Drivers of Cross-Country GDP Inequality in Europe: A Two-Stage Factor Decomposition, 1990–2024

Antonio Abatemarco Giuseppina Autiero
Claudia Avossa

Department of Economics and Statistics, University of Salerno, Italy

Abstract

Between-country GDP inequality in Western Europe declined markedly from the early 1990s to the eve of the global financial crisis, but this convergence has since stalled and partly reversed, pointing to a structural change in the macroeconomic forces shaping cross-country disparities. This paper investigates the contribution of macroeconomic factors to that evolution by decomposing between-country GDP inequality into expenditure-side components, income-side components, and demographic and productivity-related channels. Using annual OECD National Accounts data for 17 European countries over 1990–2024, we implement a non-parametric two-stage decomposition strategy that combines a counterfactual Shapley procedure with a Shorrocks factor decomposition. The estimation strategy we propose provides an exact accounting of inequality in terms of interpretable factor contributions, separates demographic effects from per-capita GDP dynamics, and is well suited to settings in which macro aggregates are jointly determined. Our findings show that the decline in inequality up to the late 2000s was largely driven by wage- and consumption-led convergence, underpinned by narrowing productivity gaps. Since the 2000s, however, growing dispersion in exports has increasingly acted as the main source of divergence, while profits have progressively replaced labor compensation as the main income-side channel through which productivity differences translate into inequality. These results suggest that, in a changed macroeconomic environment, reducing between-country inequality among advanced European economies requires not only policies that reconnect wage growth to productivity and sustain domestic demand, but also interventions on the profit side and greater coordination of external balances.

JEL classification: D63; E01; O47; F32.

Keywords: between-country inequality; GDP decomposition; Shapley value; functional

income distribution; global imbalances.

1 Introduction

Recent research has shown that the wage share has declined markedly since the 1980s, largely due to globalization, financialization, and welfare-state retrenchment under neoliberal policies, with technology playing a comparatively minor role (Lavoie and Stockhammer, 2013; Onaran and Galanis, 2013). This literature has mainly examined how changes in the functional distribution of income shape demand regimes—wage-led and profit-led—and, in turn, growth. However, changes in aggregate demand components and, therefore, in demand regimes along with their implications for between-country GDP inequality has not been explored to our knowledge, despite its potential macroeconomic relevance and important implications for citizens' well-being across member states. In an integrated Europe, shifts in demand components and in the wage-profit split may translate into changes in the cross-country dispersion of per-capita GDP, for example through net exports. The present study addresses this gap by decomposing between-country GDP inequality into the contributions of expenditure-side components and income-side components—wages and salaries, employers' social contributions, gross operating surplus and mixed income, and taxes on production and imports less subsidies—while separating demographic effects and productivity-related dynamics. Our objective is not causal identification, but decomposition-based attribution: using the national accounting decomposition of GDP, we quantify how variation in expenditure and income components contributes to variation in between-country GDP inequality[1].

Inequality in Europe is mainly a within-country phenomenon (Blanchet et al., 2019b; Filauro et al., 2025). Between 1985 and the late 2000s, while disposable income converged between countries, inequality deepened within countries (Fredriksen, 2012). However, this convergence was far from uniform and masked substantial heterogeneity across the subperiods considered between 1980 and 2013 (Nolan et al., 2019). European regions also presented widening gaps in average incomes, particularly between Northern Europe, on the one hand, and, on the other, Western and Southern Europe, which became particularly visible from the early 1990s onward (Blanchet et al., 2019a). More recently, Suárez-Arbesú et al. (2022) identified distinct convergence clubs in income inequality across EU countries between 2007 and 2018. Thus, cross-country differences in living standards remain a non-negligible dimension

[1]Here and throughout, "drivers" denotes accounting drivers—contributions measured by the decomposition rather than causal effects. This approach preserves accounting identities and cross-component covariances, yielding an exact attribution despite joint determination. Its limitation is that it cannot identify behavioral or general-equilibrium effects; causal analysis would require exogenous variation and a strategy overcoming the part–whole relationship and simultaneity.

of European inequality and an important policy concern(Milanovic, 2013).

Evidence from the broader convergence literature also points to heterogeneous convergence patterns, depending on the timeframe, geographic scope and methodology employed. While Yin et al. (2003) showed real per capita GDP convergence for the period 1960-1995, Franks et al. (2018) found that the catching up process slowed down in the 1990s, stagnated in the first decade of the euro and reversed following the crisis.

These patterns motivate a closer look at the macroeconomic drivers of between-country GDP inequality among advanced Western European economies.

Recent literature has related cross-country differences in income inequality to a range of economic, structural, and policy factors (Suárez-Arbesú et al., 2023),with particular attention to structural supply-side forces and their interaction with institutions (Nolan et al., 2019; Sauer et al., 2023). In this vein, technological innovation, globalization, and finance are often regarded as key forces behind these differences; assessing their direct or indirect effects on between-country inequality is rather complex given the links between them and their interactions with sociodemographic factors, policy interventions and institutional settings. As to the latter aspect, contributions in the Comparative Political Economy field have brought to the forefront the significance of institutional arrangements of coordinated market economies for tempering the effects of supply-side factors on earnings inequality and related macro distributional outcomes (Streeck, 1991; Hall and Soskice, 2001). In this perspective, the shortcomings of liberal markets in terms of inequality can be addressed by institutional arrangements.

However, the spreading of earnings inequality among developed nations from the nineties, regardless of the institutional framework, has redirected attention to how different demand regimes shape the relationship between changes in income distribution and growth models (Baccaro and Pontusson, 2016). Following the neo-Kaleckian approach, a decline in the wage share depresses consumption, while it may stimulate investment through higher profitability and a stronger capacity for self-financing, and support exports through lower labor costs and greater price competitiveness. Whether a demand model is wage-led or profit-led is determined by the relative impact of consumption compared to investments and net exports on aggregate demand (Behringer and van Treeck, 2019). This perspective is particularly relevant for understanding the time evolution of between-country GDP inequality in an integrated Europe, as it points to demand components and the wage–profit split as potential drivers of divergence or convergence.

Empirical evidence from the years 1960 to 2007 shows that overall demand was wage-led in the Euro area (12 nations) with high intra-EU trade (Onaran and Galanis, 2013). However, a more nuanced view emerges when evaluating aggregate demand of the Euro-

pean countries and extending the analysis to the period 2009-2018, suggesting that the 2008 financial crisis marked a significant transformation in demand regimes (Baccaro and Pontusson, 2016; Baccaro and Hadziabdic, 2024). From the second half of the nineties to 2007, continental Europe[2] was mainly export led, this orientation became stronger after the crisis. Germany, for instance, was characterized by wage moderation, favoring manufacturing exports, sensitive to price competitiveness, and lower domestic consumption. While Nordic countries such as Denmark, Finland, Iceland, Norway, and Sweden, were focused on domestic demand, with increasing reliance on it after the crisis. This excluded Iceland and Denmark, which became more outward oriented. Interestingly, Sweden coupled consumption growth with export growth in ICT sector and services, not very price-sensitive and thus, not requiring the compression of salaries. United Kingdom especially in the first period adopted consumption-led growth driven by domestic consumption financed by higher real wages and financial capital from abroad. In Ireland, demand was led by export and by FDI. In Southern Europe, including France, Greece, Italy, Portugal and Spain, government expenditure played a major role, though after the crisis it became more export oriented. Italy provides a noteworthy example as it experienced slow growth of consumption and exports with a declining wage share throughout the 1990s and early 2000s.

Beyond the well known effect of demand regime shifts on both domestic and foreign economies through the external channel, there is a spillover effect associated with wages. Wage restraint to promote exports forces other countries to take the same approach to maintain their competitiveness; when wage competition becomes widespread, even for profit-led countries competitive advantage is reduced (Onaran and Galanis, 2013).

Building on the literature addressing the effect of aggregate demand composition on economic growth, we shift the focus from the contribution of demand components to within-country GDP growth to their contribution to between-country GDP disparities. By linking expenditure-side and income-side components within the national accounts framework, the analysis also provides a bridge between demand side and the role of productivity differences in shaping cross-country GDP disparities.

To our knowledge, this aspect has not been addressed. Thus, we consider how the dispersion of expenditure-side components, on the one hand, and of wages and salaries, employers' social contributions, profits, and net taxes on production and imports, on the other, has contributed to the dispersion of per-capita GDP across countries over the period 1990–2025. Importantly, the link between GDP inequality and productivity divergence via expenditure and income components is explored.

Data are drawn from the OECD and cover annual GDP and its components—both from

[2]Austria, Belgium, Germany, Luxembourg, Netherlands, and Switzerland.

the expenditure approach and the income approach—form 1990 to 2025 for 17 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

Methodologically, we propose a novel non-parametric two-stage decomposition strategy that combines multiplicative and additive factor decompositions. In a first stage, we use a counterfactual Shapley procedure to separate population effects from per-capita components in total GDP inequality (Shapley, 1953; Duro and Esteban, 1998); in a second stage, we apply a Shorrocks factor decomposition to quantify how expenditure-side and income-side components contribute to between-country inequality in per-capita GDP (Shorrocks, 1982, 2013).

Our findings strikingly show that exports become the main driver of divergence in per capita GDP from 2000. Exports also contribute to productivity dispersion from 2000 onward. The contribution of salaries steadily decline throughout the period whereas the one of profits rises around 2014. This result hints to the decoupling of wages and productivity and the role of exports in the divergence of profits, which appear to absorb the productivity gains instead of salaries.

The remainder of the paper is organized as follows. Section 2 describes the data and outlines the empirical methodology. Section 3 presents and discusses the results of the two-stage decomposition. Section 4 extends the analysis to examine the role of productivity as a transmission channel of inequality. Section 5 concludes.

2 Data and Empirical Strategy

2.1 Data

GDP per capita and total GDP serve different analytical purposes. The former is the preferred lens for convergence in living standards since it measures average material welfare. The latter captures macroeconomic weight, relevant for external spillovers across countries and their systemic importance.

Data are drawn from the OECD and cover Annual GDP and components—expenditure approach and income approach—from 1990 to 2025 for 17 European countries, nominally Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.[3] They

[3]In line with Blanchard and Giavazzi (2002), we excluded Luxembourg since its surpluses over time are noticeably higher than the surpluses of the other countries.

are highly homogeneous in socioeconomic, political, and historical patterns differently from the Eastern Bloc and the Balkan area. This choice limits the influence of path dependence where historical legacies can shape recent economic performance, thus avoiding the confounding role of post-socialist transition and EU-enlargement catching-up in Central and Eastern Europe. The geographical scope is also policy-motivated since our focus is on how macroeconomic changes affected already advanced economies rather than catching-up economies following EU enlargement.

The starting point (early 1990s) is determined by data availability, specifically the harmonization of standardized national accounts throughout the sample.

The income-side decomposition distinguishes wages and salaries (W), employers' social contributions (SC), gross operating surplus and mixed income (Π), and taxes on production and imports less subsidies (T). Wages and salaries and employers' social contributions jointly constitute compensation of employees. Gross operating surplus and mixed income capture business and self-employment income, while T is the net-tax component that completes the income-side valuation of GDP at market prices.

The expenditure decomposition disaggregates GDP into Private Consumption (C), Government Individual Consumption (GIC), Government Collective Consumption (CGC), Gross Fixed Capital Formation (GFCF), Changes in Inventories (IN) and Net Exports (NX).[4] C represents goods and services purchased directly by households and those provided by nonprofit institutions, reflecting living-standard convergence; CGC captures pure public goods, offering a lens on cross-country differences in state capacity; GIC measures publicly provided education and health services, indicative of the welfare state; GFCF records investment in capital stock, the engine of growth; IN proxies for short-run inventory cycles; NX represents net exports and thus connects directly to the literature on global imbalances.[5]

All variables are expressed in US dollars at constant 2020 prices. This decomposition captures domestic volume shifts and the differing exposure of European economies to international currency shocks across EMU and non-EMU regimes.

For consistency with the additive decomposition, expenditure-side GDP is constructed as the sum of the components included in the analysis.[6]

[4]For details see Table 1 in the Appendix.

[5]For Spain, Greece, and Sweden, some observations are missing for GIC, CGC, and IN in the OECD data. We fill these gaps by expressing each missing component as a share of GDP. For each country and component, we compute a five-year moving average of the component-to-GDP ratio and use the first available smoothed value as the reference share. Missing values are then recovered by applying this reference share to GDP in the relevant year.

[6]For the expenditure-side analysis, we use the component-consistent aggregate $Y_{it} = C_{it}+CGC_{it}+GIC_{it}+GFCF_{it}+IN_{it}+X_{it}-IM_{it}$, rather than the GDP series published separately by the OECD. Differences between the two aggregates may arise from the treatment of acquisitions less disposals of valuables and from the non-additivity of chain-linked volume measures outside the reference year. Constructing Y_{it}^{E} from its

To compute per-capita GDP and the employment-to-population ratio, we use OECD data on Population (N) and Employment (E).

Table 2.1 presents summary statistics (mean and standard deviation over time) for the variables.[7]

Table 2.1: Country averages over time (millions of 2020 US dollars; E and N # of individuals)

Country	Y	C	CGC	GIC	$GFCF$	IN	X	IM	W	SC	Π	T	E	N
AT	321101	168570	24562	39824	77851	2740	160415	153328	128636	27313	126242	38910	3945514	8346669
	(111942)	*(54707)*	*(8044)*	*(16261)*	*(26631)*	*(4197)*	*(79587)*	*(75295)*	*(45072)*	*(9398)*	*(45881)*	*(12662)*	*(303528)*	*(420768)*
BE	392078	203225	32968	56509	89800	3147	299847	293749	145021	51405	156687	38966	4299257	10700000
	(140961)	*(71160)*	*(11831)*	*(24113)*	*(35868)*	*(3919)*	*(139977)*	*(143965)*	*(50541)*	*(16874)*	*(63062)*	*(11168)*	*(434400)*	*(582941)*
CH	619090	328356	32814	36788	162022	1700	361360	314160	291957	55217	255338	16578	4227463	7722436
	(149956)	*(67288)*	*(6630)*	*(10698)*	*(34555)*	*(8336)*	*(152301)*	*(123122)*	*(75090)*	*(13746)*	*(57476)*	*(5366)*	*(350014)*	*(684048)*
DE	3002040	1632624	236382	362831	629497	14748	1096658	973966	1284857	282655	1157377	277151	38300000	82000000
	(866994)	*(419843)*	*(67816)*	*(135703)*	*(169973)*	*(17123)*	*(528726)*	*(450821)*	*(386586)*	*(76718)*	*(325886)*	*(85936)*	*(2496766)*	*(1033513)*
DK	260565	124202	19539	44665	54600	1580	136753	120457	123497	10022	91092	35955	2738543	5504094
	(89272)	*(39451)*	*(5886)*	*(15298)*	*(21264)*	*(1944)*	*(73826)*	*(65342)*	*(41313)*	*(4149)*	*(32846)*	*(11591)*	*(123718)*	*(247601)*
ES	1024789	595958	80821	111091	228143	7093	305159	303643	379584	107654	441428	96123	17100000	43900000
	(394469)	*(216089)*	*(33109)*	*(50883)*	*(83758)*	*(7605)*	*(168388)*	*(148596)*	*(142673)*	*(42375)*	*(170500)*	*(41271)*	*(2976316)*	*(3371537)*
FI	197592	101267	15507	30139	45472	979	76292	72003	77278	17824	78081	24408	2398286	5307547
	(66770)	*(35058)*	*(5018)*	*(13079)*	*(16566)*	*(1809)*	*(31457)*	*(34165)*	*(26955)*	*(4473)*	*(26399)*	*(9582)*	*(163003)*	*(185683)*
FR	2108252	1146312	184582	315167	455005	8040	621536	622471	787405	297269	740721	282857	25300000	63400000
	(604033)	*(326992)*	*(49054)*	*(105784)*	*(146178)*	*(10785)*	*(247469)*	*(271800)*	*(235068)*	*(81241)*	*(206220)*	*(83571)*	*(1775215)*	*(3453744)*
GR	185017	124781	19187	18423	33860	1609	50549	63173	49718	13983	99166	22150	4014000	10800000
	(63329)	*(42360)*	*(7888)*	*(6656)*	*(14291)*	*(3142)*	*(29792)*	*(32087)*	*(19195)*	*(5587)*	*(30775)*	*(9094)*	*(325231)*	*(256689)*
IE	229697	82136	10870	21580	59310	2171	264944	211865	64929	12139	135175	17454	1874229	4290154
	(168826)	*(38859)*	*(5946)*	*(12739)*	*(51733)*	*(3682)*	*(253587)*	*(189165)*	*(35479)*	*(7130)*	*(120018)*	*(8762)*	*(452558)*	*(574048)*
IS	12306	6331	1096	1888	2671	16	5256	5050	5151	1154	4418	1582	168600	310415
	(8897)	*(4294)*	*(795)*	*(1512)*	*(2159)*	*(45)*	*(4193)*	*(3923)*	*(3744)*	*(990)*	*(3161)*	*(1042)*	*(25727)*	*(39462)*
IT	1663800	982697	134890	183187	334207	6447	449706	427243	470079	177650	815854	200217	22000000	58400000
	(435338)	*(256745)*	*(34803)*	*(50994)*	*(91145)*	*(12261)*	*(179602)*	*(177031)*	*(129512)*	*(40652)*	*(202940)*	*(65651)*	*(1146066)*	*(1376263)*
NL	678664	313140	55419	107206	139966	2688	504467	444159	259601	68766	282391	67906	8048543	16400000
	(257500)	*(105491)*	*(19851)*	*(50995)*	*(50651)*	*(5614)*	*(268421)*	*(237904)*	*(85962)*	*(30452)*	*(114632)*	*(27399)*	*(931530)*	*(829848)*
NO	262450	106782	18932	36322	57643	6944	107344	77294	90317	22036	125112	24985	2411886	4815574
	(149905)	*(51692)*	*(9869)*	*(22153)*	*(32514)*	*(5274)*	*(70361)*	*(44917)*	*(46001)*	*(13133)*	*(81626)*	*(11699)*	*(287116)*	*(425171)*
PT	179406	115146	14361	18681	37502	680	63665	70778	65800	17945	73263	22399	4796057	10300000
	(64861)	*(40156)*	*(4995)*	*(6755)*	*(11608)*	*(690)*	*(36148)*	*(32792)*	*(22717)*	*(6992)*	*(26241)*	*(9267)*	*(260183)*	*(215649)*
SE	366348	172137	26942	68813	85036	819	163946	149563	145129	27559	122111	71548	4544257	9377925
	(151385)	*(66566)*	*(10436)*	*(29664)*	*(40032)*	*(2262)*	*(88217)*	*(85458)*	*(60915)*	*(13495)*	*(44284)*	*(34112)*	*(432342)*	*(638482)*
UK	1971076	1249264	144328	239447	342659	4836	553598	576911	800458	157539	795560	217519	29100000	62000000
	(788641)	*(477441)*	*(54938)*	*(120594)*	*(134093)*	*(8602)*	*(273632)*	*(284822)*	*(312709)*	*(79584)*	*(316227)*	*(87065)*	*(2656036)*	*(3751135)*

Note: Standard deviations in parentheses.

2.2 Methodology

In this section, we introduce a two-stage non-parametric estimation strategy to assess the contributions of expenditure aggregates and income-side components to GDP inequality,

included components guarantees the accounting identity required by the Shorrocks decomposition and hence $\sum_k s_{k,t} = 1$. Robustness checks considering alternative treatments of valuables and deflation, as well as the published GDP aggregate, show that the maximum absolute change in the estimated contribution shares is below 0.5 percentage points. The underlying reconciliation and robustness calculations are available from the authors upon request. Consequently, $CV(Y)$ may differ slightly from the total-GDP coefficient of variation obtained from the income-side dataset.

[7]The dynamics of the main macroeconomic variables (Y, C, $GFCF$, $NX = X - IM$, Π, W, E, N) for four countries (France, Germany, Italy, Spain) that exemplify different growth, demand and external adjustment patterns is reported in Figure 2 (Appendix).

independently of the influence of population dynamics.

The dynamics of inequality metrics over time has been widely employed to assess convergence (or divergence) among EU countries, using either total GDP or per-capita GDP depending on the focus of the analysis. In this paper, we investigate the contribution of GDP components (defined in Table 1 in the Appendix) to overall GDP inequality, which is inevitably influenced by changes in population size across countries.[8] Since our aim is to examine the drivers of inequality among EU countries independently of population changes over time, we propose to combine two different decomposition procedures. This allows to disentangle the impact of demographic changes from total GDP inequality while limiting issues arising from the joint determination of macroeconomic aggregates.

The two-stage procedure reconciles two well-established factor decomposition methods designed for multiplicative and additive outcome functions (Shorrocks, 1982; Duro and Esteban, 1998; Shorrocks, 2013). This framework allows us to identify the main drivers of GDP inequality over time while disentangling the role of demographic changes from that of per-capita GDP dynamics.

2.2.1 First-stage decomposition

Let $i \in \{1, \ldots, M\}$ denote country i. Define the GDP and population vectors, respectively, as $Y = \{Y_i\}_{i=1}^{M} \in \mathbb{R}_+^M$ and $N = \{N_i\}_{i=1}^{M} \in \mathbb{R}_+^M$ with $Y_{\text{tot}} = \sum_{i=1}^{M} Y_i$ and $N_{\text{tot}} = \sum_{i=1}^{M} N_i$. Per-capita GDP in country i is $y_i = Y_i/N_i$, while

$$\bar{y} = \frac{Y_{\text{tot}}}{N_{\text{tot}}}$$

is average per-capita GDP for the entire population of individuals. For the GDP vector Y, let $\bar{Y} = M^{-1} \sum_{i=1}^{M} Y_i$ denote the unweighted mean of country-level GDP.

Building on the counterfactual approach to inequality decomposition proposed by Duro and Esteban (1998), we construct counterfactual GDP vectors defined through the multiplicative components y and N, i.e.,

$$Y^y = \{y_i N_{\text{tot}}\}_{i=1}^{M}, \qquad Y^n = \{\bar{y} N_i\}_{i=1}^{M}, \qquad Y^{yn} = \{y_i N_i\}_{i=1}^{M} = Y.$$

[8] In Milanovic's terminology, our object of analysis consists of *unweighted international inequality*, since countries are the units of observation and the focus is on the dispersion of country-level GDP and GDP per-capita aggregates rather than on population-weighted or individual-level income distributions (Milanovic, 2013).

For completeness, define the counterfactual associated with the empty coalition as

$$Y^{\varnothing} = \{\bar{y}N_{\text{tot}}\}_{i=1}^{M}.$$

This is an equal distribution across countries and therefore contains neither cross-country variation in per-capita GDP nor cross-country variation in population.

We first formulate the decomposition for a generic inequality index $I : \mathbb{R}_{++}^{M} \to \mathbb{R}_{+}$. We assume that I is continuous and symmetric, is normalized so that $I(Z) = 0$ if and only if all elements of Z are equal, is scale invariant, and satisfies the Pigou-Dalton transfer principle. These properties ensure that I measures relative inequality independently of the ordering and common scale of country-level GDP. Replication invariance is not required here because the number and identity of the countries are fixed throughout the analysis.

For each coalition $S \in \{\varnothing, y, n, yn\}$, define the value function $v_I(S) = I(Y^S)$. By normalization, $v_I(\varnothing) = I(Y^{\varnothing}) = 0$. Moreover, scale invariance implies

$$v_I(y) = I(y), \qquad v_I(n) = I(N), \qquad v_I(yn) = I(Y). \tag{1}$$

The Shapley rule assigns to each multiplicative component its average marginal contribution over the two possible orders in which y and N can enter the counterfactual distribution. It therefore yields the exact and path-independent decomposition (Shapley, 1953; Shorrocks, 2013)

$$I(Y) = I^{y} + I^{n}, \tag{2}$$

where

$$\begin{aligned} I^{y} &= \frac{1}{2}\Big[v_I(y) - v_I(\varnothing)\Big] + \frac{1}{2}\Big[v_I(yn) - v_I(n)\Big], \\ I^{n} &= \frac{1}{2}\Big[v_I(n) - v_I(\varnothing)\Big] + \frac{1}{2}\Big[v_I(yn) - v_I(y)\Big]. \end{aligned} \tag{3}$$

The component I^{y} captures the average of two effects: the inequality generated by introducing cross-country variation in per-capita GDP when population is held equal, and the change in inequality obtained by introducing per-capita GDP variation when population differences are already present. Analogously, I^{n} averages the corresponding marginal contributions of population. The Shapley rule therefore allocates the interaction between y and N symmetrically across the two components.

The contributions I^{y} and I^{n} should not be confused with the inequality of per-capita GDP, $I(y)$, and the inequality of population, $I(N)$. The former are contributions to inequality in aggregate GDP, whereas the latter are inequality levels calculated directly on the corresponding distributions. Using equations (1) and (3), the two contributions can be

written as

$$I^y = \frac{1}{2}\left[I(y) + I(Y) - I(N)\right], \qquad I^n = \frac{1}{2}\left[I(N) + I(Y) - I(y)\right]. \tag{4}$$

A contribution may be negative when one multiplicative component offsets part of the inequality generated by the other. This can occur, for example, when per-capita GDP and population are sufficiently negatively associated across countries. Moreover, if $I(N) = 0$, population is equally distributed across countries. In that special case, scale invariance implies $I(y) = I(Y) = I^y$ and $I^n = 0$.

For the empirical analysis, we consider the Coefficient of Variation

$$CV(Y) = \frac{\sqrt{M^{-1}\sum_{i=1}^{M}\left(Y_i - \bar{Y}\right)^2}}{\bar{Y}} \tag{5}$$

whose square is proportional to the Generalized Entropy index with parameter $\alpha = 2$, that is, $GE_2(Y) = \frac{1}{2}CV(Y)^2$ with

$$GE_\alpha(Y) = \frac{1}{\alpha(\alpha-1)}\left[\frac{1}{M}\sum_{i=1}^{M}\left(\frac{Y_i}{\bar{Y}}\right)^\alpha - 1\right], \qquad \alpha \neq 0, 1.$$

The CV is selected for our empirical inequality analysis for three related reasons.[9] First, the CV is scale invariant and provides a direct measure of relative cross-country dispersion, consistently with the general concept of σ-convergence (Sala-i Martin, 1996). Second, because the CV is a monotonic transformation of GE_2, it preserves the inequality ordering generated by GE_2 while reporting dispersion in the more transparent units of a relative standard deviation.[10] Third, as shown in the second stage, the normalization underlying the CV provides a direct bridge between the inequality measure and covariance-based source contributions, without additional axiomatic attribution rules (Shorrocks, 1982). It therefore allows the contributions obtained at the two stages to be reported using a common inequality metric.

Setting $I = CV$ and writing $v(S) = CV(Y^S)$, the generic decomposition in equation (2) becomes

$$CV(Y) = CV^y + CV^n, \tag{6}$$

[9]Between-country inequality, as measured by $CV(Y)$ in equation (5), differs from the between-group component of an inequality decomposition computed over the entire population of individuals (Shorrocks, 1980). The latter would require within-country distributional information, whereas countries are the units of observation in the present analysis.

[10]For example, $CV(Y) = 0.20$ means that the cross-country standard deviation of GDP is equal to 20 percent of mean GDP.

where

$$CV^y = \frac{1}{2}\left[CV(y) + CV(Y) - CV(N)\right], \qquad CV^n = \frac{1}{2}\left[CV(N) + CV(Y) - CV(y)\right]. \quad (7)$$

The resulting components CV^y and CV^n are expressed in the same relative-standard-deviation units as $CV(Y)$ and add directly to the observed coefficient of variation, rather than being reported on the squared scale of GE_2. At the first stage, transparency therefore refers both to the immediate interpretation of the inequality measure and to the common additive scale of its Shapley components. Combined with the covariance representation introduced in the second stage, this also ensures that all contributions in the two-stage decomposition are expressed using the same inequality metric.

In contrast to Duro and Esteban (1998), who analyze factors influencing per-capita GDP inequality, such as productivity and labor-market participation, we use the counterfactual approach to disentangle the respective contributions of population size and per-capita GDP to inequality in aggregate GDP. This distinction allows us to separate demographic differences from variations in per-capita GDP. [11]

A further methodological departure from Duro and Esteban (1998) is that we use the Coefficient of Variation consistently at both stages of the decomposition. At the first stage, the Shapley rule allocates the interaction between the multiplicative components (y, N) symmetrically. At the second stage, as discussed below, the additive accounting identity for per-capita GDP allows the same inequality measure to be decomposed exactly into covariance-based factor contributions. The two stages therefore use different decomposition rules, suited respectively to a multiplicative and an additive accounting structure, while retaining a common inequality metric.

Three qualifications should nevertheless be emphasized. First, although the Shapley decomposition is exact and path independent for any selected inequality index, the allocation between I^y and I^n is not generally invariant to the choice of that index. Second, the counterfactual distributions provide an accounting attribution rather than a causal decomposition: they hold one component at a common reference value without modelling behavioral or general-equilibrium responses. Third, because the CV is based on squared deviations from the mean, it is sensitive to countries located far from the cross-country mean.

[11] In Section 4, we also present results based on the decomposition procedure originally proposed by Duro and Esteban (1998).

2.2.2 Second-stage decomposition: expenditure components

Consider the country-level GDP decomposition into expenditure-side sources,

$$Y_i = C_i + CGC_i + GIC_i + GFCF_i + IN_i + X_i - IM_i, \tag{8}$$

where $C = (AIC - GIC)$ denotes private consumption (goods and services), AIC Actual Individual Consumption, CGC Government Collective Consumption, GIC Government Individual Consumption, $GFCF$ Gross Fixed Capital Formation, IN Changes in Inventories, X Exports, and IM Imports. Hence, define the vectors $C = \{C_i\}_{i=1}^M$, $CGC = \{CGC_i\}_{i=1}^M$, $GIC = \{GIC_i\}_{i=1}^M$, $GFCF = \{GFCF_i\}_{i=1}^M$, $X = \{X_i\}_{i=1}^M$, $IM = \{IM_i\}_{i=1}^M$ in $\mathbb{R}_+^M$ and $IN = \{IN_i\}_{i=1}^M \in \mathbb{R}^M$ (i.e. real-valued). For completeness, define net exports $NX_i = X_i - IM_i$ and $NX = \{NX_i\}_{i=1}^M \in \mathbb{R}^M$.

For the per-capita GDP component $y_i = Y_i/N_i$, introduce source-specific per-capita terms as follows

$$c_i = \frac{C_i}{N_i}, \quad cgc_i = \frac{CGC_i}{N_i}, \quad gic_i = \frac{GIC_i}{N_i}, \quad gfcf_i = \frac{GFCF_i}{N_i},$$
$$in_i = \frac{IN_i}{N_i}, \quad x_i = \frac{X_i}{N_i}, \quad im_i = \frac{IM_i}{N_i}, \quad nx_i = \frac{NX_i}{N_i} = x_i - im_i,$$

so that

$$y_i = c_i + cgc_i + gic_i + gfcf_i + in_i + x_i - im_i. \tag{9}$$

Since equation (9) expresses per-capita GDP as an additive function of its expenditure-side sources, we can apply the covariance-based factor decomposition characterized by Shorrocks (1982).

Let $\mathcal{K}_E = \{C, CGC, GIC, GFCF, IN, X, -IM\}$, and define

$$q_C = c, \quad q_{CGC} = cgc, \quad q_{GIC} = gic, \quad q_{GFCF} = gfcf, \quad q_{IN} = in, \quad q_X = x, \quad q_{-IM} = -im,$$

where each q_k denotes the corresponding cross-country vector.

Under the axioms of Theorem 3 in Shorrocks (1982), the relative contribution to overall inequality of source k is

$$\frac{S_k(I)}{I(y)} = s_k = \frac{\mathrm{Cov}(q_k, y)}{\mathrm{Var}(y)}, \qquad k \in \mathcal{K}_E, \tag{10}$$

where $S_k(I)$ denotes the absolute contribution of source k when inequality is measured by the admissible index I. Covariances and variances are computed across countries using equal weights.

Equation (10) shows that, under the covariance-based rule, the relative source shares s_k

are invariant to the inequality index, including indices belonging to the Generalized Entropy class, whereas the absolute contributions are

$$S_k(I) = s_k I(y).$$

This invariance concerns the covariance-based decomposition rule and should not be confused with the index-specific natural decompositions of the Gini coefficient or the Theil index. By construction, $\sum_{k\in\mathcal{K}_E} s_k = 1$ whenever $\mathrm{Var}(y) > 0$. A negative value of s_k indicates that source k is negatively associated with per-capita GDP and therefore acts as an equalizing source within this decomposition.

Specializing the covariance-based rule to $I = CV$, let $\mu_y = M^{-1}\sum_{i=1}^{M} y_i$ and $\sigma_y = \sqrt{\mathrm{Var}(y)}$ denote, respectively, the unweighted cross-country mean and standard deviation of per-capita GDP. Since $y_i = \sum_k q_{ki}$, the linearity of covariance implies $\mathrm{Var}(y) = \sum_k \mathrm{Cov}(q_k, y)$. Therefore, the coefficient of variation admits the exact factor decomposition

$$CV(y) = \frac{\sigma_y}{\mu_y} = \sum_k \frac{\mathrm{Cov}(q_k, y)}{\mu_y \sigma_y} = \sum_k CV^k(y), \tag{11}$$

where

$$CV^k(y) = \frac{\mathrm{Cov}(q_k, y)}{\mu_y \sigma_y} = s_k CV(y). \tag{12}$$

Thus, s_k is the relative contribution of factor k to $CV(y)$, whereas $CV^k(y)$ is its absolute contribution expressed in relative-standard-deviation units.[12] A factor is disequalizing (equalizing) when it covaries positively (negatively) with per-capita GDP.

The second-stage contribution of factor k to the per-capita channel identified at the first stage is obtained by proportionally rescaling its contribution to $CV(y)$ as follows,

$$CV^{y,k} = \frac{CV^y}{CV(y)} CV^k(y) = s_k CV^y, \qquad k \in \{C, CGC, GIC, GFCF, IN, X, -IM\}. \tag{13}$$

The first equality rescales the factor contribution to $CV(y)$ so that it applies to the per-capita channel CV^y identified by the first-stage Shapley decomposition. Since $\sum_k s_k = 1$, it follows that $CV^y = \sum_k CV^{y,k}$, and therefore

$$\begin{aligned} CV(Y) = {} & CV^{y,C} + CV^{y,CGC} + CV^{y,GIC} + CV^{y,GFCF} \\ & + CV^{y,IN} + CV^{y,X} + CV^{y,-IM} + CV^n. \end{aligned} \tag{14}$$

[12] Unlike some entropy measures (e.g., the mean log deviation), which requires strictly positive observations, $CV(q_k)$ (i.e. GE_2) can be computed when some source values are zero or negative, provided that $\mu_{q_k} > 0$. This may be useful for comparing a source's stand-alone dispersion with its covariance-based contribution to overall inequality.

When net exports are treated as a single source, the relevant expenditure-side set becomes $\mathcal{K}_E^{NX} = \{C, CGC, GIC, GFCF, IN, NX\}$, with $q_{NX} = nx$. By linearity of covariance, $s_{NX} = s_X + s_{-IM}$ and, consequently, $CV^{y,NX} = CV^{y,X} + CV^{y,-IM}$. Thus, treating net exports as a single source or disaggregating them into exports and imports leaves the overall decomposition unchanged and only affects the level of source aggregation.

The inequality decomposition in equation (14) attributes total cross-country inequality in GDP, $CV(Y)$, to (i) the per-capita channel—disaggregated into expenditure-side sources per person—and (ii) the population channel. Roughly, the two-stage term $s_k CV^y$ is precisely the contribution of factor k to inequality in aggregate GDP (Y), net (in the Shapley sense) of cross-country population inequality and with the $y \times N$ interaction split symmetrically between y and N. Since the second-stage contributions are expressed directly through covariances, they remain well defined for signed sources such as IN and $-IM$, as well as for NX when exports and imports are aggregated, even if the mean of the relevant source is zero or negative. The Shapley allocation at the first stage, in turn, guarantees an exact and path-independent allocation of the interaction between the per-capita and population channels.

Moreover, when comparing the two-stage contribution of factor k, $CV^{y,k} = s_k CV^y$, with the one-stage attribution of per-capita inequality $CV^k(y) = s_k CV(y)$, it is worth observing that (see equation (7))

$$CV^{y,k} - CV^k(y) = s_k\Big(CV^y - CV(y)\Big) = \frac{s_k}{2}\Big[CV(Y) - CV(N) - CV(y)\Big], \tag{15}$$

implying that, if $CV(N) = 0$, then the two attributions coincide since $CV^{y,k} = CV^k(y)$. Differently, if heterogeneity in N (and/or its interaction with y) is substantial, CV^y scales factor k's contribution up or down in a way consistent with the pass-through from per-capita dispersion to aggregate inequality.

2.2.3 Second-stage decomposition: income components

Consider the country-level GDP decomposition on the income side,

$$Y_i = W_i + SC_i + \Pi_i + T_i, \tag{16}$$

where W_i denotes wages and salaries, SC_i denotes employers' social contributions, Π_i denotes gross operating surplus plus mixed income, and T_i denotes taxes on production and imports

less subsidies. Thus, $W_i + SC_i$ corresponds to compensation of employees. Let

$$W = \{W_i\}_{i=1}^M, \qquad SC = \{SC_i\}_{i=1}^M, \qquad \Pi = \{\Pi_i\}_{i=1}^M, \qquad T = \{T_i\}_{i=1}^M.$$

While $W, SC \in \mathbb{R}_+^M$, both Π and T may in principle contain signed values, so that $\Pi, T \in \mathbb{R}^M$.

For the per-capita component $y_i = Y_i/N_i$, define

$$w_i = \frac{W_i}{N_i}, \qquad sc_i = \frac{SC_i}{N_i}, \qquad \pi_i = \frac{\Pi_i}{N_i}, \qquad t_i = \frac{T_i}{N_i},$$

so that

$$y_i = w_i + sc_i + \pi_i + t_i. \tag{17}$$

Let $\mathcal{K}_{\text{inc}} = \{W, SC, \Pi, T\}$, with $q_W = w$, $q_{SC} = sc$, $q_\Pi = \pi$, and $q_T = t$. Applying the same covariance-based factor decomposition as on the expenditure side, define

$$s_k = \frac{\text{Cov}(q_k, y)}{\text{Var}(y)}, \qquad k \in \mathcal{K}_{\text{inc}}. \tag{18}$$

Since $y_i = \sum_{k \in \mathcal{K}_{\text{inc}}} q_{ki}$, $\sum_{k \in \mathcal{K}_{\text{inc}}} s_k = 1$ whenever $\text{Var}(y) > 0$. The absolute contribution of source k to the coefficient of variation of per-capita GDP is

$$CV^k(y) = \frac{\text{Cov}(q_k, y)}{\mu_y \sigma_y} = s_k CV(y), \qquad k \in \mathcal{K}_{\text{inc}}. \tag{19}$$

The corresponding contributions to the first-stage per-capita channel are

$$CV^{y,k} = \frac{CV^y}{CV(y)} CV^k(y) = s_k CV^y, \qquad k \in \mathcal{K}_{\text{inc}}. \tag{20}$$

The two-stage income-side decomposition is therefore

$$CV(Y) = CV^{y,W} + CV^{y,SC} + CV^{y,\Pi} + CV^{y,T} + CV^n. \tag{21}$$

This expression attributes total cross-country GDP inequality to wages and salaries, employers' social contributions, gross operating surplus plus mixed income, net taxes on production and imports, and the population channel. When the objective is to aggregate the two components of employee compensation, let $LC_i = W_i + SC_i$ and $lc_i = w_i + sc_i$. By linearity of covariance,

$$s_{\text{LC}} = s_W + s_{SC}, \qquad CV^{y,\text{LC}} = CV^{y,W} + CV^{y,SC}.$$

Thus, the appropriate labor-compensation contribution is $CV^{y,\text{LC}}$. The comparison between

$CV^{y,\mathrm{LC}}$ and $CV^{y,\Pi}$ provides a close empirical counterpart to the conventional wage–profit split. Strictly speaking, however, Π also includes mixed income, which combines labor and capital income from unincorporated enterprises. This qualification does not undermine the usefulness of the comparison, but indicates that it should be interpreted as a labor-compensation versus operating-surplus and mixed-income comparison rather than as a perfectly sharp division between labor and capital income.

Since t may contain signed values, $CV^{y,T}$ is a covariance-based accounting contribution rather than the stand-alone coefficient of variation of t. It should not be interpreted as a causal effect of taxation or as a measure of general income or corporate taxation: it refers specifically to taxes on production and imports less subsidies.

3 Results and Discussion

3.1 Expenditure-side decomposition

Figure 3.1 presents the first-stage Shapley decomposition of between-country GDP inequality into its per-capita (CV^y) and population (CV^n) components. As one might expect, the overall dispersion in total GDP, $CV(Y)$, largely reflects cross-country differences in population size rather than in per-capita income. Indeed, the demographic component accounts for about 81% (see Table 2 in the Appendix) and remains broadly stable over time. Whereas, the contribution of dispersion in per-capita GDP is smaller and shows a trend matching GDP dynamics. The per-capita component appears to be the main driver of the decline in total GDP inequality, which falls up to the 2008 crisis and slightly increases thereafter.

Figure 3.2a shows the second-stage decomposition of per capita GDP inequality by expenditure components including net exports. The major source of GDP variation is consumption of households (C), 8.6%, followed by gross fixed investments (GFCF), 5.4%, and, to a lesser extent, net exports (NX), 2.5%. The impact of household consumption and gross fixed investments decreases dramatically from the beginning of the 1990s to the first decade of the 2000s. The global financial crisis reverses their role as equalizers. The contribution of consumption begins to steadily decline again around 2013, though heterogeneity slightly re-emerges with the recovery from the Covid-19 shock. Investments present a renewed peak around 2019 and a subsequent reduction in 2020.

The rise in the contribution of the trade balance becomes evident towards the end of the nineties, followed by a decline in the aftermath of the financial crisis. In the post-COVID-19 period, coinciding with the investment peak, we observe a drop in the contribution of net exports, which suggests an asymmetric response to the common shock. While investment

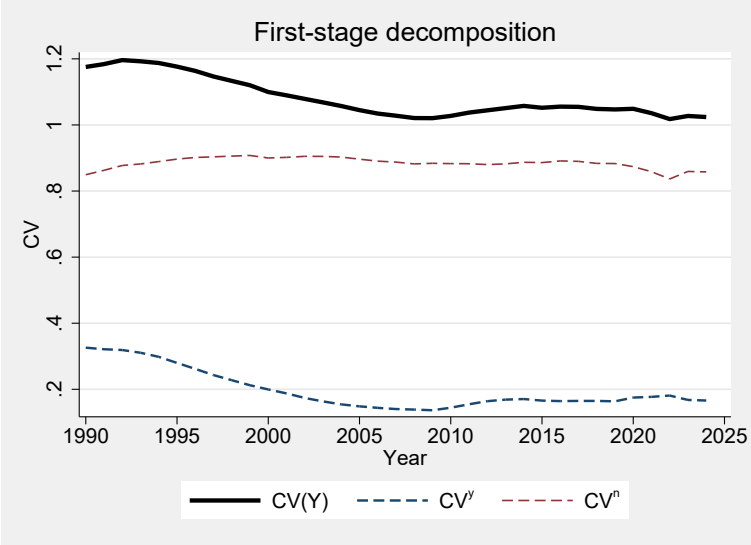
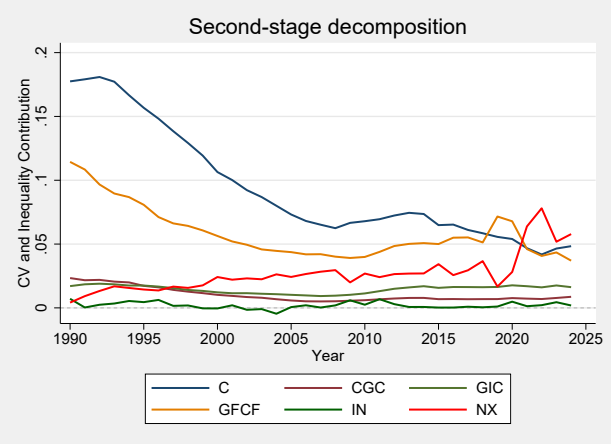
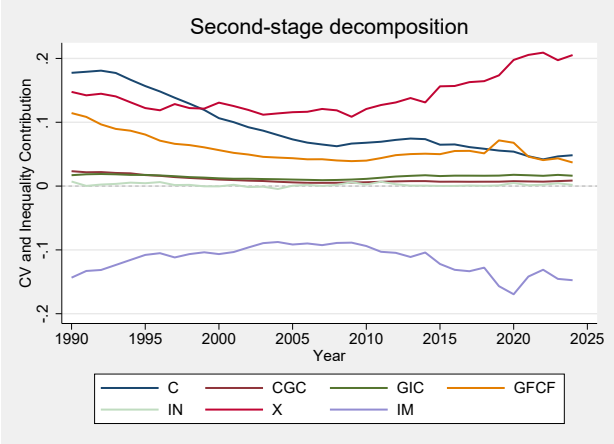


Figure 3.1: First-stage decomposition of between-country GDP inequality (total, per-capita, and population components).



(a) Second-stage decomposition of per-capita GDP inequality by expenditure components.



(b) Second-stage decomposition of per-capita GDP inequality by expenditure components (exports and imports disaggregated).

Figure 3.2: Second-stage decomposition of per-capita GDP inequality by expenditure components, with and without exports/imports disaggregation.

regains the role of equalizer, net exports become a relevant source of variation, reaching 34% in 2024 (see Table 2 in the Appendix). In conclusion, in the long run, the declining asymmetry in the distribution of GDP per capita across countries is associated with the convergence of consumption and investment, while net exports have become a constraining factor in recent years.

We separate net exports into exports and imports to better understand their role. Figure 3.2b shows that from the late 1990s, exports increasingly emerge as the main driver

of inequality. especially in the aftermath of the 2008 crisis. This could partly mirror the growing net export to GDP ratio in Germany and the overall large variability of net exports in the other countries beginning approximately in the late 1990s and early 2000s (Figure 1 in the Appendix).

The contribution of imports rises untill the end of the 2000s, after which it declines and leaves exports as the primary source of dispersion.

Discussion. The explanation for the role of exports is not univocal. A number of factors that primarily impact countries' competitiveness is at the core of external imbalances. Differences in price competitiveness emerged from the final stage of the European Monetary Union in 1999, with Germany increasing its competitiveness, while Italy, Portugal, Spain, Ireland and Luxembourg lost competitiveness to varying degrees(Fischer, 2007). Diverse patterns of unit labor costs (ULCs hereafter) caused disparities in competitive strength: from the mid-1990s, Germany's rate of ULC appeared below the level necessary for EMU convergence, while Portugal, Greece, and to a lesser extent Italy, persistently reported higher rates than the other EMU countries (Dullien and Fritsche, 2008).

We focus on some explanatory factors regarding labor market institutions and fiscal policies, on the one hand, and capital flows, on the other.

Labor market institutions and fiscal policies

Labor market institutions can explain the structural imbalance between export-led countries with current account surpluses and domestic demand-led countries with current account deficits within the EMU. When export-led Northern countries (Austria, Belgium, Finland, France, Germany and the Netherlands) joined the EMU, their institutional arrangement prompted competitiveness with respect to Southern economies (Greece, Ireland, Italy, Portugal and Spain). Coordination institutions favored wage moderation in wage bargaining leading to lower inflation and real exchange rate competitiveness (Hall, 2012). They stimulated the production of high value-added goods as well (Streeck, 1997; Hall, 2012).

From a sectoral perspective, the political coalition with tradable manufacturing sectors generally prevailing in Northern Europe kept unit labor costs low, while in peripheral states coalitions focused on domestic non-tradable sectors where wage inflation was higher (Johnston and Regan, 2016).

Analyzing the other European countries outside of the EMU alongside post-2008 shifts in demand regimes aids in clarifying the dispersion of exports. Prior to the financial crisis, Nordic countries were primarily driven by domestic demand, with Sweden also focusing on export growth in the ICT and services sectors. Subsequently, only Denmark and Iceland along with Southern Europe shifted to an export-led model. The role of exports became

stronger in continental Europe (Baccaro and Pontusson, 2016; Baccaro and Tober, 2021).

Overall, the strategy adopted by Austria, Belgium, Finland, France, Germany and the Netherlands was coupled with tight fiscal policy leading to competitive deflation (Hall, 2012). In Southern Europe the rise of domestic demand was stimulated through fiscal policy conducive to different inflationary patterns and real exchange rates. The internal fixed exchange rate did not allow Southern states to adjust the nominal exchange rate against their principal trading partners to offset the inflationary pressure of domestic demand and preserve competitiveness (Hall, 2012). After the debt crisis, the fiscal policy shift with the revival of the Stability and Growth Pact (SGP) in 2011 and the Fiscal Stability Treaty in 2013 until 2019, helped Greece, Italy, Portugal and Spain improve and stabilize their current-account balances (Glebocki Keefe and Hepp, 2024).

It is plausible that diverse fiscal policies affected the dispersion of imports, however, the 2008 and the COVID shocks appear to have transformed imports in an equalizing factor.

However, Johnston and Regan (2016) show that the introduction of the single currency led to persistent external imbalances, by eliminating nominal exchange-rate adjustments as a policy option for Southern European states. This prevented them from counteracting the significant wage moderation pursued by northern coordinated market economies.

Capital flows

An additional source of external imbalances is the movement of capital from core economies to peripheral ones prompted by the EMU creation of a favorable environment through financial integration. It triggered the expansion of domestic credit in Southern countries in the late 1990s and over part of the early 2000s (Spaventa and Giavazzi, 2010). Especially when the euro was introduced, capital flows to Southern countries were matched by lower private savings rates, higher consumption, private investment rates and imports (Jaumotte and Sodsriwiboon, 2010; Holinski et al., 2012). The boost of domestic demand caused higher labor costs and prices, lower real interest rates and higher real exchange rates in the period 1995–2012 (Gabrisch and Staehr, 2015). Recent empirical findings (Baccaro and Tober, 2021) show that financial flows stimulating private credit explain nominal wage increases in 1999–2014 better than wage-bargaining coordination. Relative changes in wages influenced bilateral Germany's exports to other European countries to a greater extent compared to Austria and the Netherlands.

The development of domestic demand, powered by the expansion of domestic credit, particularly in peripheral countries throughout part of the nineties and the first decade of the 2000s, was likely to have an equalizing influence on consumption and investment.

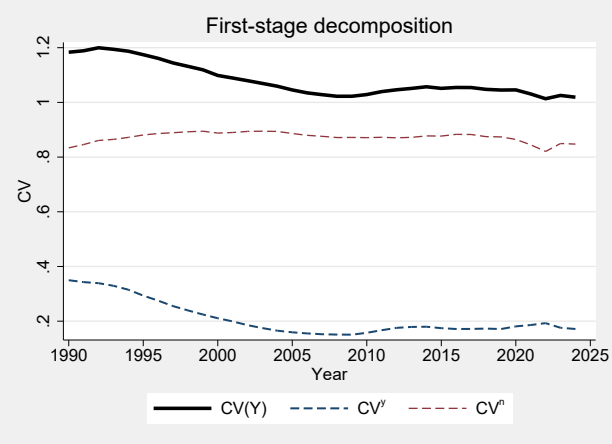
NON SO SE AGGIUNGERE=>A final consideration concerns the asymmetric exposure to currency shocks as post-1999 fluctuations affected EMU and non-EMU countries

differently.

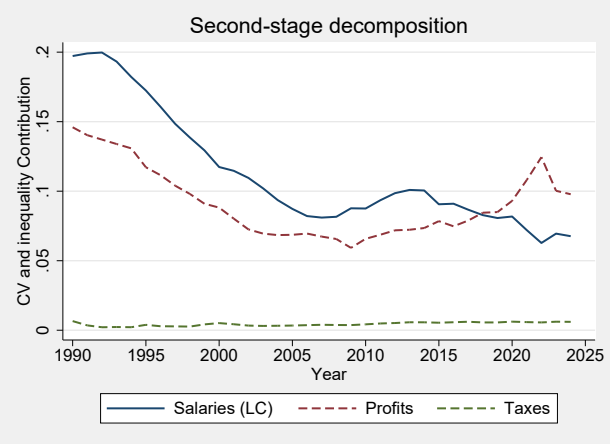
3.2 Income-side decomposition

percentages in comments to be revised

In Figures 3.3a and 3.3b, salaries display the higher contribution to per-capita GDP inequality, even if a reversal can be observed from 2019 onward. Both salaries and profits inequality contribute to per capita and total GDP inequality reduction until 2009, respectively from 18% and 13% to 9.7% and 6.4%; similarly, the rise from 2010 to 2014 (i.e. from 9.7% and 7% to 10.9% and 7.6% respectively) seems to be explained by both still preserving the same dominance ratio of the wage component (see Table 3 in the Appendix). However, from 2015 two different dynamics can be observed, since the contribution of salaries to the inequality of per capita (and total) GDP decreases from 9.8% to 6.8%, while the opposite can be observed for profits whose contribution moves from 8.3% in 2015 to 13.4% in 2022).



(a) First-stage decomposition of cross-country GDP inequality (total, per capita, and population components).



(b) Second-stage decomposition of per-capita GDP inequality by income components (salaries, profits, and taxes).

Figure 3.3: Decomposition of cross-country and per-capita GDP inequality.

Discussion. Does this evidence reflect the dynamics of the expenditure components? Could wage restraint in Northern Europe previously mentioned mirror the pattern of wages and profits? The period between 1999 and 2007 was characterized by wage convergence in accordance with the evidence showed by Mora et al. (2005). The surge of ULC in Greece, Italy, Ireland, Portugal, and Spain was due to wage rather than productivity (Dao and Maggi, 2018; Dao, 2020; Baccaro and Tober, 2021). The increase in wages from relatively lower levels was fueled by the boost in domestic demand from cheap capital inflows. This

was matched by wage moderation in Northern countries (Streeck, 1997; Hall, 2012) and wage stagnation or decrease in Germany and UK (Fernández-Macías and Vacas-Soriano, 2015). Notably, in Germany from 2000 to 2008, wage restraint and falling labor shares along with globalization raised exports and profits (Dao and Maggi, 2018; Dao, 2020).

In the post-Great Financial Crisis period, wage inequality widened, potentially reflecting the weakening of labour-market institutions to varying degrees across Southern Europe, including the decentralisation of collective bargaining, declining collective-bargaining coverage, and weakening employment protection (Afonso, 2019; Bulfone and Tassinari, 2021).

After 2014, the diminishing contribution of wage dispersion could be partly explained by the spread of wage moderation aimed at preserving export competitiveness (Lavoie and Stockhammer, 2013). In Southern Europe, fiscal austerity and internal devaluation were associated with a shift towards an export-oriented growth model (Baccaro and Pontusson, 2016; Baccaro and Hadziabdic, 2024).

4 Extension: the contribution of productivity over time

Recall definitions in Section 2.2. Let $E = \{E_i\}_{i=1}^M \in \mathbb{R}_+^M$ be the total employment and let the aggregate value be $E_{\text{tot}} = \sum_{i=1}^M E_i$. For each country i, define productivity $p_i = Y_i/E_i$ and employment-to-population ratio $e_i = E_i/N_i$; at the aggregate level use $\bar{p} = Y_{\text{tot}}/E_{\text{tot}}$ and $\bar{e} = E_{\text{tot}}/N_{\text{tot}}$. Finally, set $n_i = N_i$ and write $Y_i = p_i e_i n_i$.

Given the Coefficient of Variation in (1), construct the counterfactual GDP vectors as follows

$$\begin{aligned} Y^p &= \{p_i\,\bar{e}\,N_{\text{tot}}\}_{i=1}^M, \qquad Y^e = \{\bar{p}\,e_i\,N_{\text{tot}}\}_{i=1}^M, \quad Y^n = \{\bar{p}\,\bar{e}\,n_i\}_{i=1}^M, \\ Y^{pe} &= \{p_i\,e_i\,N_{\text{tot}}\}_{i=1}^M, \qquad Y^{pn} = \{p_i\,\bar{e}\,n_i\}_{i=1}^M, \qquad Y^{en} = \{\bar{p}\,e_i\,n_i\}_{i=1}^M, \\ Y^{pen} &= \{p_i\,e_i\,n_i\}_{i=1}^M = Y. \end{aligned} \tag{22}$$

Let $v(S) = CV(Y^S)$ for $S \in \{p, e, n, pe, pn, en, pen\}$. By adopting a Shapley-value allocation to obtain an exact, path-independent decomposition

$$CV(Y) = CV^p + CV^e + CV^n. \tag{23}$$

The three components are

$$\begin{aligned} CV^p &= \frac{1}{3}v(p) + \frac{1}{6}\Big[v(pe) - v(e)\Big] + \frac{1}{6}\Big[v(pn) - v(n)\Big] + \frac{1}{3}\Big[v(pen) - v(en)\Big], \\ CV^e &= \frac{1}{3}v(e) + \frac{1}{6}\Big[v(pe) - v(p)\Big] + \frac{1}{6}\Big[v(en) - v(n)\Big] + \frac{1}{3}\Big[v(pen) - v(pn)\Big], \\ CV^n &= \frac{1}{3}v(n) + \frac{1}{6}\Big[v(pn) - v(p)\Big] + \frac{1}{6}\Big[v(en) - v(e)\Big] + \frac{1}{3}\Big[v(pen) - v(pe)\Big]. \end{aligned}$$

Intuitively, CV^p captures the contribution of cross-country dispersion in labor productivity to overall inequality in Y (holding, on average, employment and population fixed); CV^e the contribution of dispersion in employment-to-population rates; and CV^n the contribution of dispersion in population. The Shapley averaging fairly allocates interaction effects among (p, e, n). This information is particularly relevant in that, compared to the bi-partition in (5), the tri-partition in (21) identifies the contribution of productivity and employment-to-population rate to the dynamics of inequality of per-capita GDP.

Given this first-stage decomposition, define source-specific terms for the productivity component $p_i = Y_i/E_i$ on the expenditure side as follows:

$$c_i^p = \frac{C_i}{E_i}, \quad cgc_i^p = \frac{CGC_i}{E_i}, \quad gic_i^p = \frac{GIC_i}{E_i}, \quad gfcf_i^p = \frac{GFCF_i}{E_i},$$
$$in_i^p = \frac{IN_i}{E_i}, \quad x_i^p = \frac{X_i}{E_i}, \quad im_i^p = \frac{IM_i}{E_i}, \quad nx_i^p = \frac{NX_i}{E_i} = x_i^p - im_i^p.$$

On the income side, define

$$w_i^p = \frac{W_i}{E_i}, \qquad sc_i^p = \frac{SC_i}{E_i}, \qquad \pi_i^p = \frac{\Pi_i}{E_i}, \qquad t_i^p = \frac{T_i}{E_i}.$$

The corresponding accounting identities are

$$p_i = c_i^p + cgc_i^p + gic_i^p + gfcf_i^p + in_i^p + x_i^p - im_i^p, \tag{24}$$

and

$$p_i = w_i^p + sc_i^p + \pi_i^p + t_i^p. \tag{25}$$

As above, we apply a Shorrocks-type factor decomposition to the cross-country coefficient of variation of p. For each source k, define

$$s_k = \frac{\mathrm{Cov}(q_k, p)}{\mathrm{Var}(p)}. \tag{26}$$

For the expenditure-side decomposition, define $\mathcal{K}_E = \{C, CGC, GIC, GFCF, IN, NX\}$, with

$$q_C = c^p, \quad q_{CGC} = cgc^p, \quad q_{GIC} = gic^p, \quad q_{GFCF} = gfcf^p, \quad q_{IN} = in^p, \quad q_{NX} = nx^p.$$

For the income-side decomposition, the relevant set is $\mathcal{K}_I = \{W, SC, \Pi, T\}$ with

$$q_W = w^p, \qquad q_{SC} = sc^p, \qquad q_\Pi = \pi^p, \qquad q_T = t^p.$$

Here, each q_k denotes the corresponding cross-country vector.

Let $\mu_p = M^{-1}\sum_{i=1}^{M} p_i$ and $\sigma_p = \sqrt{\text{Var}(p)}$. The contribution of factor k to the coefficient of variation of productivity is

$$CV^k(p) = \frac{\text{Cov}(q_k, p)}{\mu_p \sigma_p} = s_k CV(p). \tag{27}$$

Its contribution to the productivity channel identified at the first stage is therefore

$$CV^{p,k} = \frac{CV^p}{CV(p)} CV^k(p) = s_k CV^p. \tag{28}$$

Consequently, a second-stage decomposition can be obtained using either expenditure-side or income-side components. In the former case, we obtain

$$\begin{aligned} CV(Y) = {} & CV^{p,C} + CV^{p,CGC} + CV^{p,GIC} + CV^{p,GFCF} \\ & + CV^{p,IN} + CV^{p,NX} + CV^{e} + CV^{n}, \end{aligned} \tag{29}$$

where $CV^{p,k} = s_k CV^p$, with s_k denoting the Shorrocks share in equation (26) and $\sum_{k\in\mathcal{K}_E} s_k = 1$. As before, if net exports are disaggregated into exports and imports, then $q_X = x^p$ and $q_{-IM} = -im^p$, so that $CV^{p,NX} = CV^{p,X} + CV^{p,-IM}$.

The second-stage decomposition based on income-side components is

$$CV(Y) = CV^{p,W} + CV^{p,SC} + CV^{p,\Pi} + CV^{p,T} + CV^{e} + CV^{n}, \tag{30}$$

where

$$\sum_{k\in\mathcal{K}_I} s_k = 1.$$

Since wages and salaries and employers' social contributions jointly constitute compensation of employees, define the labor-compensation contribution as

$$CV^{p,L} = CV^{p,W} + CV^{p,SC}. \tag{31}$$

The comparison between $CV^{p,L}$ and $CV^{p,\Pi}$ indicates whether the productivity-related component of aggregate GDP inequality is predominantly associated with labor compensation or with profits. The term $CV^{p,T}$ captures the separate contribution of taxes on production and imports less subsidies. These terms should be interpreted as accounting attributions rather than as causal effects of wages, profits, social contributions, or taxes on productivity.

4.1 Evidence on the expenditure-side and income-side decomposition

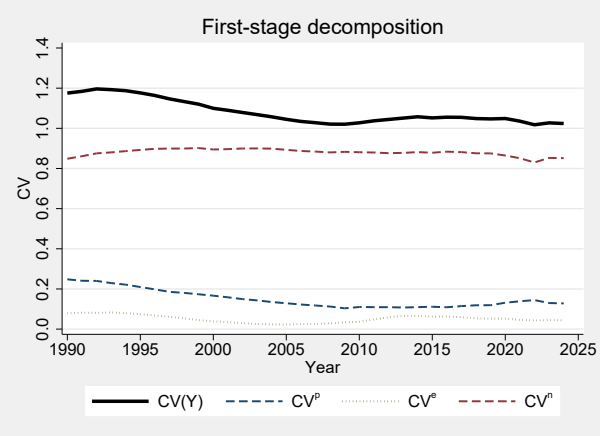
Figure 4.1 summarizes the extension for the sample from 1990 to 2024. Panel (a) reports the first-stage decomposition of $CV(Y)$ into productivity, employment and population components on the expenditure side. The population component CV^n remains the dominant term in levels, again reflecting largely cross-country differences in population size. Employment inequality strongly reflects the pattern of total GDP inequality over time more than per-capita GDP inequality. In addition, overall, inequality in productivity contributes more than inequality in employment by 14.6% and 4.8% respectively (see Table 5 in the Appendix).

CV^p declines from the early 1990s to around 2008 and then stabilizes at a lower level. The employment component CV^e is comparatively small throughout, but it becomes more relevant around downturns and in the aftermath of the global financial crisis, indicating that cross-country differences in participation rates shape short-run movements in inequality.

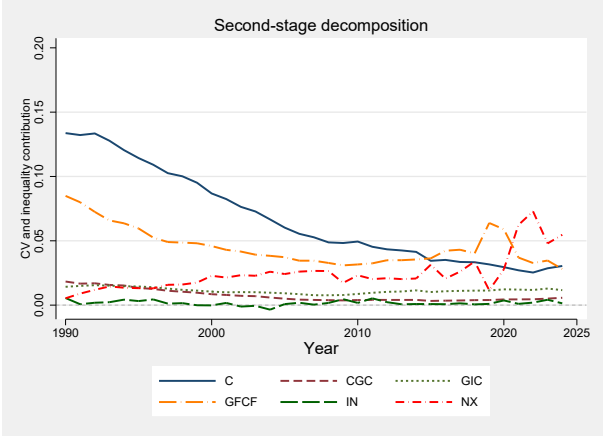
Panel (b) and panel (c) display the second-stage decomposition of the productivity-related component CV^p by expenditure aggregates. In panel (c) we divide net exports into exports and imports. Overall, the patterns match the contribution of expenditure components to GDP variation (Figures 4.1a and 4.1b). Panel (b) shows that in the early 1990s, more than half of CV^p is transmitted through private Consumption (C), while Gross Fixed Capital Formation (GFCF) roughly contributes by one third and exports play a secondary role. In the following period, the contribution of C and GFCF declines markedly (respectively from 11.3% and 7.2% to 7.9% and 4.2%), while the role of exports increases. Over the 2000s, the dispersion of total productivity is increasingly channeled through the dispersion of productivity in net exports. It becomes clear that the export side of external demand carries most of the productivity-related divergence across countries in panel (c). While imports act as a mildly equalizing force, by the end of the nineties the contribution of exports begins to rise and from the early 2000s becomes the main driver of productivity inequality between European countries (from 10.5% in 2000 to 18% in 2024).

Finally, Panel (d) shows the second-stage decomposition of the productivity-related component by income sources. In the early 1990s about 60% of CV^p is transmitted through wages and 40% through profits (see Table 5 in the Appendix). By the 2010s these shares are reversed, with profits accounting for more than two-thirds of CV^p. In other words, productivity-induced divergence increasingly manifests itself in the dispersion of capital incomes rather than in wage differentials.

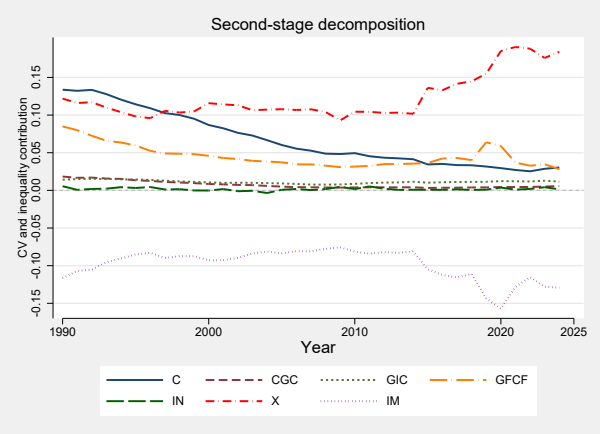
Discussion. Overall, the extension shows that the decline in between-country inequality observed in the 1990s and the 2000s was associated with the narrowing of productivity gaps,



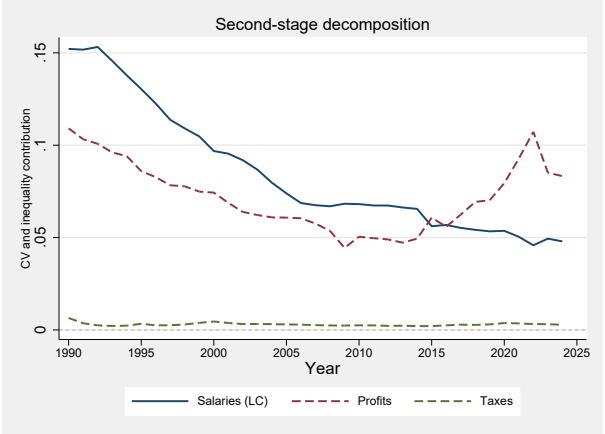
(a) First-stage decomposition (expenditure side): $CV(Y)$ into CV^p, CV^e and CV^n.



(b) Second-stage decomposition of CV^p by expenditure components.



(c) Second-stage decomposition of CV^p by expenditure components (NX disaggregated).



(d) Second-stage decomposition of CV^p by income components (salaries, profits, and taxes).

Figure 4.1: Extension: Shapley decomposition of $CV(Y)$ into productivity (p), employment (e) and population (n) components and second-stage decompositions of the productivity channel, 17 OECD economies, 1990–2024.

reflected primarily in the contributions of household consumption and investment, on the expenditure side, and wages, on the income side. However, exports emerge as the main contributor to productivity dispersion. In the years following the financial crisis, exports and profits gained momentum. At the same time, demographic and participation patterns modulated the impact of these forces on total output.

When examining the export channel more closely, the Kaldor–Verdoorn law provides a useful framework. Differences in demand regimes, reflecting the role of wages in driving economic growth, translated into different patterns of demand expansion through exports. In export-led regimes, wage moderation supported external competitiveness, fostering export demand and production growth. Differences in production growth, in turn, shaped cross-country patterns of productivity growth, which subsequently affected unit labour costs.

Turning to the effect of productivity on exports, the self-selection of more productive firms into external markets, alongside the exit of the least productive ones, led to intra-industry reallocation across firms and to sectoral differences in productivity (Melitz, 2003; Bernard et al., 2007). Moreover, the integration of manufacturing in the tradable sector into global production networks fostered technology adoption, thereby enhancing aggregate labor productivity depending on the sector's employment share (Rodrik, 2013).

From the income perspective, the contribution of wage dispersion to productivity dispersion steadily declined, in line with the evidence of convergence in nominal wage but not in productivity in the Euro-area between 1981 and 2001(Mora et al., 2005). This may be related to the decoupling of wage growth from productivity growth, which began at the aggregate level in the early 1990s. However, there were country differences in terms of timing due to technological progress, global integration and institutional setup (Bobeica et al., 2019). For the period 2000–2016, evidence from EU countries further suggests that the weakening of the pass-through from productivity to wages was more pronounced in the tradable sector, exposed to external competition. They were able to retain a larger share of productivity gains as profits rather than passing them on to workers, owing to their stronger labor market power, especially where collective bargaining was weak (Bormans and Theodorakopoulos, 2023). This process may be interpreted in the broader context of a race to the bottom in wages and working conditions amid increasing global integration. This may also have weakened the association of household consumption with productivity.

5 Concluding Remarks

We empirically examine how the dispersion of expenditure components, on the one hand, and of salaries and profits, on the other, has contributed to the inequality of per capita

GDP among countries in Europe over the period 1990-2025 to understand the dynamics of inequality. In addition, the link between divergence in expenditure and income components and in productivity is explored.

The results highlight that the declining asymmetry in the distribution of GDP per capita across countries was associated with the convergence of consumption and investment, while net exports, especially exports, became the main source of dispersion from the end of the nineties. It appears that demand regimes though progressively shifting to export major role, were marked by diversity over time.

From the income side, the wage component played a incresingly minor role, likely owing to the spread of wage restraint to preserve competitiveness, while profits became increasingly important beginning in 2015.

During the 2000s, exports carried most of the productivity-related divergence, while salaries became progressively unrelated to productivity dynamics giving way to profits. The race to the bottom combined with the capture of productivity gains from globalization by profit were most likely the causes of the falling importance of wages.

Our results suggest that an unbalanced shift of demand regimes toward exports may lower living standards at home and abroad if competitiveness in globalized economies relies on wage competitiveness and productivity gains are largely captured by profits. Within the current environment of growing instability and uncertainty, it is widely acknowledged that this strategy can fire back into domestic economies, faced with a strong need to expand internal demand and to reduce external imbalances. This calls for a twofold policy strategy: policies that reconnect wage growth to productivity and support domestic demand, and profit-oriented strategies—such as extra-profit taxation or other redistributive interventions—to curb the concentration of productivity gains while reducing structural dependence on export-led competitivenes.

A natural extension of the analysis would be to apply the same decomposition to the EU-27. This would address a different question, namely whether EU-wide convergence driven by Central and Eastern European catching-up coexists with renewed divergence among already advanced Western European economies.

References

Alexandre Afonso. State-led wage devaluation in southern europe in the wake of the eurozone crisis. *European Journal of Political Research*, 58(3):938–959, 2019. doi: 10.1111/1475-6765.12317.

L. Baccaro and S. Hadziabdic. Operationalizing growth models. *Quality & Quantity*, 58: 1325–1360, 2024. doi: 10.1007/s11135-023-01685-w.

L. Baccaro and J. Pontusson. Rethinking comparative political economy: the growth model perspective. *Politics & Society*, pages 1–33, 2016. doi: 10.1177/0032329216638053.

L. Baccaro and T. Tober. The role of wages in the eurozone. *Review of International Political Economy*, 29(4):1263–1286, 2021.

J. Behringer and T. van Treeck. Income distribution and growth models: A sectoral balances approach. *Politics & Society*, 47(3):303–332, 2019. doi: .org/10.1177/0032329219861237.

Andrew B. Bernard, J. Bradford Jensen, Stephen J. Redding, and Peter K. Schott. Firms in international trade. *Journal of Economic Perspectives*, 21(3):105–130, 2007. doi: 10.1257/jep.21.3.105.

T. Blanchet, T. L. Chancel, and A. Gethin. How unequal is europe? evidence from distributional national accounts, 1980-2017. *World Inequality Lab Working papers*, 2019/06. hal-02877000ff:147–186, 2019a.

T. Blanchet, T. L. Chancel, and A. Gethin. Forty years of inequality in europe: Evidence from distributional national accounts. *VoxEU.org.*, 2019b.

E. Bobeica, G. Koester, E. Lis, C. Nickel, and M. Porqueddu. Understanding low wage growth in the euro area and european countries. Occasional Paper Series 232, European Central Bank, 2019.

Y. Bormans and A. Theodorakopoulos. Productivity dispersion, wage dispersion and superstar firms. *Economica*, 90:1145–1172, 2023. doi: 10.1111/ecca.12490.

Fabio Bulfone and Arianna Tassinari. Under pressure. economic constraints, electoral politics and labour market reforms in southern europe in the decade of the great recession. *European Journal of Political Research*, 60(3):509–538, 2021. doi: 10.1111/1475-6765.12414.

M.C. Dao. Wealth inequality and private savings: The case of germany. *IMF Working Paper*, 20(107), 2020.

M.C. Dao and C. Maggi. The rise in corporate saving and cash holdings in advanced economies: aggregate and firm-level trends. *IMF Working Paper*, 18(262), 2018.

S. Dullien and U. Fritsche. Does the dispersion of unit labor cost dynamics in the emu imply long-run divergence? *International Economics and Economic Policy*, 5:269–295, 2008. doi: 10.1007/s10368-008-0114-z.

J. A. Duro and J. Esteban. Factor decomposition of cross-country income inequality, 1960–1990. *Economics Letters*, 60(2):269–275, 1998.

S. Filauro, Z. Parolin, and P. Valetto. What explains recent trends in income inequality in the european union? *The Journal of Economic Inequality*, 23:483–505, 2025. doi: 10.1007/s10888-024-09651-8.

C. Fischer. An assessment of the trends in international price competitiveness among emu countries. *Deutsche Bundesbank, Discussion Paper, Series 1: Economic Studies*, 08/2007, 2007.

K. Bonesmo Fredriksen. Income inequality in the european union. OECD Economics Department Working Papers 952, OECD Publishing, 2012.

H. Gabrisch and K. Staehr. The euro plus pact cost competitiveness and external capital flows in the eu countries. *Journal of Common Market Studies*, 53(3):558–576, 2015.

H. Glebocki Keefe and R. Hepp. The effects of european fiscal discipline measures on current account balances. *International Economics and Economic Policy*, 21:251–283, 2024. doi: 10.1007/s10368-024-00587-y.

P. Hall. The economics and politics of the euro crisis. *German Politics*, 21(4):355–371, 2012.

P. Hall and D. Soskice. *Varieties of Capitalism*. New York: Oxford University Press, 2001.

N. Holinski, C. J. M. Kool, and J. Muysken. Persistent macroeconomic imbalances in the euro area: causes and consequences. *Review, Federal Reserve Bank of St. Louis*, 94(Jan.): 1–20, 2012.

F. Jaumotte and P. Sodsriwiboon. Current account imbalances in the southern euro area. *IMF Working Papers*, 2010(139), 2010.

A. Johnston and A. Regan. European monetary integration and the incompatibility of national varieties of capitalism. *Journal of Common Market Studies*, 54(2):318–336, 2016. doi: 10.1111/jcms.12289.

M. Lavoie and E. Stockhammer, editors. *Wage-Led Growth An Equitable Strategy for Economic Recovery*. Palgrave Macmillan, 2013. doi: 10.1057/9781137357939.

Marc J. Melitz. The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6):1695–1725, 2003. doi: 10.1111/1468-0262.00467.

B. Milanovic. Global income inequality in numbers: In history and now. *Global Policy*, 4 (2):198–208, 2013. doi: 10.1111/1758-5899.12032.

T. Mora, J. López-Tamayo, and J. Suriñach. Are wages and productivity converging simultaneously in euro-area countries? *Applied Economics*, 37(17):2001–2008, 2005. doi: 10.1080/00036840500217655.

B. Nolan, M. G. Richiardi, and L. Valenzuela. The drivers of income inequality in rich countries. *Journal of Economic Surveys*, 33(4):1285–1324, 2019. doi: 10.1111/joes.12328.

Ö. Onaran and G. Galanis. Is aggregate demand wage-led or profit-led? a global model. In M. Lavoie and E. Stockhammer, editors, *Wage-led Growth. Advances in Labour Studies*. Palgrave Macmillan, London, 2013. doi: 10.1057/9781137357939_4.

Dani Rodrik. Unconditional convergence in manufacturing. *The Quarterly Journal of Economics*, 128(1):165–204, 2013. doi: 10.1093/qje/qjs047.

Xavier X. Sala-i Martin. The classical approach to convergence analysis. *The Economic Journal*, 106(437):1019–1036, July 1996. doi: 10.2307/2235375.

P. Sauer, N. D. Rao, and S. Pachauri. Explaining income inequality trends: An integrated approach. *Research on Economic Inequality, in: Mobility and Inequality Trends*, 30(2): 1–47, 2023. doi: 10.1108/S1049-258520230000030001.

L. S. Shapley. A value for n-person games. *Contributions to the Theory of Games*, II(28): 307–317, 1953.

A. F. Shorrocks. The class of additively decomposable inequality measures. *Econometrica*, 48(3):613–625, apr 1980. doi: 10.2307/1913126.

A. F. Shorrocks. Inequality decomposition by factor components. *Econometrica*, 50(1): 193–211, 1982.

A. F. Shorrocks. Decomposition procedures for distributional analysis: A unified framework based on the shapley value. *Journal of Economic Inequality*, 11(1):99–126, 2013. doi: 10.1007/s10888-011-9214-z.

L. Spaventa and F. Giavazzi. Why the current account may matter in a monetary union: Lessons from the financial crisis in the euro area. *CEPR Discussion Papers*, 8008, 2010.

W. Streeck. On the institutional preconditions of diversified quality production. In *Beyond Keynesianism*, pages 21–61. Aldershot: Elgar, 1991.

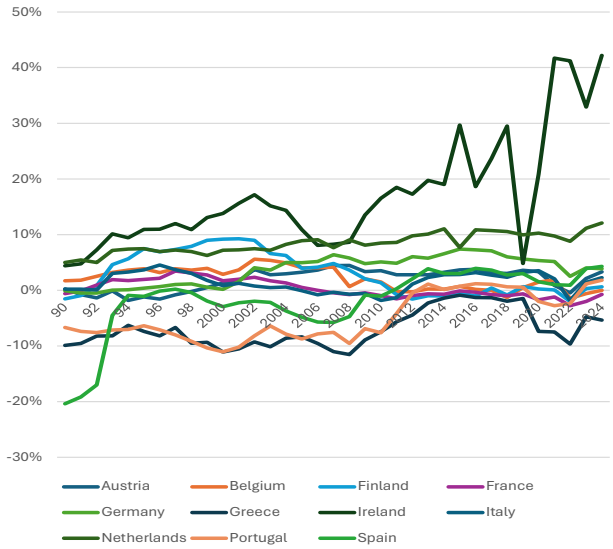
W. Streeck. German capitalism: does it exist? can it survive? *New Political Economy*, 2 (2):237–256, 1997.

Claudia Suárez-Arbesú, Nicholas Apergis, and Francisco J. Delgado. Club convergence and factors of income inequality in the european union. *International Journal of Finance & Economics*, 28(4):3654–3666, 2023. doi: 10.1002/ijfe.2612.

Appendix

Figure 1: Net exports as percentage of GDP

(a) Countries in the European Monetary Union.



(b) Other countries

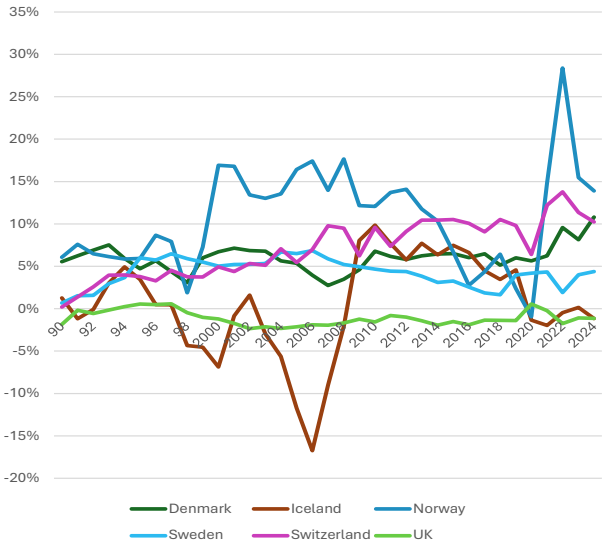


Table 1: Definition of variables and data sources

Variable name	**Description**	**Data source**
GDP	Gross domestic product: standard measure of the value added created through the production of goods and services in a country during a certain period.	OECD data (1990-2024)
GDP per capita	Gross domestic product per capita.	OECD data (1990-2024)
C	Goods and services purchased directly by households and those provided by non-profit institutions (NPISH, Non-Profit Institutions Serving Households).	OECD data (1990-2024)
CGC	Government Collective Consumption: public goods and services benefiting society as a whole or large parts of society.	OECD data (1990-2024)
GIC	Government Individual Consumption: expenditures incurred by government on behalf of an individual household (health care, housing, education, etc.).	OECD data (1990-2024)
GFCF	Gross Fixed Capital Formation: acquisition less disposals of produced fixed assets for the production of other goods and services.	OECD data (1990-2024)
IN	Inventories: stocks of outputs that are still held by the units that produced them for sale, work in progress, or materials and supplies to be used in production.	OECD data (1990-2024)
NX	External balance of goods and services: goods and services (including transactions in barter or goods exported as part of gifts or grants) sold from residents to non-residents minus imports reflecting the same transactions from non-residents to residents.	OECD data (1990-2024)
Salaries	Compensation of employees (wages and salaries paid to employees).	OECD data (1990-2024)
SC	Employers' social contributions.	OECD data (1990-2024)
Profits	Gross operating surplus (business profits) and gross mixed income (profits of the self-employed).	OECD data (1990-2024)
Taxes	Taxes on production and imports less subsidies.	OECD data (1990-2024)
Employment	Employers, own account workers, employees, contributing family workers.	OECD data (1990-2024)
Population	Annual population: data refer to mid-year estimates of the population.	OECD data (1990-2024)

Note: Values are reported in US dollars, converted from local currencies using exchange rates and transformed in constant prices by adjusting to 2020 prices. OECD data are available at: https://data-explorer.oecd.org/vis?lc=en&tm=GDP%20EXPENDITURE%20APPROACH&pg=0&hc[Transaction]=&hc[Financial%20instruments%20and%20non-financial%20assets]=&snb=37&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_NAMAIN10%40DF_TABLE1_EXPENDITURE&df[ag]=OECD.SDD.NAD&df[vs]=2.0&dq=A.AUS.....XDC.V..&lom=LASTNPERIODS&lo=5&to[TIME_PERIOD]=false https://data-explorer.oecd.org/?lc=en&tm=GDP%20income%20APPROACH&pg=0&hc[Transaction]=&hc[Financial%20instruments%20and%20non-financial%20assets]=&snb=23&isAvailabilityDisabled=false https://data-explorer.oecd.org/vis?lc=en&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_POPULATION%40DF_POP_HIST&df[ag]=OECD.ELS.SAE&dq=AUS..PS._T..&pd=2014%2C2024&to[TIME_PERIOD]=false&vw=ov https://data-explorer.oecd.org/vis?lc=en&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_ALFS%40DF_ALFS_EMP&df[ag]=OECD.SDD.TPS&df[vs]=1.1&dq=CHE.EMP.PS.N._T%2BM%2BF.Y_GE15._T._T.A&pd=1990%2C&to[TIME_PERIOD]=false&vw=tb

Table 2: Decomposition of cross-country GDP inequality: expenditure side

Year	$CV(Y)$	CV^{y}	CV^{n}	$CV^{y,\mathrm{C}}$	$CV^{y,\mathrm{CGC}}$	$CV^{y,\mathrm{GIC}}$	$CV^{y,\mathrm{GFCF}}$	$CV^{y,\mathrm{IN}}$	$CV^{y,X}$	$CV^{y,-IM}$
1990	1.1799	0.3436	0.8364	0.1775	0.0234	0.0171	0.1144	0.0071	0.1476	-0.1435
1991	1.1863	0.3372	0.8492	0.1791	0.0217	0.0185	0.1084	0.0003	0.1422	-0.1330
1992	1.1977	0.3342	0.8635	0.1809	0.0219	0.0189	0.0967	0.0025	0.1447	-0.1314
1993	1.1947	0.3262	0.8686	0.1772	0.0206	0.0185	0.0896	0.0034	0.1405	-0.1236
1994	1.1875	0.3119	0.8756	0.1666	0.0200	0.0175	0.0868	0.0054	0.1313	-0.1157
1995	1.1753	0.2911	0.8842	0.1567	0.0172	0.0175	0.0807	0.0045	0.1223	-0.1079
1996	1.1617	0.2721	0.8896	0.1483	0.0161	0.0167	0.0712	0.0062	0.1188	-0.1051
1997	1.1449	0.2525	0.8923	0.1384	0.0141	0.0155	0.0662	0.0016	0.1285	-0.1118
1998	1.1327	0.2378	0.8949	0.1292	0.0127	0.0140	0.0642	0.0019	0.1222	-0.1066
1999	1.1197	0.2222	0.8976	0.1193	0.0116	0.0133	0.0607	-0.0004	0.1214	-0.1037
2000	1.0988	0.2089	0.8899	0.1064	0.0102	0.0122	0.0563	-0.0004	0.1308	-0.1066
2001	1.0893	0.1972	0.8921	0.1002	0.0094	0.0115	0.0521	0.0020	0.1254	-0.1033
2002	1.0795	0.1833	0.8962	0.0922	0.0085	0.0115	0.0495	-0.0015	0.1193	-0.0962
2003	1.0693	0.1731	0.8961	0.0868	0.0079	0.0111	0.0458	-0.0009	0.1118	-0.0894
2004	1.0590	0.1639	0.8951	0.0800	0.0068	0.0107	0.0447	-0.0046	0.1139	-0.0876
2005	1.0460	0.1577	0.8882	0.0732	0.0058	0.0102	0.0437	0.0006	0.1158	-0.0915
2006	1.0360	0.1536	0.8825	0.0681	0.0052	0.0098	0.0419	0.0020	0.1165	-0.0899
2007	1.0298	0.1502	0.8796	0.0652	0.0051	0.0093	0.0421	0.0003	0.1209	-0.0925
2008	1.0233	0.1489	0.8744	0.0624	0.0052	0.0096	0.0401	0.0020	0.1187	-0.0891
2009	1.0232	0.1475	0.8757	0.0666	0.0056	0.0102	0.0391	0.0059	0.1086	-0.0886
2010	1.0302	0.1546	0.8756	0.0679	0.0060	0.0113	0.0399	0.0025	0.1208	-0.0939
2011	1.0409	0.1641	0.8768	0.0695	0.0067	0.0131	0.0439	0.0068	0.1270	-0.1029
2012	1.0476	0.1726	0.8750	0.0724	0.0073	0.0150	0.0485	0.0029	0.1311	-0.1046
2013	1.0532	0.1761	0.8771	0.0745	0.0078	0.0160	0.0501	0.0007	0.1380	-0.1111
2014	1.0596	0.1768	0.8828	0.0736	0.0078	0.0170	0.0507	0.0007	0.1311	-0.1041
2015	1.0530	0.1719	0.8811	0.0648	0.0068	0.0157	0.0500	0.0003	0.1563	-0.1220
2016	1.0563	0.1695	0.8868	0.0653	0.0069	0.0164	0.0550	0.0003	0.1569	-0.1312
2017	1.0554	0.1698	0.8856	0.0611	0.0068	0.0163	0.0552	0.0009	0.1629	-0.1334
2018	1.0493	0.1700	0.8793	0.0585	0.0069	0.0162	0.0513	0.0005	0.1644	-0.1278
2019	1.0472	0.1683	0.8788	0.0556	0.0069	0.0164	0.0716	0.0011	0.1735	-0.1568
2020	1.0464	0.1802	0.8662	0.0540	0.0077	0.0177	0.0679	0.0049	0.1976	-0.1695
2021	1.0316	0.1823	0.8493	0.0468	0.0073	0.0170	0.0461	0.0013	0.2056	-0.1417
2022	1.0121	0.1857	0.8263	0.0418	0.0069	0.0161	0.0407	0.0021	0.2091	-0.1311
2023	1.0257	0.1716	0.8541	0.0465	0.0078	0.0176	0.0434	0.0045	0.1973	-0.1454
2024	1.0205	0.1699	0.8506	0.0484	0.0087	0.0162	0.0370	0.0019	0.2053	-0.1475

Table 3: Decomposition of cross-country GDP inequality: income side

Year	$CV(Y)$	CV^{y}	CV^{n}	$CV^{y,W}$	$CV^{y,SC}$	$CV^{y,\Pi}$	$CV^{y,T}$
1990	1.1835	0.3498	0.8337	0.1658	0.0315	0.1460	0.0066
1991	1.1888	0.3429	0.8460	0.1675	0.0315	0.1403	0.0035
1992	1.1998	0.3390	0.8608	0.1682	0.0315	0.1371	0.0021
1993	1.1942	0.3295	0.8648	0.1628	0.0305	0.1339	0.0023
1994	1.1872	0.3152	0.8720	0.1536	0.0286	0.1308	0.0022
1995	1.1744	0.2935	0.8810	0.1455	0.0269	0.1172	0.0039
1996	1.1612	0.2751	0.8861	0.1359	0.0248	0.1115	0.0029
1997	1.1444	0.2552	0.8892	0.1264	0.0220	0.1040	0.0028
1998	1.1319	0.2393	0.8926	0.1184	0.0202	0.0981	0.0026
1999	1.1192	0.2245	0.8947	0.1106	0.0187	0.0910	0.0042
2000	1.0986	0.2107	0.8878	0.1013	0.0161	0.0882	0.0051
2001	1.0891	0.1992	0.8899	0.0989	0.0157	0.0803	0.0043
2002	1.0794	0.1854	0.8940	0.0949	0.0147	0.0725	0.0033
2003	1.0694	0.1747	0.8947	0.0889	0.0131	0.0695	0.0031
2004	1.0591	0.1653	0.8938	0.0815	0.0121	0.0684	0.0032
2005	1.0456	0.1593	0.8863	0.0765	0.0107	0.0686	0.0034
2006	1.0349	0.1553	0.8796	0.0721	0.0100	0.0695	0.0036
2007	1.0283	0.1523	0.8760	0.0709	0.0101	0.0674	0.0039
2008	1.0225	0.1510	0.8715	0.0716	0.0100	0.0656	0.0038
2009	1.0225	0.1506	0.8719	0.0769	0.0108	0.0592	0.0037
2010	1.0287	0.1575	0.8711	0.0770	0.0106	0.0658	0.0042
2011	1.0395	0.1670	0.8725	0.0819	0.0116	0.0687	0.0049
2012	1.0462	0.1756	0.8706	0.0860	0.0126	0.0719	0.0052
2013	1.0511	0.1789	0.8722	0.0879	0.0130	0.0723	0.0057
2014	1.0571	0.1797	0.8774	0.0876	0.0129	0.0735	0.0057
2015	1.0514	0.1745	0.8769	0.0792	0.0114	0.0785	0.0054
2016	1.0547	0.1715	0.8832	0.0795	0.0115	0.0747	0.0058
2017	1.0544	0.1717	0.8827	0.0758	0.0110	0.0789	0.0061
2018	1.0477	0.1729	0.8748	0.0723	0.0105	0.0845	0.0056
2019	1.0452	0.1713	0.8739	0.0702	0.0105	0.0850	0.0056
2020	1.0457	0.1810	0.8647	0.0710	0.0108	0.0931	0.0062
2021	1.0309	0.1859	0.8450	0.0623	0.0097	0.1080	0.0058
2022	1.0135	0.1929	0.8206	0.0537	0.0091	0.1245	0.0056
2023	1.0255	0.1759	0.8496	0.0590	0.0104	0.1003	0.0061
2024	1.0190	0.1715	0.8475	0.0574	0.0102	0.0978	0.0060

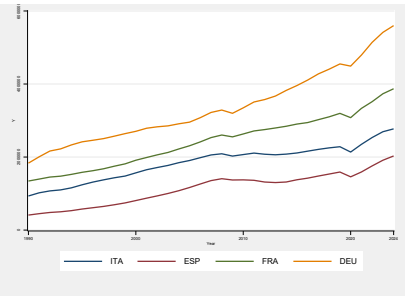
Table 4: Extension of the decomposition of cross-country GDP inequality: expenditure side

Year	$CV(Y)$	CV^{p}	CV^{e}	CV^{n}	$CV^{p,\mathrm{C}}$	$CV^{p,\mathrm{CGC}}$	$CV^{p,\mathrm{GIC}}$	$CV^{p,\mathrm{GFCF}}$	$CV^{p,\mathrm{IN}}$	$CV^{p,X}$	$CV^{p,-IM}$
1990	1.1799	0.2621	0.0811	0.8367	0.1337	0.0183	0.0143	0.0849	0.0055	0.1218	-0.1165
1991	1.1863	0.2535	0.0842	0.8487	0.1322	0.0167	0.0149	0.0800	0.0007	0.1160	-0.1071
1992	1.1977	0.2522	0.0827	0.8628	0.1334	0.0170	0.0155	0.0725	0.0019	0.1171	-0.1052
1993	1.1947	0.2413	0.0851	0.8683	0.1278	0.0157	0.0151	0.0659	0.0023	0.1099	-0.0954
1994	1.1875	0.2318	0.0812	0.8744	0.1205	0.0153	0.0147	0.0636	0.0043	0.1039	-0.0903
1995	1.1753	0.2181	0.0756	0.8816	0.1143	0.0134	0.0145	0.0596	0.0032	0.0982	-0.0850
1996	1.1617	0.2056	0.0691	0.8871	0.1091	0.0126	0.0139	0.0525	0.0044	0.0959	-0.0829
1997	1.1449	0.1926	0.0629	0.8894	0.1026	0.0112	0.0129	0.0491	0.0012	0.1056	-0.0898
1998	1.1327	0.1886	0.0545	0.8896	0.1001	0.0104	0.0119	0.0486	0.0015	0.1034	-0.0873
1999	1.1197	0.1816	0.0459	0.8923	0.0951	0.0096	0.0113	0.0481	-0.0001	0.1048	-0.0873
2000	1.0988	0.1743	0.0394	0.8851	0.0868	0.0085	0.0105	0.0459	-0.0002	0.1158	-0.0930
2001	1.0893	0.1665	0.0357	0.8871	0.0824	0.0079	0.0100	0.0430	0.0017	0.1142	-0.0928
2002	1.0795	0.1576	0.0306	0.8913	0.0764	0.0072	0.0101	0.0416	-0.0011	0.1130	-0.0897
2003	1.0693	0.1513	0.0261	0.8919	0.0728	0.0070	0.0101	0.0392	-0.0005	0.1064	-0.0836
2004	1.0590	0.1430	0.0245	0.8916	0.0666	0.0059	0.0097	0.0383	-0.0035	0.1073	-0.0813
2005	1.0460	0.1367	0.0241	0.8852	0.0602	0.0050	0.0092	0.0372	0.0008	0.1078	-0.0836
2006	1.0360	0.1307	0.0258	0.8795	0.0554	0.0043	0.0085	0.0345	0.0019	0.1068	-0.0808
2007	1.0298	0.1260	0.0271	0.8767	0.0527	0.0041	0.0077	0.0345	0.0004	0.1077	-0.0811
2008	1.0233	0.1213	0.0294	0.8726	0.0488	0.0039	0.0077	0.0328	0.0017	0.1041	-0.0776
2009	1.0232	0.1126	0.0352	0.8754	0.0483	0.0037	0.0078	0.0309	0.0046	0.0929	-0.0756
2010	1.0302	0.1186	0.0374	0.8741	0.0494	0.0039	0.0087	0.0316	0.0017	0.1045	-0.0813
2011	1.0409	0.1170	0.0496	0.8743	0.0454	0.0041	0.0096	0.0325	0.0053	0.1043	-0.0841
2012	1.0476	0.1159	0.0601	0.8716	0.0434	0.0041	0.0103	0.0349	0.0023	0.1029	-0.0819
2013	1.0532	0.1130	0.0669	0.8733	0.0425	0.0040	0.0106	0.0349	0.0007	0.1032	-0.0830
2014	1.0596	0.1140	0.0677	0.8779	0.0414	0.0041	0.0115	0.0355	0.0009	0.1017	-0.0810
2015	1.0530	0.1165	0.0628	0.8736	0.0345	0.0033	0.0102	0.0364	0.0008	0.1362	-0.1048
2016	1.0563	0.1131	0.0636	0.8797	0.0352	0.0035	0.0108	0.0423	0.0007	0.1330	-0.1124
2017	1.0554	0.1188	0.0593	0.8773	0.0336	0.0036	0.0111	0.0431	0.0014	0.1416	-0.1155
2018	1.0493	0.1232	0.0548	0.8713	0.0333	0.0039	0.0113	0.0402	0.0006	0.1448	-0.1109
2019	1.0472	0.1234	0.0529	0.8708	0.0317	0.0040	0.0114	0.0639	0.0010	0.1551	-0.1435
2020	1.0464	0.1367	0.0529	0.8568	0.0295	0.0044	0.0123	0.0590	0.0037	0.1850	-0.1572
2021	1.0316	0.1439	0.0458	0.8419	0.0271	0.0045	0.0121	0.0370	0.0010	0.1904	-0.1281
2022	1.0121	0.1492	0.0430	0.8198	0.0253	0.0045	0.0118	0.0327	0.0020	0.1881	-0.1152
2023	1.0257	0.1335	0.0446	0.8476	0.0287	0.0051	0.0129	0.0347	0.0042	0.1758	-0.1279
2024	1.0205	0.1319	0.0443	0.8443	0.0304	0.0057	0.0116	0.0280	0.0014	0.1840	-0.1293

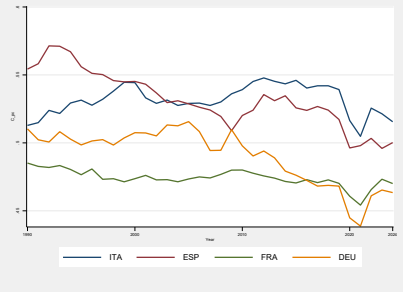
Table 5: Extension of the decomposition of cross-country GDP inequality: income side

Year	$CV(Y)$	CV^p	CV^o	CV^n	$CV^{p,W}$	$CV^{p,SC}$	$CV^{p,\Pi}$	$CV^{p,T}$
1990	1.1835	0.2678	0.0815	0.8342	0.1256	0.0266	0.1091	0.0065
1991	1.1888	0.2586	0.0846	0.8456	0.1253	0.0264	0.1033	0.0036
1992	1.1998	0.2565	0.0830	0.8604	0.1262	0.0270	0.1008	0.0025
1993	1.1942	0.2439	0.0854	0.8649	0.1199	0.0258	0.0961	0.0022
1994	1.1872	0.2343	0.0816	0.8713	0.1134	0.0245	0.0941	0.0023
1995	1.1744	0.2198	0.0759	0.8787	0.1070	0.0234	0.0860	0.0033
1996	1.1612	0.2078	0.0694	0.8839	0.1005	0.0221	0.0827	0.0025
1997	1.1444	0.1946	0.0632	0.8865	0.0936	0.0201	0.0783	0.0025
1998	1.1319	0.1898	0.0547	0.8874	0.0904	0.0187	0.0777	0.0030
1999	1.1192	0.1835	0.0461	0.8896	0.0872	0.0176	0.0749	0.0038
2000	1.0986	0.1758	0.0396	0.8832	0.0818	0.0151	0.0744	0.0046
2001	1.0891	0.1680	0.0360	0.8851	0.0806	0.0149	0.0688	0.0038
2002	1.0794	0.1590	0.0310	0.8894	0.0779	0.0140	0.0639	0.0032
2003	1.0694	0.1522	0.0264	0.8907	0.0739	0.0129	0.0622	0.0032
2004	1.0591	0.1438	0.0248	0.8905	0.0679	0.0118	0.0609	0.0032
2005	1.0456	0.1377	0.0243	0.8835	0.0636	0.0103	0.0608	0.0030
2006	1.0349	0.1320	0.0260	0.8768	0.0591	0.0096	0.0605	0.0029
2007	1.0283	0.1277	0.0273	0.8732	0.0580	0.0095	0.0576	0.0026
2008	1.0225	0.1230	0.0296	0.8699	0.0579	0.0091	0.0536	0.0024
2009	1.0225	0.1151	0.0355	0.8719	0.0593	0.0090	0.0444	0.0024
2010	1.0287	0.1211	0.0377	0.8699	0.0598	0.0083	0.0505	0.0025
2011	1.0395	0.1195	0.0493	0.8706	0.0590	0.0084	0.0497	0.0025
2012	1.0462	0.1186	0.0599	0.8678	0.0589	0.0084	0.0490	0.0022
2013	1.0511	0.1158	0.0665	0.8688	0.0580	0.0083	0.0472	0.0023
2014	1.0571	0.1170	0.0672	0.8729	0.0573	0.0082	0.0494	0.0021
2015	1.0514	0.1190	0.0623	0.8700	0.0493	0.0069	0.0608	0.0021
2016	1.0547	0.1152	0.0629	0.8765	0.0498	0.0071	0.0559	0.0025
2017	1.0544	0.1205	0.0588	0.8750	0.0484	0.0068	0.0624	0.0029
2018	1.0477	0.1262	0.0542	0.8673	0.0476	0.0066	0.0693	0.0027
2019	1.0452	0.1267	0.0520	0.8665	0.0468	0.0066	0.0703	0.0030
2020	1.0457	0.1368	0.0525	0.8564	0.0472	0.0064	0.0794	0.0037
2021	1.0309	0.1467	0.0456	0.8386	0.0441	0.0064	0.0927	0.0036
2022	1.0135	0.1563	0.0422	0.8150	0.0394	0.0064	0.1073	0.0032
2023	1.0255	0.1377	0.0448	0.8431	0.0422	0.0072	0.0851	0.0031
2024	1.0190	0.1340	0.0441	0.8408	0.0409	0.0071	0.0833	0.0028

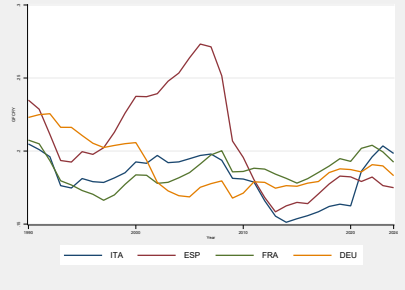
Figure 2: Variables' dynamics



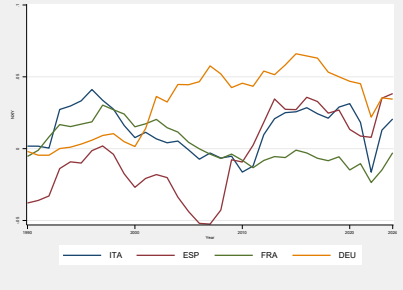
(a) GDP - Y



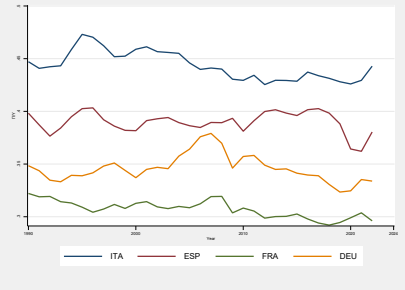
(b) Private Consumption (%) - C/Y



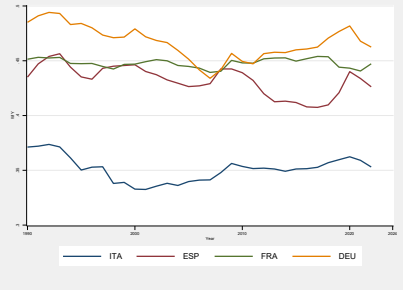
(c) Investment (%) - In/Y



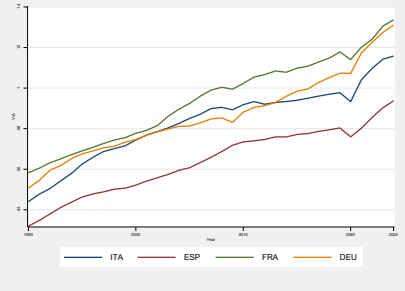
(d) Net Exports (%) - NX/Y



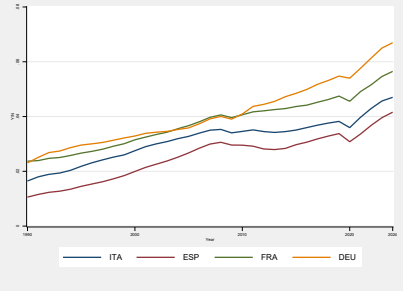
(e) Profits (%) - Π/Y



(f) Salaries (%) - W/Y



(g) Employment - E



(h) Population - N