)^2 \tag{5}$$

and

$$h_{it} = \frac{Y_{it}}{\frac{1}{N}\sum_{i=1}^{N} Y_{it}} = \frac{\delta_{it}}{\frac{1}{N}\sum_{i=1}^{N}\delta_{it}} \tag{6}$$

A regression of the following form is estimated:

$$\log\left(\frac{H_1}{H_t}\right) - 2\log L(t) = c + \beta \log t + \varepsilon_t \tag{7}$$

for $t = [rT], [rT]+1, \ldots, T$ with $r > 0$. PS (2007) suggest that $r = 0.3$, and show that the coefficient β is twice the decay rate: $\beta = 2\alpha$. The null hypothesis of convergence will be rejected if the t-statistic is less than −1.65 at the 5% significance level.

If the null hypothesis of convergence is rejected, there may still be club convergence. Phillips and Sul (2009) propose an algorithm to test this. First, the countries are sorted by their variable of interest in the last period. Next, a core subgroup, with higher member convergence, is formed and log-t-test is estimated. Each member outside the core group is added at a time, and the log-t regression is applied. If the t-statistic is greater than PS's critical value of zero, the individual member is added

Table 2
Gini coefficient for disposable income club convergence, eurozone, 1990–2020.

logt	*St. Error*	*t-stat*	
−0.5696	0.0191	−29.75	
Club	$\widehat{\beta}$	$\widehat{\alpha}$	*Countries*
Club 1 (7 countries)	−0.078 (−1.625)	−0.039	Germany, Italy, Latvia, Lithuania, Luxembourg, Portugal, Spain
Club 2 (10 countries)	−0.025 (−1.215)	−0.013	Austria, Belgium, Estonia, Finland, France, Greece, Ireland, Netherlands, Slovakia, Slovenia

The t-statistics is displayed in parenthesis. $\widehat{\alpha} = \widehat{\beta}/2$ is the speed of convergence.

Table 3
Gini coefficient for market income club convergence, eurozone, 1990–2020.

logt	*St. Error*	*t-stat*	
−1.0931	0.0530	−20.62	
Club	$\widehat{\beta}$	$\widehat{\alpha}$	*Countries*
Club 1 (13 countries)	0.116 (5.119)	0.058	Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Luxembourg, Netherlands, Portugal, Spain
Club 2 (3 countries)	0.391 (4.873)	0.196	Estonia, Latvia, Slovenia
Non-convergent club (1 country)	–	–	Slovakia

The t-statistics is displayed in parenthesis. $\widehat{\alpha} = \widehat{\beta}/2$ is the speed of convergence.

Table 4
Convergence between average GDPs per capita per percentiles, 1990–2020.

	logt	*St. Error*	*t-stat*
Top 1%	0.0644	0.0177	3.6302
Top 10%	−0.0837	0.0241	−3.4712
Bottom 50%	−0.1387	0.0169	−8.2012

Table 5
Bottom 50% national income share club convergence, eurozone, 1990–2020.

Clubs	$\widehat{\beta}$	$\widehat{\alpha}$	*Countries*
Club 1 (13 countries)	0.026 (1.106)	0.013	Austria, Belgium, Estonia, France, Germany, Ireland, Latvia, Lithuania, Luxembourg, Netherlands, Slovakia, Slovenia, Spain
Club 2 (3 countries)	1.640 (9.747)	0.820	Greece, Italy, Portugal
Non-convergent club (1 country)	–	–	Finland

The t-statistics is displayed in parenthesis. $\widehat{\alpha} = \widehat{\beta}/2$ is the speed of convergence.

to the core group. If the member is not added, other subgroups are formed, and the procedure is repeated.

4. Empirical results

Tables 2 and 3 show the groups of countries that form convergence clubs when the PS method is applied to the Gini coefficients for disposable income and market income, respectively. Overall panel convergence is rejected at the 5% significance level in both cases. We then test for the presence of club convergence following PS (2009) and arrive at a final number of two clubs for each indicator (intermediate steps are omitted for conciseness). For disposable income, the countries decouple into two similar-size clusters, but $\widehat{\beta}$ lacks statistical significance, indicating that there is no conditional convergence. The groups in both estimations do not overlap, but they also do not form an empty set: thirteen countries are combined into a single group, considering the inequality in their market practices, while they are divided into two groups based on their income redistribution policies. There is conditional convergence within each club for the Gini coefficient for market income, since $0 \leq \widehat{\beta} < 2$, and $\widehat{\beta}$ is statistically significant. As for the speed of convergence $(\widehat{\alpha})$, club 1 converges at a rate of 5.8%, contrasting with club 2 with a speed of 19.6%, denoting a faster catching up.

Table 4 displays the convergence test using income percentiles, which have been multiplied by GDP. The panel's convergence is not rejected at the 5% significance level for the top 1%, but it is rejected for the top 10% and bottom 50%. Thus, there is absolute convergence among eurozone countries in terms of GDP captured by the top 1%.

Table 6
Top 10% national income share club convergence, eurozone, 1990–2020.

Eurozone Clubs	$\widehat{\beta}$	$\widehat{\alpha}$	*Countries*
Club 1 (6 countries)	0.273 (4.608)	0.137	Estonia, Germany, Ireland, Latvia, Lithuania, Luxembourg
Club 2 (11 countries)	−0.047 (−1.011)	−0.024	Austria, Belgium, Finland, France, Greece, Italy, Netherlands, Portugal, Slovakia, Slovenia, Spain

The t-statistics is displayed in parenthesis. $\widehat{\alpha} = \widehat{\beta}/2$ is the speed of convergence.

Table 7
Club convergence results, S80/S20 ratio, eurozone, 1995–2022.

Eurozone			
logt	*St. Error*	*t-stat*	
−0.4676	*0.0027*	*−174.0234*	
Eurozone Clubs	$\widehat{\beta}$	$\widehat{\alpha}$	*Countries*
Club 1 (9 countries)	0.055 (1.688)	0.028	Austria, France, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, Spain
Club 2 (3 countries)	0.752 (8.724)	0.376	Belgium, Finland, Ireland

The t-statistics is displayed in parenthesis. $\widehat{\alpha} = \widehat{\beta}/2$ is the speed of convergence.

The PS algorithm is applied to cases in which the null hypothesis is rejected. Table 5 shows that there are two convergence clubs among the bottom 50%. The convergence speed for club 1, for which the results reveal conditional convergence, is 1.3%, while for club 2, $\widehat{\beta}$ lacks statistical significance. Only four of these countries do not converge with the larger group, three of which form a small club. Regarding the richest 10%, two clusters were found (see Table 6), the first, consisting of six countries, with a convergence speed of 13.7%, and the second, with 11 countries, exhibiting a non-statistically significant coefficient.

Given the short time series of the other countries, the convergence of the S80/S20 ratio can only be estimated for the group of 12 countries that founded the euro. Absolute convergence is rejected at the 5% level of significance, and the estimates show two asymmetrically sized convergence groups (see Table 7). A smaller group of Belgium, Finland, and Ireland has a convergence rate of 37.6%, compared to 2.8% for a group of nine countries.

In short, these tests indicate that, with the exception of the very rich, there is no absolute convergence of income inequality in the eurozone. On the contrary, there appears to be a tendency to form two clusters that do not separate in traditional classifications such as North and South or Core and Periphery, nor do they seem to be related to their economic fundamentals or institutional features.

5. Conclusion

This paper examines whether there has been convergence in inequality between eurozone countries over the last few decades, applying the PS methodology to various inequality indicators.

This analysis yields several conclusions. Firstly, apart from the top 1%'s incomes, there is no common long-term trend to which inequality is evolving in the eurozone. Secondly, there are no more than two clusters in the eurozone. Thirdly, these clubs vary in shape and size depending on the indicator under consideration and are not classified according to traditional divisions.

Data availability

Data will be made available on request.

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