European Commission

Social Situation Monitor

Redistribution through the lens of compositional inequality: novel measures and trends across the EU

Michele Raitano & Marco Ranaldi

ICF HIVA

EUROPEAN COMMISSION

Directorate-General for Employment, Social Affairs & Inclusion
Directorate F— Employment and Social Governance, Analysis
Unit F4 — Analysis and Statistics

Contact: Katarina Jaksic
E-mail: Katarina.jaksic@ec.europa.eu

European Commission
B-1049 Brussels

Redistribution through the lens of compositional inequality: novel measures and trends across the EU

Michele Raitano
Corresponding author
Sapienza University of Rome
email: michele.raitano@uniroma1.it
Marco Ranaldi
University College London (UCL)
email: m.ranaldi@ucl.ac.uk

July 2022

Manuscript completed in July 2022

PDF ISBN 978-92-68-18085-3 ISSN 2811-6798 doi 10.2767/931904 KE-CF-24-001-EN-N

TABLE OF CONTENTS

Introduction 6
Measuring redistribution 8
The IFC Index as a novel redistribution index 10
The concept of compositional inequality 10
Concentration curves for income source 12
IFC Index 15
Data 17
Main results: IFC levels and trends in EU countries 20
Composition of disposable income 20
Country rankings and comparisons including pensions among transfers 22
Country rankings and comparisons considering pensions as market income 26
Differences in IFC values due to pensions 30
Disentangling the role of non-contributory and means-tested other income support benefits 32
Correlates of IFC levels and trends: an empirical estimate 34
Conclusions 41
References 43
Appendix 45
Appendix A1. TREND OF IFC-1 IN 2006-2019 45
Appendix A2. TREND OF IFC-2 IN 2006-2019 48

INTRODUCTION

The economic literature indicates that the best proxy of individuals' economic wellbeing is the equivalised disposable income, i.e., all incomes earned in the market by household members from every source (employment, self-employment, capital, land), net of taxes and including welfare state transfers, and equivalised by dividing total income by the so-called equivalence scale in order to take into account differences in households' sizes (Canberra Group, 2011).

However, for a better understanding of mechanisms engendering disposable income inequality, the process that shapes equivalised disposable incomes may be depicted as a chain of three links, with the first two links referring to market outcomes and the third depending on redistribution (Organisation for Economic Co-operation and Development (OECD), 2011; Raitano, 2019). The first link refers to individual earning inequality and is related to labour market outcomes achieved by individuals in their active age. The second link acts at the household level (incomes are then equivalised) and refers to market income inequality, i.e. all gross incomes from every market source (labour, capital, rents) earned by household members, before redistribution. The final link refers to public redistribution through taxes and transfers (e.g. pensions, unemployment and social assistance benefits).

Theoretically, disposable income should measure what an individual might consume in a certain time period (usually one year) without reducing their wealth (Simons, 1938). The measurement of disposable income should then include all types of imputed incomes (e.g. own production, fringe benefits, imputed rents from housing) (Canberra Group, 2011; Raitano, 2022), capital gains and, particularly, the monetary value attributed to welfare in-kind benefits (e.g. healthcare, education), as well as all types of social contributions, tax expenditure and direct and indirect taxes on income and wealth. However, methodological and measurement issues mean that the standard definition of disposable income used in international comparisons does not include unrealised capital gains, imputed rents, indirect taxes and in-kind benefits. Exclusion of the latter, in particular, might bias comparisons of well-being between individuals living in countries with different welfare regimes and those where access to welfare services – and the quality of those services – is heterogeneous.

Aside from issues related to the economic well-being proxies, a conceptual chain is useful in highlighting that economic inequalities are the result of complex processes acting on different parts of the income ladder and can be looked at from different perspectives. Public redistribution, as the link most directly affected by policy, is clearly crucial.[1]

[1] Every type of policy measure influencing individual choice (e.g. education) or behaviour (e.g. labour supply) and affecting market equilibrium has an effect on income inequality. Some academics argue for properly distinguishing between redistribution, i.e. measures acting to change 'ex post' the distribution engendered by the markets through the tax and benefit system, and 'predistribution', i.e. measures designed to affect 'ex ante' market outcomes and reduce income and earnings dispersion produced by the markets (Hacker, 2011; Franzini, 2018).

The measurement of redistribution (how much taxes and transfers shape the income distribution with respect to what is engendered by the market) is complex and demands considerable methodological and policy attention. It is standard practice, especially in cross-country comparisons, to measure government redistribution by comparing the values of specific inequality indices (typically, the Gini coefficient) before and after taxes and transfers. This has severe theoretical limitations, however, in that it hinders understanding where the recipients of public transfers, or the taxpayers, lie along the income ladder. This Research Note (RN) proposes a method to overcome this issue by relying on the novel concept of compositional inequality, as well as on the income-factor concentration (IFC) index, recently developed in Ranaldi (2022).

Compositional inequality describes the extent to which the composition of income into two factors, such as market and transfer incomes, is unequally distributed. Compositional inequality is at a maximum when individuals at the top and bottom of the distribution separately earn only the two income factors, i.e. when those lying in the bottom 10% of distribution only get their income from public transfers, while the remainder live solely on their market income. While compositional inequality has been empirically studied in relation to the composition of income in capital and labour incomes (Ranaldi and Milanovic, 2022; Iacono and Ranaldi, 2022), no attention has yet been paid to the study of compositional inequality in market and transfer incomes. The IFC index is based on compositional inequality and concentration curves (see Section 3), thus seems much suitable than the Gini coefficient to capture the direction of distributive changes due to public transfers and then provide sound comparisons across countries. The Kakwani index is commonly used to measure tax progressivity, but some properties of the IFC index make it a more suitable measure to study the effectiveness of government transfers across the income distribution.

Having clarified the main issues in standard approaches to measuring redistribution and the possibilities of relying on compositional inequality to develop an original index of redistribution, this RN adopts the IFC index and uses European Union Statistics on Income and Living Conditions (EU-SILC) microdata to provide new estimates of the intensity and effectiveness of redistribution obtained through cash welfare transfers in all EU countries from 2006 to 2019. This also provides useful insights about the role of some specific types of transfers (e.g. pensions and non-pension benefits, non-contributory and means-tested other income support benefits). Exploiting all available EU-SILC cross-sections, this RN delivers a new database on the intensity of redistribution, as measured by the IFC index, considering or excluding various classes of cash welfare transfers (pensions vs non-pension transfers, or means-tested vs non-means-tested benefits). Particular attention is paid to the inclusion or exclusion of pensions from redistributive transfer income: existing measures of redistribution are often biased by the role of pensions, which for most individuals may represent a horizontal transfer across their phases of life rather than a vertical transfer at a certain point in time from the 'rich' to the 'poor' (Raitano, 2019). The existence of pensions also biases the shape of the distribution of market incomes when pensions are wholly considered as a transfer, thickening the bottom tail of the market income distribution. In

most cases, pensioners have zero market income but a positive disposable income, which points to a very sharp redistribution (i.e. the gap between market and disposable income). Again, however, this type of redistribution is largely due to a horizontal redistribution in the individual's life phases. Wholly including pensions as a transfer means considering a high pension benefit obtained by a previously high-paid worker through an earnings-related or defined contribution computation formula to be a highly redistributive transfer (Barr and Diamond, 2008). When measuring redistribution, pensions must be treated cautiously. Exploiting additional information available from the 2014 wave of the EU-SILC, this RN analyses distinguishing between non-means-tested pensions (NMTP) and means-tested pension benefits. Finally, it examines, through a set of regressions, the empirical association between redistribution levels and trends, as measured by the IFC index and a set of countries' characteristics, institutions and macroeconomic outcomes.

In detail, the RN is organised as follows. Section 2 briefly summarises the conceptual issues related to the measurement of redistribution, while Section 3 explains why compositional inequality and the related IFC index may improve the capacity to measure redistribution and carry out sound cross-country comparisons. The RN then moves to the empirical analyses. Section 4 presents the empirical data, Section 5 describes the main results on the extent of levels and trends of redistribution between market and transfer incomes in EU countries as captured by the IFC index, obtained by including or excluding pensions from market incomes. It also presents additional findings on NMTP and means-tested pension benefits within market incomes and transfer incomes, respectively. Section 6 examines the degree of redistribution in the EU that is attributable to non-contributory and means-tested other income support benefits, as a rough proxy for minimum income (MI) schemes. Section 7 presents descriptive multivariate regressions on the association between redistribution intensity, as captured by the IFC index, and some countries' characteristics. Section 8 summarises the main content of the RN and draws conclusions.

MEASURING REDISTRIBUTION

Computing the percentage gap between the Gini index of market incomes and disposable incomes (or between disposable incomes net and gross of public cash transfers) is the easiest way to assess the effect of public redistribution on income inequality (i.e. intensity of redistribution), as this gap expresses the reduction in inequality due to redistributive policies.[2] However, some limits affect this standard measure of redistribution.

[2] As headline indicators, the Social Scoreboard also includes the quintile share ratio (S80/S20) to measure income inequality and the impact of social transfers (other than pensions) on poverty reduction.

Firstly, limits in assigning a monetary value to in-kind benefits and imputed incomes mean that only personal income taxes and cash transfers are (usually) taken into account when the intensity of redistribution is computed, neglecting the distributive effect of other crucial items, such as indirect taxes and in-kind benefits. As a consequence, these analyses do not allow, for instance, assessment of the effect on inequality of cuts in in-kind benefits (e.g. healthcare, education) or of higher indirect taxes (Jenkins et al., 2012).

Secondly, the use of 'pre-redistribution' and 'post-redistribution' values of the Gini coefficient is a very rough approach to capture the intensity and the effectiveness of redistribution (i.e. to take account of the specific quantiles of the distribution hit by taxes and transfers). The Gini index is a synthetic inequality index whose value is very sensitive to movement in the middle of the distribution (Villar, 2017). This property might then bias the capacity of the Gini index to precisely capture movements in the extreme tails of the distribution, whereas the bottom tail should be the most affected by anti-poverty transfers or highly progressive taxes, for example. In addition, the Gini index does not always satisfy the property of 'decreasing transfer' (i.e. it is not guaranteed that the poorer the beneficiary of a certain transfer, the higher the Gini reduction), impairing use of the Gini to capture the extent and the direction of redistribution (Foster and Shorrocks, 1987).

Thirdly, the intensity of redistribution is strongly affected by the inclusion of pensions.[3] Most pensioners have zero market income but a positive disposable income, pointing to a very sharp redistribution. However, pensions cannot be considered a mere inter-individual redistribution (i.e. a transfer between the workers who pay contributions and the elderly who receive pensions). This is especially true where pension benefits are strictly linked to life earnings (as in defined benefit earnings-related schemes where the reference pension is calculated on the basis of earnings obtained in a large portion of the working life) or to contributions paid by the individuals during their previous working life (as in defined contribution schemes).[4]

[3] To deal with this issue, in its statistical database the OECD computes the Gini of disposable and market income inequality by excluding households headed by the over-65s. However, this correction is unsatisfactory given that the household composition (e.g. the number of households where elderly people reside together with their adult children) and the share of under-65s and receiving a pension largely differ across countries.

[4] The weight of inter-personal or intra-personal redistribution in Member States' pension systems is not easy to compute as it depends on several factors: details of the pension computation formula (e.g. existence of minimum and maximum pensions and how the benefit changes according to retirement age, length of the period for assessing reference earnings, qualifying period for a full pension); possible contribution relief; differences in the rules applied to the various workers' categories (e.g. employees, self-employed); benefit indexation rule; interaction with social means-tested pensions; role of private pension funds (which usually do not redistribute among individuals). Detailed comparisons carried out through micro-simulation models might allow researchers to provide some figures about these weights in EU countries (Dekkers et al., 2010). However, preliminary insights in respect of public pensions might be obtained by critically analysing the main features of the pension computation formulas adopted in the various countries (e.g. Mutual Information System on Social Protection (MISSOC) comparative tables, https://www.missoc.org/missoc-database/comparative-tables/). Four Member States (Italy, Latvia, Poland, Sweden) have adopted a notional defined contribution scheme that strictly links pensions to the contributions paid over the whole working life and adjusts pension amounts to the retirement age according to actuarial principles. The German 'point system' creates a rather strict link between individuals' earnings histories and future pensions, while that link is somewhat looser in France and Spain, which adopt an earnings-related formula, where the reference is to the last 25 earning years, together with minimum and maximum pension amounts. By contrast, Ireland and the Netherlands adopt a flat-rate pension pillar, where the benefit amount is independent of previous working career.

In other terms, at least part of pension incomes comes from an intra-individual transfer during the different life phases rather than from inter-individual transfers. In an extreme case, where pensions only depend on previous earnings (i.e. where pensions are merely a deferred wage), the pension system would bring about no inter-individual redistribution. However, the difference between market and disposable income in a given year due to pensions and contributions would bias the intensity of redistribution index, incorrectly suggesting the existence of an intense inter-individual redistribution.

Finally, in general, redistributive policies and impacts can influence market inequalities (Esping Andersen and Myles, 2009). Comparing pre-transfer and post-transfer distributions inevitably biases the measure of a pure redistributive effect of the welfare state, since it does not capture whether the various features of the welfare state have an impact on the degree of inequality engendered by the markets.[5] This effect should instead be measured by identifying a counterfactual market distribution, i.e. the income distribution that would emerge if the welfare state did not exist.

Accounting for all four limits of the redistribution analyses is beyond the scope of this RN, which instead considers the second and third issue only. It makes use of the novel IFC index as a more suitable means of capturing the direction of distributive changes due to public transfers and compares values of IFC index computing by assessing the direction of the redistribution when pensions (or at least NMTP) are excluded or included in market incomes. Additional analyses examine the redistributive effect of specific single welfare transfers such as means-tested and non-contributory and means-tested other income support benefits.

THE IFC INDEX AS A NOVEL REDISTRIBUTION INDEX

THE CONCEPT OF COMPOSITIONAL INEQUALITY

The RN measures the incidence of redistribution, or the redistributive effectiveness of government transfers across the income distribution,[6] by introducing a novel version of the IFC index, recently proposed by Ranaldi (2022) as a suitable measure of compositional inequality. It is useful to begin with an overview of the concept of compositional inequality and its relevance in this analysis. In line with

[5] For instance, there may be an association between the characteristics of the welfare state and the degree of compression of wage distribution. Nevertheless, the insurance provided to individuals by an effective welfare state (e.g. unemployment benefit) might have an effect on wage distribution.

[6] The concept of redistributive effectiveness is strictly related to the concept of target efficiency, which is often adopted for means-tested transfers. This concept refers to the capacity of means-tested welfare transfers to reach all deserving individuals and avoid wasting resources by paying benefits to non-poor individuals and households (Raitano et al., 2021).

the original theoretical formulation of Ranaldi (2022), and for simplicity, the composition of income is considered first in terms of capital and labour incomes, then in terms of market and transfer incomes that are the focus of this RN.

Compositional inequality describes the extent to which the composition of income into two factors, such as capital and labour incomes, is unequally distributed across the income distribution or, in other words, between rich and poor individuals. Compositional inequality is at its maximum when individuals at the top and bottom of the income distribution separately earn only the two income factors, i.e. the top 10% of the population (in terms of their total income) derive income solely from capital, while the bottom 90% derive income solely from labour. The 'top 10%' or 'bottom 90%' of the population in terms of their total income refers to the richest 10% or the poorest 90% in the population, based on their capital and labour incomes. In other words, the ranking of individuals is based on the sum of their income source (i.e. capital and labour incomes). Theoretically – if somewhat unrealistically - maximum compositional inequality can also be attained when the top 10% individuals exclusively earn income from labour, and the bottom 90% derive all their income from capital. Compositional inequality is at a minimum when everyone is characterised by the same relative composition of the two income factors. This happens when, for example, both the top 10% and the bottom 90% of the total income distribution earn 20% of their income from labour and 80% of their income from capital. Generally, when $x\%$ and $(1-x)\%$ are the total shares of the two income sources in a certain population, minimal compositional inequality is attained when every individual in the population earns $x\%$ of their income from capital and $(1-x)\%$ of their income from labour, irrespective of the value of x. As a consequence, a decrease in compositional inequality may be explained by either an increase in capital income at the bottom of the distribution, or an increase in labour income at the top.

To date, compositional inequality has been studied in relation to the composition of income in capital and labour incomes (Ranaldi and Milanovic, 2022; Iacono and Ranaldi, 2022), no attention has been paid to the study of compositional inequality in market and transfer incomes. Considering the composition of income into market and transfer incomes, maximal compositional inequality is attained when individuals at the top and bottom of the income distribution separately earn and receive market and transfer incomes, respectively, while minimal compositional inequality suggests that the relative composition of market and transfer income is the same across the income distribution. By contrast, a maximal level of compositional inequality indicates that transfers are received by low-income individuals, while high-income individuals do not benefit from welfare transfers at all. Therefore, a very well-designed means-tested benefit targeting the poor should be characterised by high compositional inequality. On the other hand, social insurance schemes, which also protect high-income individuals (e.g. sickness, unemployment benefit), and whose contribution rates and benefit computation formulas are based on previous earnings, should be characterised by lower levels of compositional inequality. The study of compositional inequality in market and transfer incomes thus allows for an evaluation of the way in which market forces and government intervention simultaneously shape the distribution of income.

Nevertheless, using compositional inequality to measure redistribution is slightly different from studying the composition of total income between labour and capital income. The latter looks at how total income is divided between the two sources, while a redistribution index asks how transfer incomes change the market income distribution. While the composition between labour and capital incomes orders individuals according to their total income, analysing the composition between market and transfer incomes so as to capture the extent of redistribution takes market income as the reference term.

In order to measure compositional inequality in market and transfer incomes, the pseudo-IFC index is introduced, as a modified version of the IFC index. The IFC index is a non-rank-based measure of association between two income components and is constructed based on three different concentration curves for income source: the actual concentration curve for income source, the zero-concentration curve, and the maximum-concentration curve. The following section briefly defines the concentration curve, then describes these three curves.

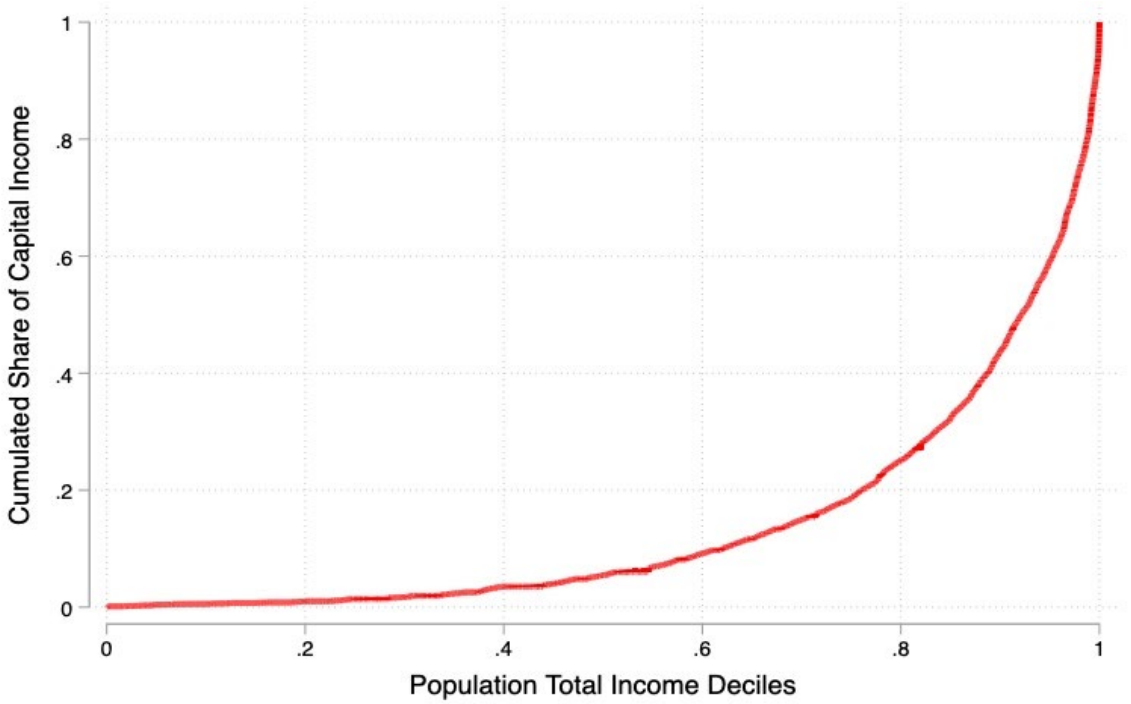
CONCENTRATION CURVES FOR INCOME SOURCE

The concentration curve for income source, originally introduced in a more general setting by Kakwani (1977), describes the cumulative distribution of a given variable, x, across the population with individuals ordered by another variable, y. The concentration curve for capital income describes, for instance, the cumulative distribution of capital income (x) across the total income distribution (y).
Figure 1 shows the concentration curve for capital income for Italy in 1989. It plots the deciles of the total income distribution (horizontal axis) against their relative share of capital income (vertical axis). This shows that the bottom 60% of the total income distribution earned approximately 10% of total capital income in the economy, while the top 20% earned roughly 80% of total capital income.

The main difference between the concentration curve for capital income and the Lorenz curve is that while both curves rank individuals according to their level of total income, the latter cumulates total income, while the former cumulates capital income across the total income distribution. When the income source (capital income in our example) is entirely concentrated at the top of the total income distribution, the concentration curve is flat in correspondence to the bottom of the distribution, and convex thereafter. By contrast, when the income source is concentrated at the bottom of the income distribution, the concentration curve increases monotonically in correspondence to the bottom of the distribution, and flat thereafter. The area under the concentration curve can thus be seen as a measure of concentration of the income source across the income distribution: the higher (lower) the area, the lower (higher) the concentration of the income source at the top of the distribution.[7]

[7] One minus twice the area of the actual concentration curve for income source corresponds to the pseudo-Gini of the income source in question.

Figure 1 Concentration curve for capital income, Italy, 1989



Source: elaborations on Bank of Italy's Survey of Household Income and Wealth (SHIW).

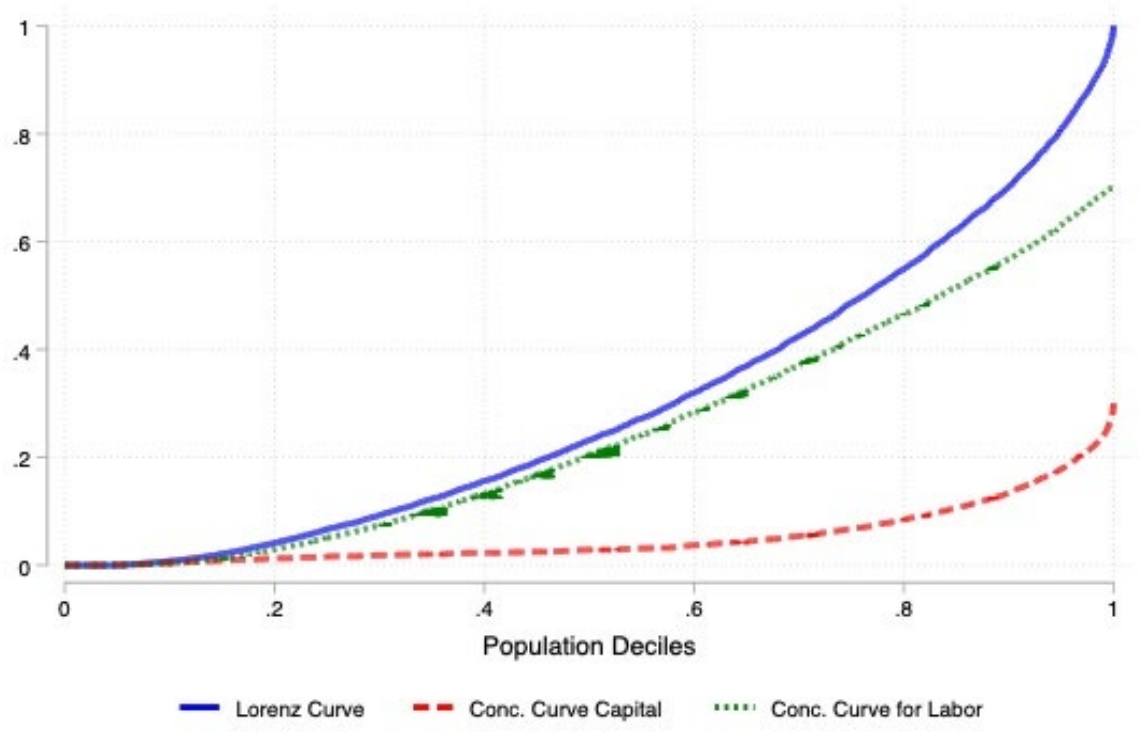
Next, two mutually exclusive income sources (e.g. capital and labour incomes) are considered, as well as the total income given by the sum of these two sources. Given the interdependence between the two concentration curves (i.e. when one source, such as capital income, is concentrated at the top, the other source, labour income, is concentrated at the bottom[8]), a single curve is sufficient to analyse the joint distribution of the two sources. Although the analysis always refers to a single concentration curve, both sources of income are jointly and simultaneously analysed.

This aspect is clearly illustrated in Figure 2, where the Lorenz curve for total income is equal to the sum of the concentration curves for capital (red) and labour (blue) income, weighted by their relative shares (capital and labour income, respectively), for each percentile of the total income distribution. The actual concentration curve used to compute the IFC index is equal to the concentration curve for income source, then multiplied by the relative overall share of the income source. The actual concentration curve for capital used to compute the IFC index is equal to the concentration curve for capital income multiplied by the capital income share, as can be seen in Figure 3 (red curve). This is evident in that the red curve, instead of cumulating all individuals' income in the economy in correspondence

[8] The area under the Lorenz curve for income can be decomposed into the sum of the areas under the concentration curves for the two sources, weighted by the aggregate relative shares of the two components.

to its 100th percentile, as per the Lorenz curve, only cumulates to 30%, which corresponds to the overall household sector capital share. This has the effect of scaling-down the concentration curve.

Figure 2 Lorenz curve and concentration curves for capital and labour income, Italy, 1989



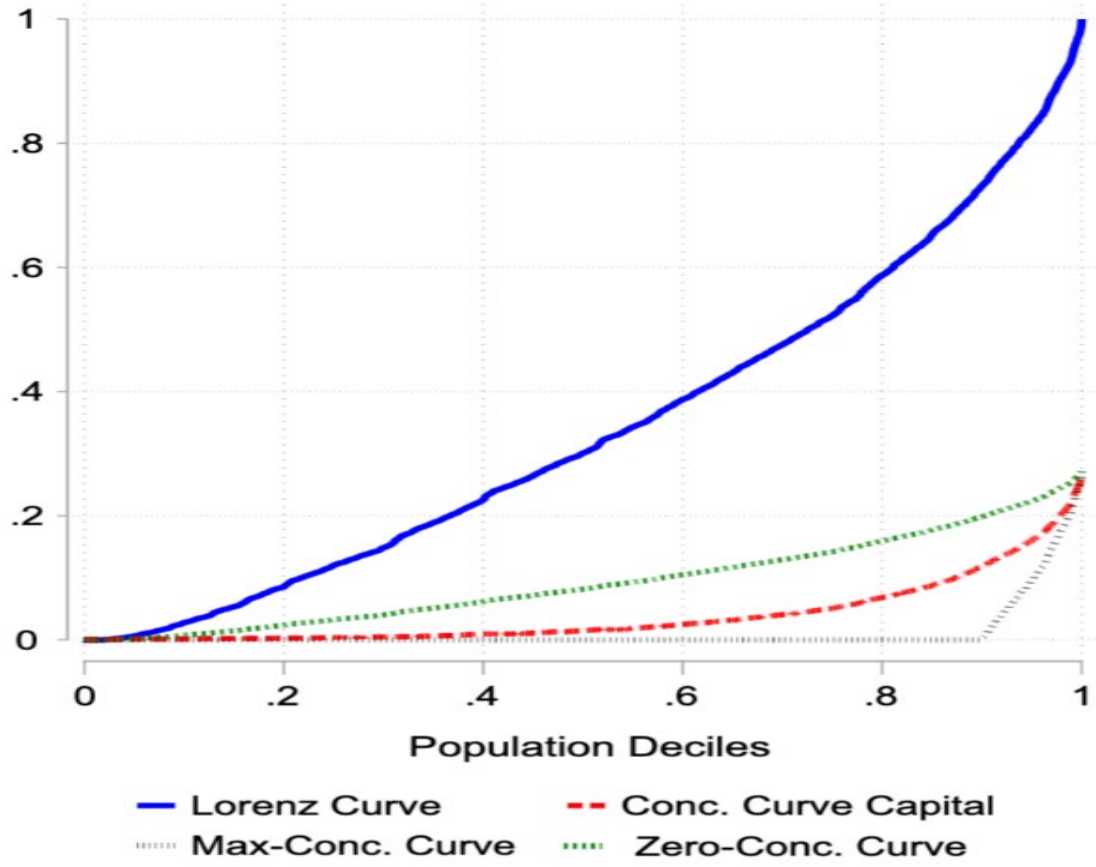
Source: elaborations on Bank of Italy's Survey of Household Income and Wealth (SHIW).

The zero-concentration (green line) and maximum-concentration (grey line) curves describe the cumulative distributions of a given income component under minimal and maximal compositional inequality.[9] Figure 3 shows an example of these concentration curves. The zero-concentration curve– representing minimal compositional inequality – mimics the Lorenz curve for income and decomposes the (cumulative) income of each percentile of the distribution into equal shares. Such equal shares thus correspond to the overall capital and labour shares of income. Crucially, unlike income inequality, whose benchmark of minimal inequality is the same across distributions, minimal compositional inequality is distribution-specific, as it depends on the shape of the Lorenz curve. The maximum-concentration curve – splitting the distribution into deciles – is flat up to the 90th percentile, then mimics the Lorenz curve for total income. This implies that under maximal inequality in income composition, the bottom 90% of the distribution would receive labour income only, and the top 10% would earn only capital income. However, should the capital income be entirely concentrated at the bottom of the income distribution and labour at the top of the income distribution, the maximum concentration curve would mimic the Lorenz curve up to a certain percentile, and be flat thereafter. The next section

[9] See Ranaldi (2022) for a thorough illustration of the zero-concentration and maximum-concentration curves.

explains that a double shape of the maximum-concentration curve (e.g. capital income concentrated either at the top or at the bottom of a distribution) is what causes the IFC indicator to take both negative and positive values.

Figure 3 Lorenz and concentration curves for Italy, 1989



Note: Concentration curves for capital (red line), zero-concentration curve (green line), Lorenz curve for income (blue line), and maximum-concentration curve (grey line) for Italy in 1989 (Iacono and Ranaldi, 2022).

Source: elaborations on Bank of Italy's Survey of Household Income and Wealth (SHIW).

The next section introduces both the IFC index, and the pseudo-IFC adopted in this RN. The framework is described in terms of the decomposition of income into market and transfer incomes.

IFC INDEX

Denoting by A the area between the zero- and actual concentration curves, and by B the absolute value of the area between the zero- and maximum-concentration curves, the IFC index can be defined as follows:

$$I = \frac{A}{B} \qquad (1)$$

The IFC index ranges between -1 and 1. It equals 1 when the first component (market income) is concentrated at the top of the income distribution and the second component (transfer income) is concentrated at the bottom of the total income distribution. It equals 0 when the composition of the two types of income is the same across the distribution (i.e. the relative shares of total income held as market and transfer income, respectively, is constant along the distribution). Finally, it equals -1 when the second component (transfer income) is concentrated at the top of the distribution and the first component (market income) at the bottom of the distribution. Under this scenario, both the maximum-concentration and actual-concentration curves for market income lie above the zero-concentration curve, implying that A is negatively signed. Like the Gini coefficient, the IFC index tends to be more sensitive to changes occurring at the middle, rather than at the top or bottom of the income distribution. This is determined by the use of concentration curves, with the Lorenz curve used to derive the Gini coefficient as a particular case.

The IFC index proposed by Ranaldi (2022) ranks individuals according to the sum of these two income components (here, market plus transfer income). However, it may be desirable to rank individuals according to a different variable. For instance, as the RN aims to measure how transfer incomes shape market income distribution, it may be useful to examine the joint distribution of market and transfer incomes across the market income distribution only (i.e. without considering transfer incomes when ranking individuals).
The pseudo-IFC index thus maintains the mathematical structure of the IFC index, but ranks individuals according to a given variable, here denoted by h:

$$\widetilde{I_h} = \frac{A_h}{B_h} \qquad (2)$$

Additional analyses (available on request) show that the pseudo-IFC index can be seen as a normalised version of the Kakwani index commonly used to measure tax progressivity. However, the pseudo-IFC index is more suitable to study the effectiveness of government transfers across the income distribution for two reasons. Firstly, the Kakwani index cannot attain its maximal or minimal values of 1 and -1. The values are therefore compacted around its average value, making cross-country comparisons more difficult, as the range of values for countries is rather limited. Secondly, the Kakwani index benchmark values are difficult to interpret from a normative standpoint. The Kakwani index was originally designed as a measure of tax (or transfer) progressivity. By contrast, the compositional inequality framework adopted in this study sheds light on the very characteristics of an equal, or an unequal, distribution of the composition of market and transfer incomes across the distribution. This aspect of the compositional inequality framework can usefully inform the policy debate: suppose, for example, that the income of the bottom 10% of the distribution is composed of 40% market income and 60% transfer income. By knowing that the relative shares of market and transfer incomes across the population are 70% and 30%, respectively, and by assuming that the remaining income deciles (from 2nd to 10th) have the same composition of the two factors as that of the overall population (70% and 30%), it is immediately evident that compositional inequality is greater than zero. If the government

were to increase the overall transfer share of income, all else being equal, this would have an equalising effect on the total income distribution proportional to the strength of the IFC index. On the other hand, should the bottom decile's income be composed of 25% transfers and 75% market income, compositional inequality would be negative and an overall increase in the share of transfer income would automatically increase income inequality in society.

DATA

All empirical analyses presented here used EU-SILC cross-sectional waves from 2007 to 2020, which record annual income data from 2006 to 2019 (annual income values refer to the calendar year before the interview).[10] The analysis focuses on all 27 Member States of the EU (EU-27).

The range of income variables recorded in the EU-SILC allow for the definition of various concepts of market income and transfer income (i.e. redistribution). The baseline analysis follows the standard definition of market vs transfer incomes, where the latter include pensions and all other cash transfers (e.g. unemployment benefits, family allowances, non-contributory and means-tested other income support benefits). Accordingly, the IFC-1 index refers to the composition between market income (labour, self-employment, business, land, capital) on the one hand, and all transfers (including pensions) on the other. However, pensions are a sort of hybrid income that may represent both a deferred wage obtained by individuals in line with their previous labour income and a redistributive benefit paid to older adults (particular the poor) independently (or according to a weaker link) of the characteristics of their previous working life. To better disentangle the role of pensions and non-pension transfers in the redistribution process, the IFC-2 index refers to the composition between market income plus pensions on the one hand, and all transfers other than pensions on the other hand.[11]

Redistribution is usually measured including pensions among the transfers. However, IFC-2 may be considered a more reliable index as it cleans the measure of redistribution intensity from bias due to pensions, which cannot be considered mere inter-individuals transfer. For instance, IFC-1 considers as redistributive a high pension related to a successful previous working career received by well-off retired individuals with a current low (or zero) market income. This creates a sort of artificial enlargement of the bottom tail of the market income distribution (i.e. share of population with zero market income) and a consequent mechanical increase in the intensity of redistribution, due to the fact that many people with low or zero market income then receive an adequate pension benefit. Given that pensioners' incomes come mostly or entirely from pensions, and pensions often represent a sort of

[10] Except in Ireland, where income variables refer to the 12-month period before the date of the interview. At the time of writing, the 2020 EU-SILC wave was not available for Germany and Italy, thus data for 2019 refer to 2018. Croatia began to participate in EU-SILC from the 2010 wave, thus data for 2006 refer to the 2009 value.
[11] Consistent with the EU-SILC definition, 'pensions' includes both old-age and survivor pensions.

'deferred' wage to ensure income replacement in old age, including pensioners among those with zero income before the redistribution is misleading.

Additional analyses exploit the fact that, starting from the 2014 wave, the EU-SILC distinguishes pensions whose access is constrained to an income test (targeted pensions) from those whose access is independent of such tests (universal social insurance pensions).[12] The split of total pensions should be read with caution, as national data providers may not follow a homogenous criterion to identify the various types of pension benefits. Nevertheless, an IFC index (IFC-NMTP in Table 1) is computed, considering the composition of market income plus NMTP on the one hand, and market income plus means-tested pensions and other non-pension transfers on the other.

Table 1 summarises the various income sources included in the market income or redistribution component when computing the various IFC indicators presented in this RN.

Table 1: Income sources included in market income and redistribution, according to IFC definitions

	Market income	Redistribution
IFC-1	Income from labour, capital, business and rents	Old-age and survivor pensions, plus non-pension cash transfers
IFC-2	Income from labour, capital, business and rent, plus old-age and survivor pensions (considered a sort of 'deferred market income')	Non-pension cash transfers
IFC-NMTP	Income from labour, capital, business and rent, plus non-means-tested old-age and survivor pensions (considered a sort of 'deferred market income')	Old-age and survivor means-tested pensions, plus non-pension cash transfers

The EU-SILC does not explicitly record MI benefits (i.e. benefits paid to poor individuals and households independently of their characteristics) (Raitano et al., 2021) as a specific income source (Figari et al., 2013). Transfers for MI may be included in various EU-SILC variables and, similarly, EU-SILC variables on 'other income support benefits' may include welfare transfers other than MI. The EU-SILC is unlikely to be the best source for empirical cross-country analysis of the redistributive effectiveness of MI schemes. However, EU-SILC data from 2014 distinguish transfers paid to households (housing allowances, family/child-related allowances, benefits to protect against risks of 'social exclusion not classified elsewhere') according to the entitlement condition (whether means-tested or not) and the financing source (contributory or not-contributory). Accordingly, additional analyses consider the three types of welfare transfers where MI might be recorded – non-contributory and means-tested

[12] The EU-SILC waves after 2014 also distinguish between contributory and non-contributory pensions. This RN relies on the means vs non-means testing dichotomy, independently of the financing source (social contributions or general taxation).

allowances related to family, housing and social exclusion not elsewhere classified (variables hy053, hy073 and hy063 in the EU-SILC, respectively) – and study the income composition inequality between disposable income net of non-contributory and means-tested other income support benefits (as a possible rough proxy for MI) and those benefits.

The IFC index may be computed including or excluding specific transfers in order to better disentangle the intensity of the redistribution exerted. However, available EU-SILC data do not allow for measuring the redistributive intensity of short-term work compensation schemes – which became crucial to sustain workers' incomes during the COVID-19 crisis – as the amounts of these allowances are not separately recorded in the dataset.

Income variables are always considered net of personal income taxes and social contributions. The variables recorded in the EU-SILC for the EU-27 on disposable income including or excluding the various types of social transfers[13] are exploited in detail, then referred to the redistribution intensity due to the various types of net cash transfers. The impact exerted by income taxes on the various income sources is not considered, as it requires access to gross and net of tax values for the various income components and the latter values are recorded in the EU-SILC for only a subgroup of Member States.[14] All income variables are taken as 'equivalised incomes', where household incomes are equivalised by using the modified OECD scale.[15] The unit of analysis here is the individual, whose economic well-being is assessed by looking at their equivalised income, starting from household income.[16]

The analyses described in the following sections measure the intensity of redistribution in the last available year, as captured by the IFC index. They also show how the IFC index evolved from 2006 to 2019, highlighting possible changes in redistribution intensity during and after the economic crisis from the end of 2008 to 2013. It should be noted that an increase in IFC during that recession may have stemmed from an increase in the benefits paid to poor individuals (e.g. an increase in the amount of unemployment benefits or MI schemes) and a rise in the share of the population incurring a certain economic risk (e.g. unemployment, drop in poverty). The empirical findings should be interpreted in light of the fact that a rise in the redistribution intensity could be due to an increase in the number of unemployment and anti-poverty benefits recipients due to an adverse business cycle rather than to a more generous welfare state. The methodology adopted here does not allow for distinguishing between these two possible drivers.

[13] Variables HY020, HY022 and HY023 in the EU-SILC questionnaire.
[14] Net income variables for single income sources are not recorded in CY, CZ, DE, DK, FI, HU, LT, MT, NL, SK.
[15] The so-called modified OECD equivalence scale computes the number of equivalised components of a household by assigning a weight of 1 to the first adult in a household and values 0.5 and 0.3 to all other members aged at least 14 or under 14, respectively.
[16] See Raitano (2022) for a discussion of the pros and cons of the equivalence scales.

Summarising, this RN exploits the concept of compositional inequality and the related IFC index to evaluate the heterogeneous impact of redistribution policies across EU countries and over time. Compositional inequality (the way in which the composition of income into two mutually exclusive sources varies along the income distribution) is applied to study the composition of both welfare cash transfers and market income, across the market income distribution (the reference to measure the population subgroups benefiting relatively more from the two income sources). In the empirical context, a high level of compositional inequality (a high value of the IFC index) implies that the individuals situated at the bottom of the market income distribution receive the bulk of the cash transfers, while the individuals at the top earn only market income. By contrast, a low level of compositional inequality describes a distribution where rich and poor individuals receive a similar share of government transfers with respect to their market income. Thus, the higher the IFC index value, the more the transfers are directed towards individuals with a low market income, and the higher the target efficiency of the redistribution (i.e. its effectiveness in directing transfers towards those with the lowest market income).

MAIN RESULTS: IFC LEVELS AND TRENDS IN EU COUNTRIES

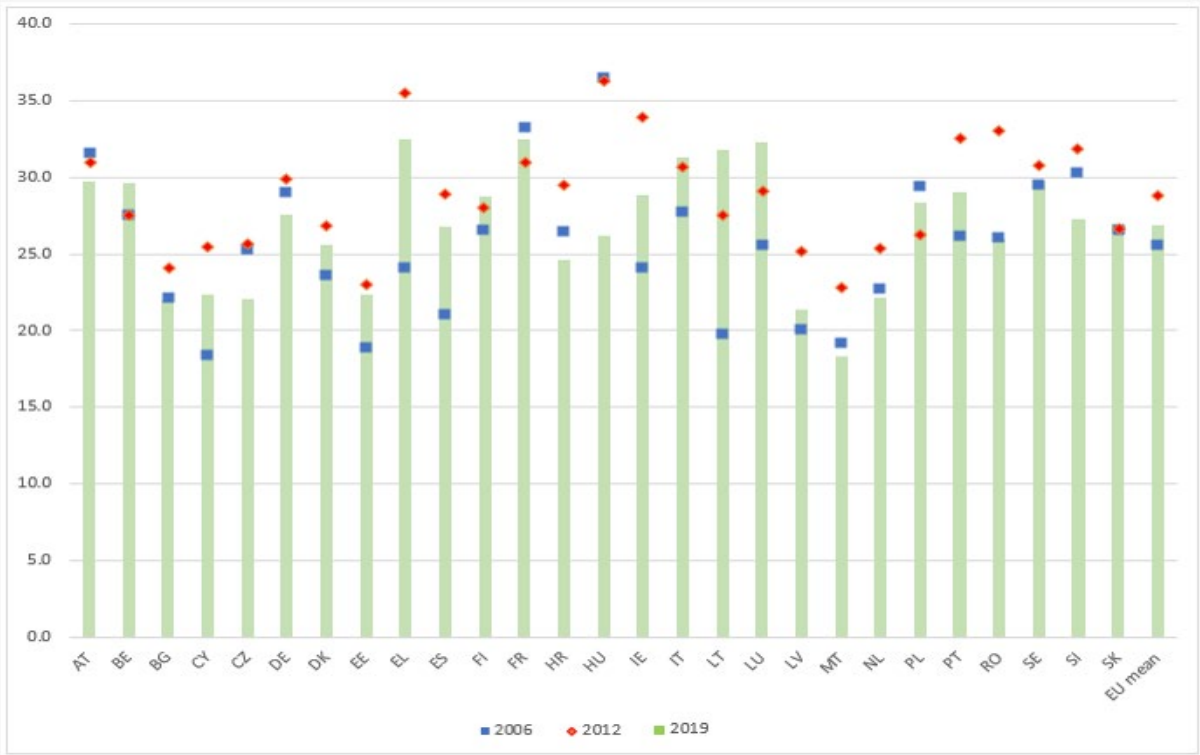
COMPOSITION OF DISPOSABLE INCOME

As a starting point, the relative share of disposable income obtained by net market income and net transfer income was computed from the EU-SILC. When pensions are included among the transfers, 26.9% of disposable income was composed of cash transfers, on average, in the Member States in 2019, even if, as expected, that share was higher during the recession phase (28.8%; see Figure 4). The share of total transfers in disposable income differed significantly across countries. In 2019, the highest values (over 30%) were in France, Italy, Greece, Latvia and Luxembourg, while the lowest values (below 25%) were in the Netherlands and in some countries that had acceded to the EU since 2005 (Bulgaria, Cyprus, Czechia, Estonia, Latvia, Malta). Interestingly, 19 of the EU-27 Member States showed a higher share of disposable income obtained by transfers in 2012 (i.e. during the economic crisis) than in 2019.

When pensions are included in market incomes (when they are considered a form of deferred market income rather than a transfer), the share of transfers on disposable incomes largely reduces, as expected (see Figure 5). On average, that share was 8.5% in 2019 and 9.8% in the EU in 2012. Considerable heterogeneity across countries is evident, with a certain tendency to cluster among Northern and Southern European countries in respect of the relative weight of cash transfers other than pensions as a share of disposable income. In seven countries (Belgium, France, Estonia, Ireland and the three Nordic countries, Denmark, Finland, Sweden), more than 10% of disposable income came from cash

welfare transfers. In three Southern European countries (Italy, Greece, Portugal) and Romania, transfers other than pensions represented less than 6% of total disposable income. Figure 5 also shows that in 20 of the EU-27, the share of disposable income due to transfers other than pensions was higher in 2012 than in 2019.

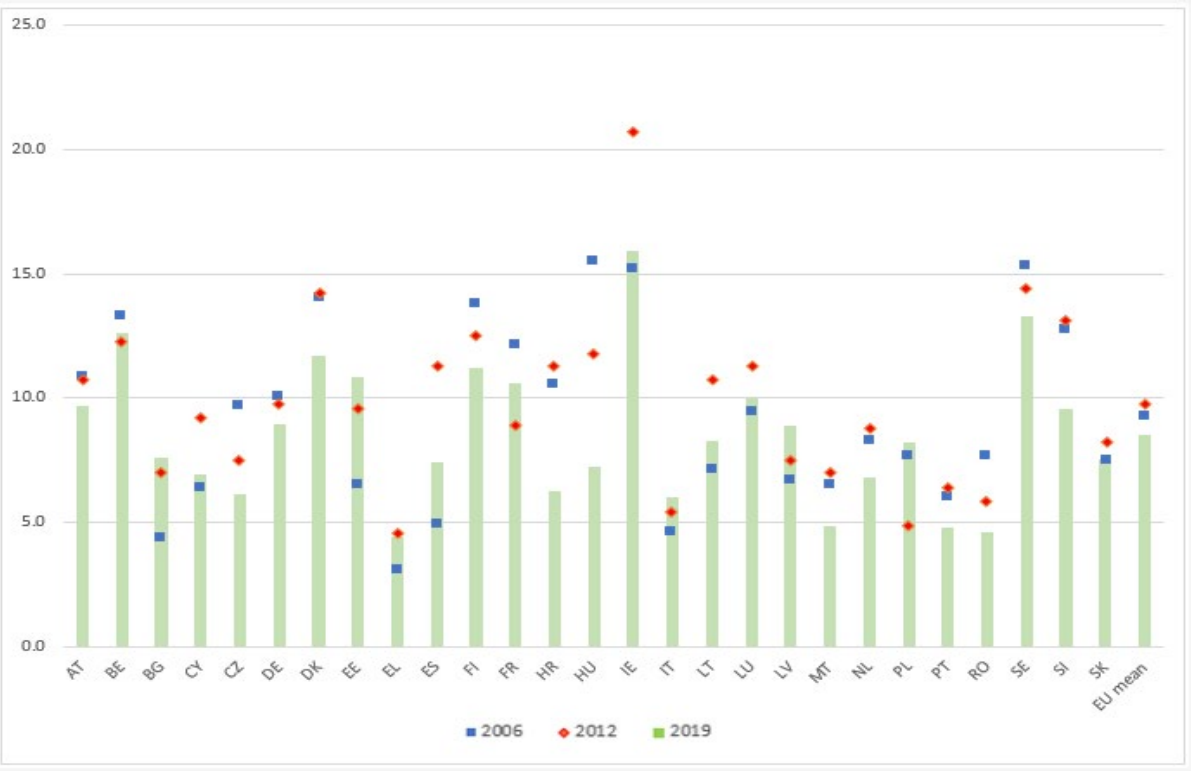
Figure 4 Share of total transfers in disposable income, EU-27, 2006-2019



Source: elaborations on EU-SILC data.

However, the values in Figure 4 and Figure 5 do not provide any information on the portion of the income ladder that benefits most from cash welfare transfers. To assess the redistributive effectiveness of those transfers, the analysis investigated levels and trends of the IFC index in EU countries.

Figure 5 Share of non-pension transfers in disposable income, EU-27, 2006-2019



Source: elaborations on EU-SILC data.

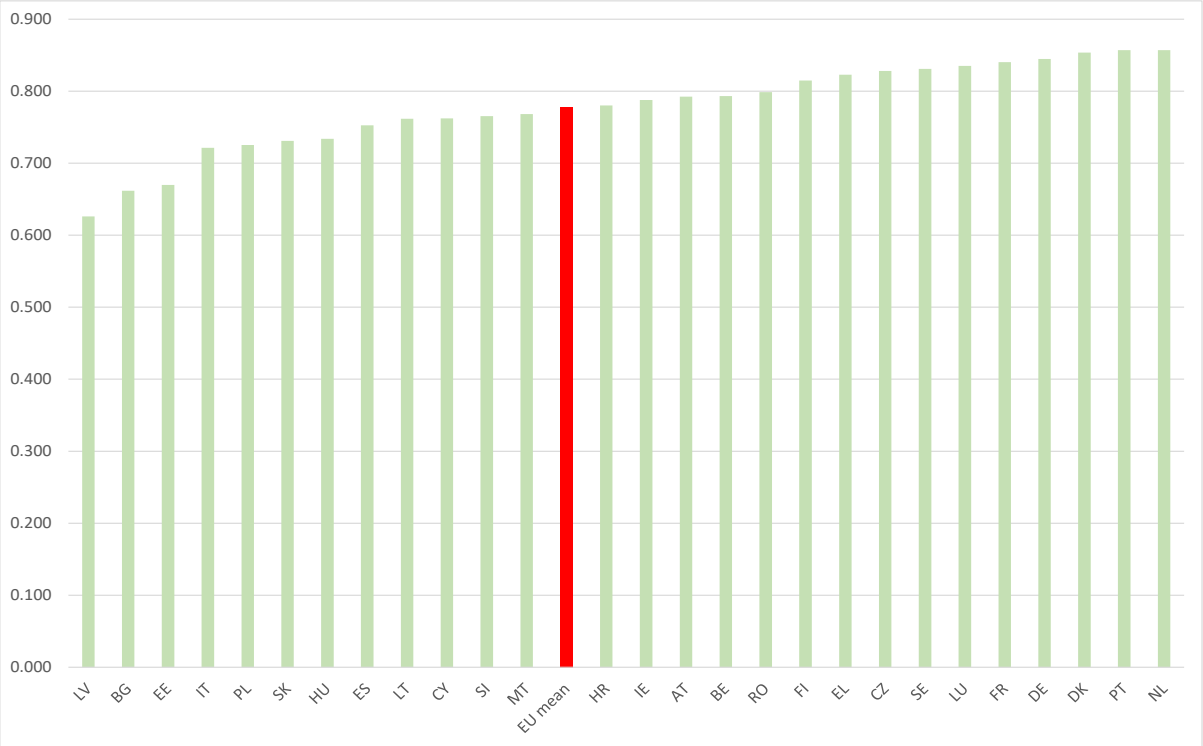
COUNTRY RANKINGS AND COMPARISONS INCLUDING PENSIONS AMONG TRANSFERS

Figure 6 shows (in ascending order) how the EU-27 countries ranked in 2019, with respect to the IFC-1 indicator. The IFC value is rather high, ranging from 0.626 in Latvia to 0.857 in the Netherlands, and with a mean EU value of 0.778. These high values suggest that cash transfers tend to be received far more by those in the bottom of the market income distribution. However, as noted earlier, the high values of IFC-1 might be biased by the inclusion of pensions in the transfers, as high pensions related to a previous successful working career might benefit retired individuals with low or zero market income. Interestingly, no clearcut country clustering emerges, although Eastern and Southern European countries are usually below the EU mean value, and the reverse is true of Northern and Central European countries (with the notable exception of Portugal and Greece).

The intensity of redistribution in EU countries is often assessed by calculating the difference between Gini indices of market and disposable incomes (see Section 2). The Gini coefficient and the difference among its values computed according to different income distributions face some conceptual limits. It is noteworthy that the country ranking that emerges when using the IFC-1 index is markedly different to that related to the percentage reduction in the Gini coefficients from market to disposable

index (Figure 7, where pensions are included among the transfers and countries are positioned according to the EU mean value). Moreover, the correlation between the two indices, even if positive, is rather low (+0.274).

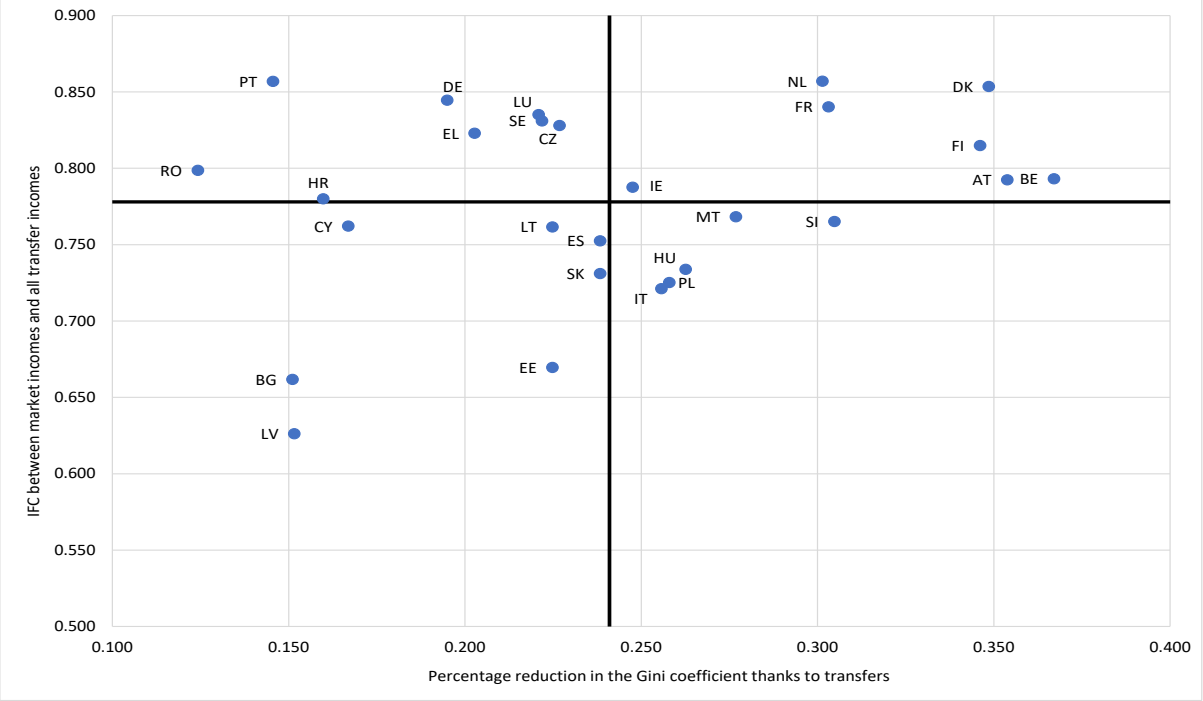
Figure 6 Values of IFC-1, EU-27, 2019



Source: elaborations on EU-SILC data.

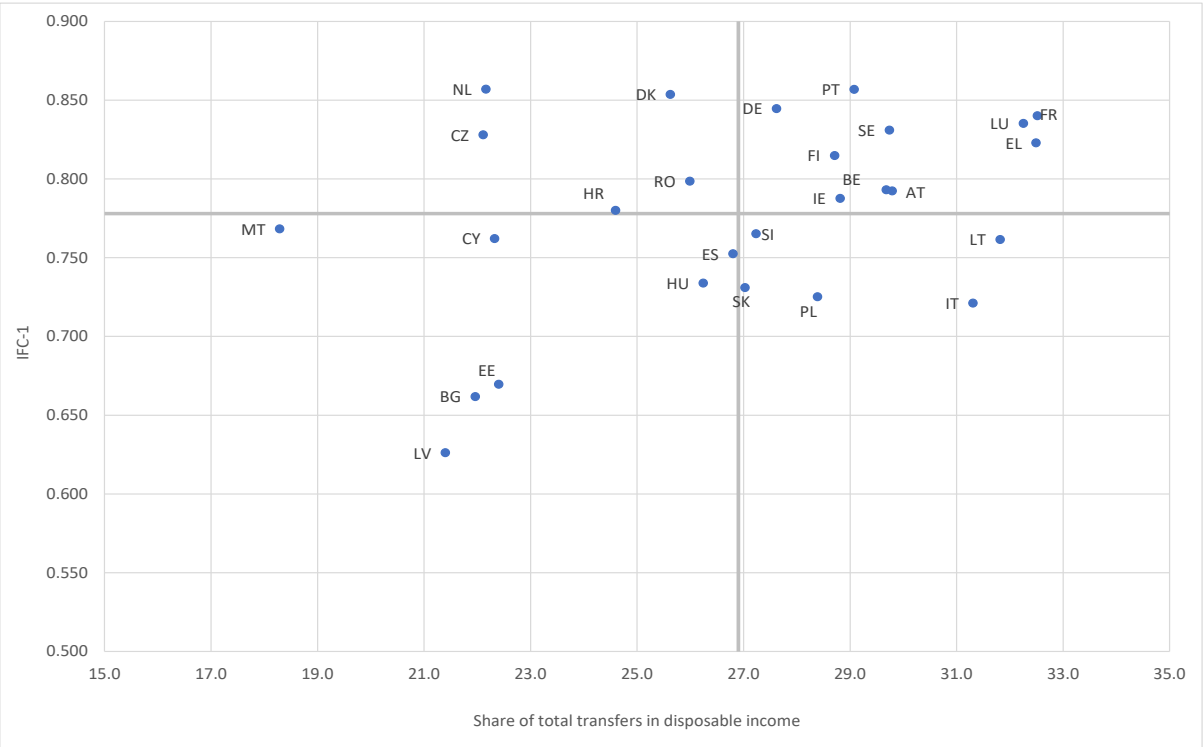
Five countries with an intensity of redistribution higher than the EU mean when computed according to the difference in the pre- and post-transfers Gini index rank below the EU mean when the IFC-1 index is adopted (Italy, Poland, Hungary, Malta, Slovenia). Conversely, eight countries with a low intensity of redistribution according to the change in the Gini index have an IFC-1 value higher than the EU mean (Romania, Croatia, Czechia, Greece, Portugal, Germany, Luxembourg, Croatia). This confirms that a detailed preliminary analysis of the characteristics of the various redistribution indexes and their conceptual and empirical pros and cons is needed before carrying out sound and robust cross-country comparisons in the intensity of the redistribution across the EU. The intensity of redistribution may depend on the characteristics of a certain social protection scheme (i.e. the entitlement conditions, the benefit computation formula), on the spread of a certain risk within a population (e.g. poverty, unemployment, old-age due to the demographic composition), and on the amount of total benefits transferred to individuals and households (which may also influence the features of a social protection scheme).

Figure 7 Country positions according to IFC-1 and to the change in the Gini index pre- and post-transfers, EU-27, 2019



Notes: axes intersect at the mean EU value of the two indexes.
Source: elaborations on EU-SILC data.

Figure 8 IFC-1 and share of total transfers in disposable income, EU-27, 2019

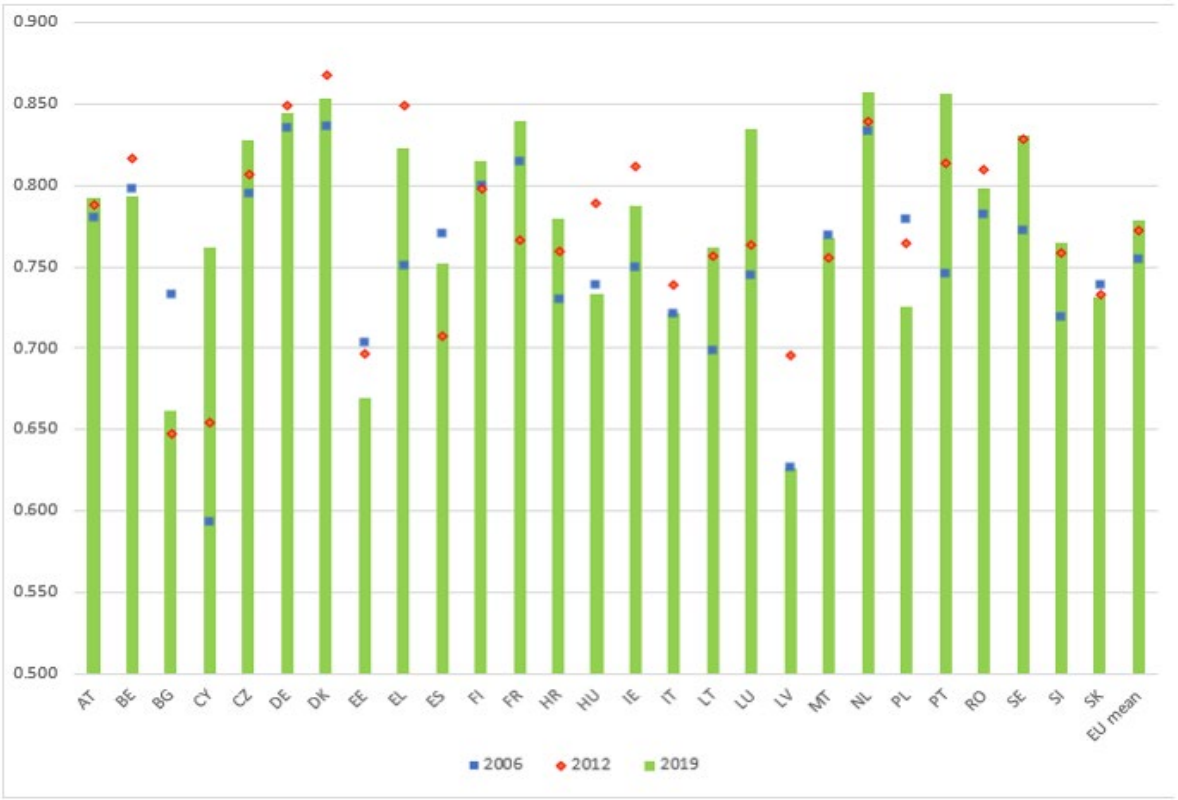


Notes: axes intersect at the mean EU value of the two indexes.
Source: elaborations on EU-SILC data.

The analysis examined the correlation between the value of the IFC-1 index and the share of total transfers in disposable income, at country level (Figure 8). The two dimensions are positively correlated (+0.378), even if the correlation is far from perfect, as signalled by the high number of countries with an IFC-1 higher than the EU mean value but a share of transfers on disposable incomes lower than the EU mean value (Croatia, the Netherlands, Denmark, Czechia, Romania) and, conversely, by the existence of a certain group of countries with a relatively low level of IFC-1 but a ratio between cash transfers and disposable incomes higher than the EU mean value (Italy, Poland, Slovenia, Lithuania, Slovakia).

The trends of the IFC-1 along the observed period are also interesting. The whole time series in the 2006-2019 period is shown in Appendix A1 (where countries are grouped according to their geographical position, for graphical convenience), while Figure 9 compares the value of the IFC-1 index in three representative years: the first (2006), the last (2019) and a central year during the economic crisis (2012).[17] No clearcut time pattern of the IFC-1 index emerges: in 10 of the EU-27, the highest IFC-1 was recorded in 2012; in six countries, the highest value was in 2006, while the remaining 11 countries showed the IFC-1 achieving its maximum level in the last available year.

Figure 9 IFC-1 levels, EU-27, 2006, 2012, 2019



Source: elaborations on EU-SILC data.

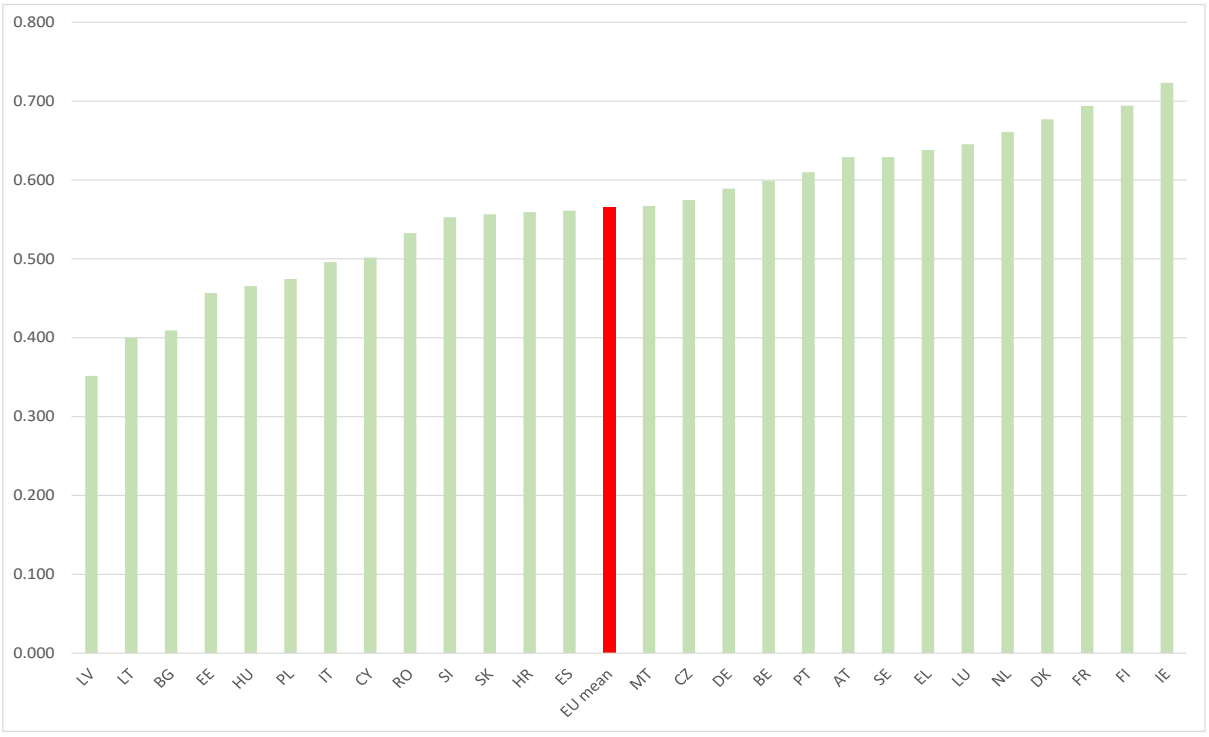
[17] The 2006 value for Croatia refers to 2009, while the 2019 values for Germany and Italy refer to 2018.

The lack of a clear and common time pattern in the IFC-1 index across the EU-27 is confirmed by looking at annual values in the 2006-2019 period. It does not neatly emerge that the intensity of redistribution, as captured by the IFC-1 index, was higher during the recession, when the intensity of redistribution would be expected to increase. This might be due to the inclusion of pension benefits – whose time trend is not strictly correlated with the stance of the business cycle – within cash transfers. For this and the conceptual reasons outlined earlier, the analysis examined compositional inequality within market incomes plus pensions, compared to cash welfare transfers other than pensions.

COUNTRY RANKINGS AND COMPARISONS CONSIDERING PENSIONS AS MARKET INCOME

Figure 10 shows (in ascending order) how the EU-27 ranked on the IFC-2 indicator in 2019. Including pensions among the transfers overestimates redistributive transfers, as it captures as redistributive transfers those relatively high pension benefits obtained by well-off individuals with zero or low market incomes. Values ranged from 0.352 in Latvia to 0.723 in Ireland, with an EU-27 mean value of 0.565. Most Eastern European and Southern countries (partial exceptions are Czechia, Greece and Portugal) are characterised by IFC-2 values lower than the EU mean, while, conversely, the intensity of redistribution captured by the IFC-2 index is relatively higher in Central and Northern European countries and achieves its maximum value in Ireland. Compared to Figure 6, the IFC-1 index, there is a clearer geographical clustering of EU-27 countries.

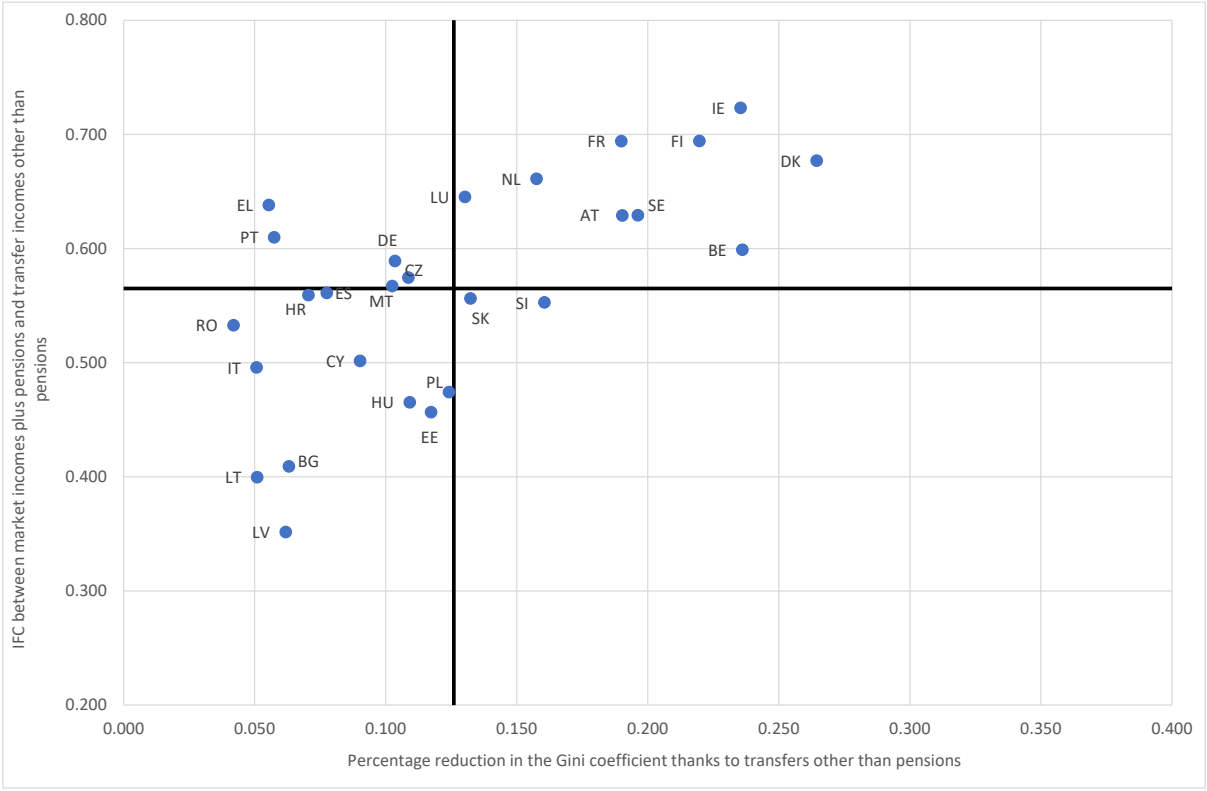
Figure 10 Values of IFC-2, EU-27, 2019



Source: elaborations on EU-SILC data.

The correlation between the IFC-2 index and the change in the Gini index pre- and post-non-pension transfers is far from perfect (Figure 11), even if the correlation coefficient (+0.662) is far stronger than that for IFC-1 and the difference between the pre- and post-transfers Gini index (Figure 7). In particular, two countries with an intensity of redistribution higher than the EU mean when computed according to the difference in the pre- and post-non-pension transfers Gini index rank below the EU mean when the IFC-2 index is adopted (Slovakia, Slovenia). Conversely, four countries with a low intensity of redistribution according to the change in the Gini index have a IFC-2 value higher than the EU mean (Greece, Portugal, Czechia, Germany).

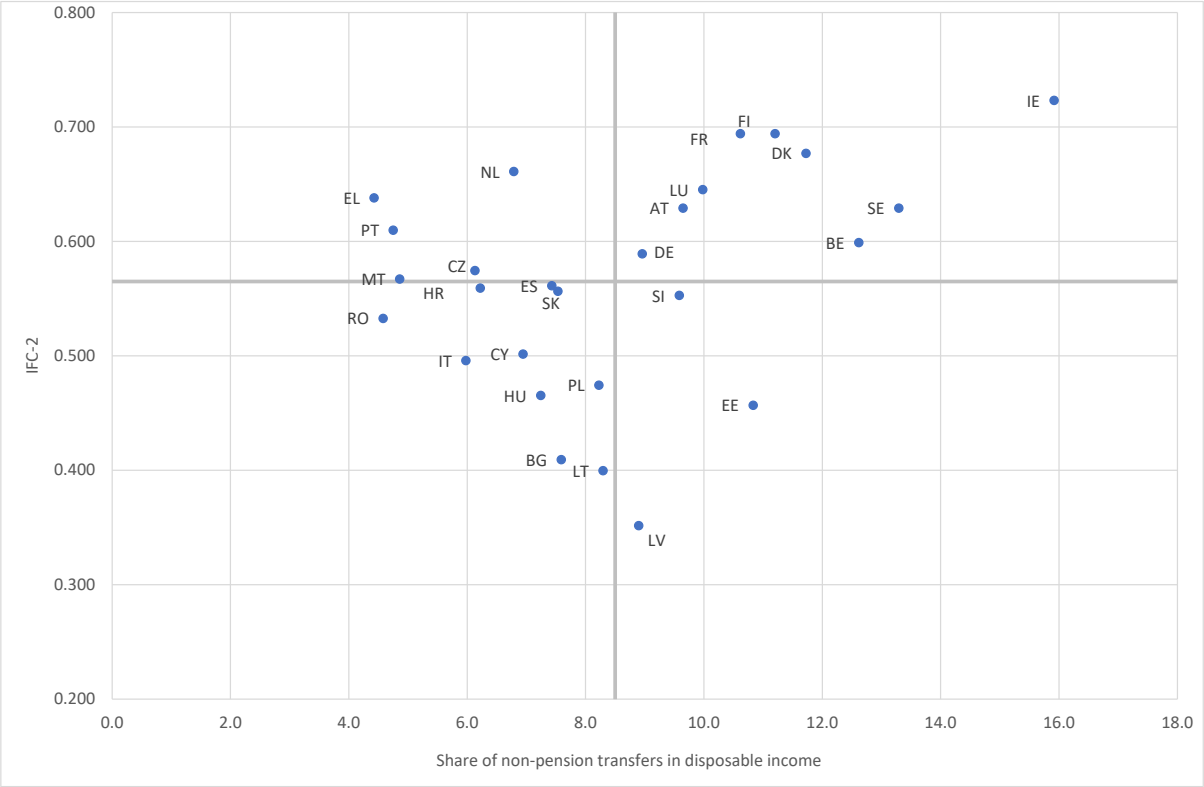
Figure 11 Country positions according to IFC-2 and to change in Gini index of pre- and post-non-pension-transfers, EU-27, 2019



Notes: axes intersect at the mean EU value of the two indexes.
Source: elaborations on EU-SILC data.

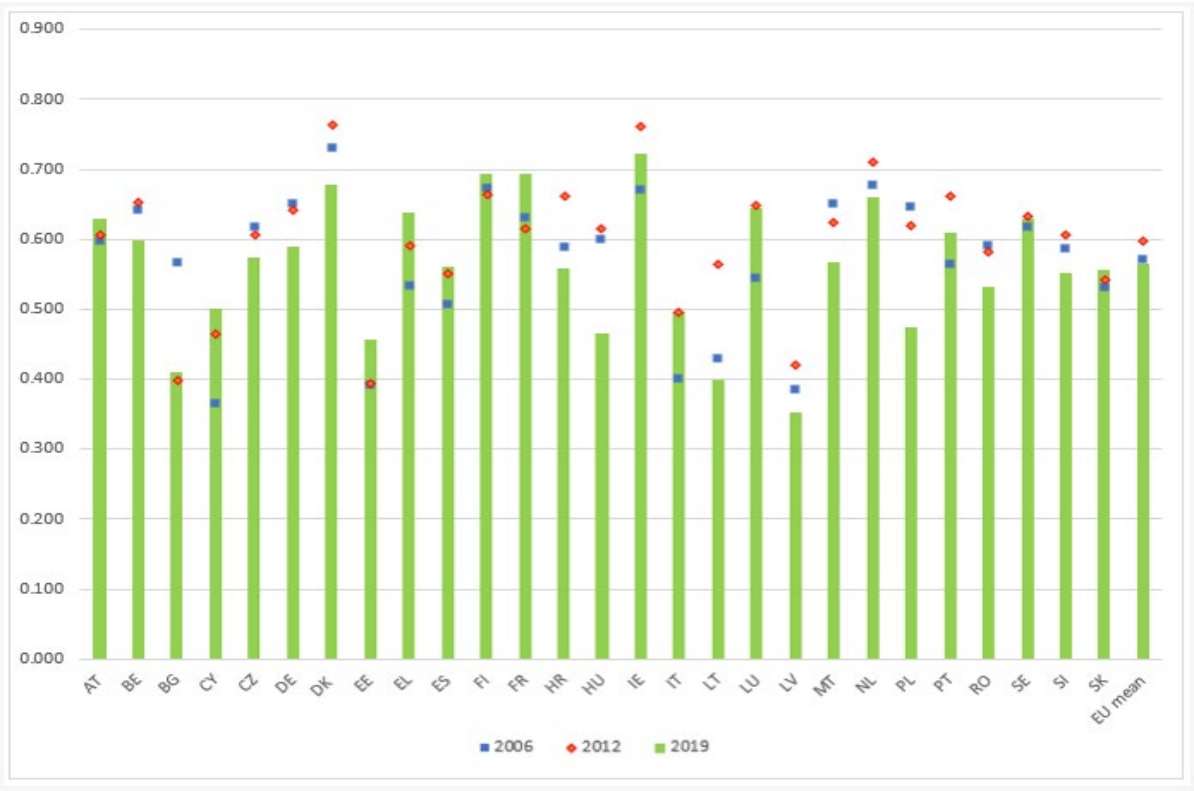
As discussed earlier, the intensity of redistribution may be related to the total amount of transfers. To investigate this relationship, the analysis examined the country-level correlation between the IFC-2 index and the ratio between transfers other than pensions and disposable income (Figure 12). The two dimensions are positively correlated (+0.355), even if the correlation is far from perfect – seven of the EU-27 countries have an IFC-2 higher than the EU mean value but a ratio between non-pension transfers and disposable income lower than the mean.

Figure 12 IFC-2 and share of non-pension transfers in disposable income, EU-27, 2019



Source: elaborations on EU-SILC data.

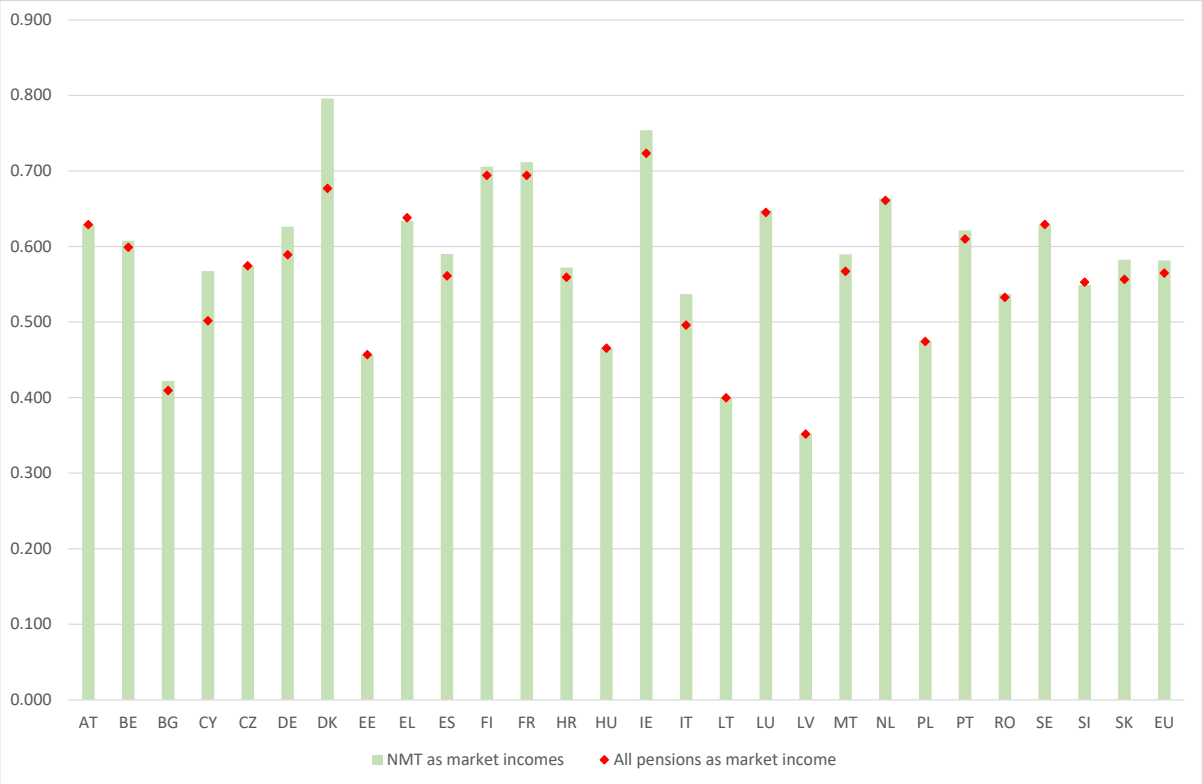
Figure 13 IFC-2 levels, EU-27, 2006, 2012, 2019



Source: elaborations on EU-SILC data.

It is interesting to investigate trends in the IFC-2 index during the observed period. The whole time series in the 2006-2019 period is shown in Appendix A2, while Figure 13 compares the value of the IFC-2 index in three representative years: 2006, 2012 and 2019.[18] No single time pattern of the IFC-2 index emerges from Figure 13, although there is a clear negative association between the macroeconomic stance and the IFC-2 values, as confirmed by the highest value of IFC-2 recorded in 2012 in 13 of the EU-27 countries, while in eight countries, the IFC-2 index achieved its maximum value in 2019.

Figure 14 Comparison between IFC-2 and IFC-NMTP, EU-27, 2019



Source: elaborations on EU-SILC data.

As a further robustness check on the influence of pension benefits on redistribution, a revised IFC-2 index (IFC-NMTP, see Table 1) was computed that included only means-tested (contributory and non-contributory) pension benefits among the transfers, while NMTPs (contributory and non-contributory) were added to market incomes (Figure 14). Distinguishing the various components of pension benefits should be done cautiously because of different national procedures to record them in the EU-SILC, or because some countries do not separately record (or do not provide) means-tested benefits. Nevertheless, it is interesting that the value of the IFC index rises in most countries when the types of pensions are distinguished, while the value of the IFC-NMTP indicator did not reduce in any country, compared to the index including all pensions in market incomes. This suggests that means-tested pensions

[18] The 2006 value for Croatia refers to 2009, while the 2019 values for Germany and Italy refer to 2018.

exert a non-negligible redistributive effect in those countries where these types of pensions are provided.

DIFFERENCES IN IFC VALUES DUE TO PENSIONS

Previous analyses demonstrated that the classification of pensions is crucial to properly measuring the effectiveness of redistribution in the Member States. Changes in country rankings when the IFC-1 or the IFC-2 index is considered are not non-negligible (Table 2), signalling that some countries with a relatively high redistributive intensity according to the IFC-1 may rank at the top largely because of the role played by a hybrid redistributive tool such as pensions.

Table 2: Country rankings in IFC-1 and IFC-2 (ascending order), EU-27, 2019

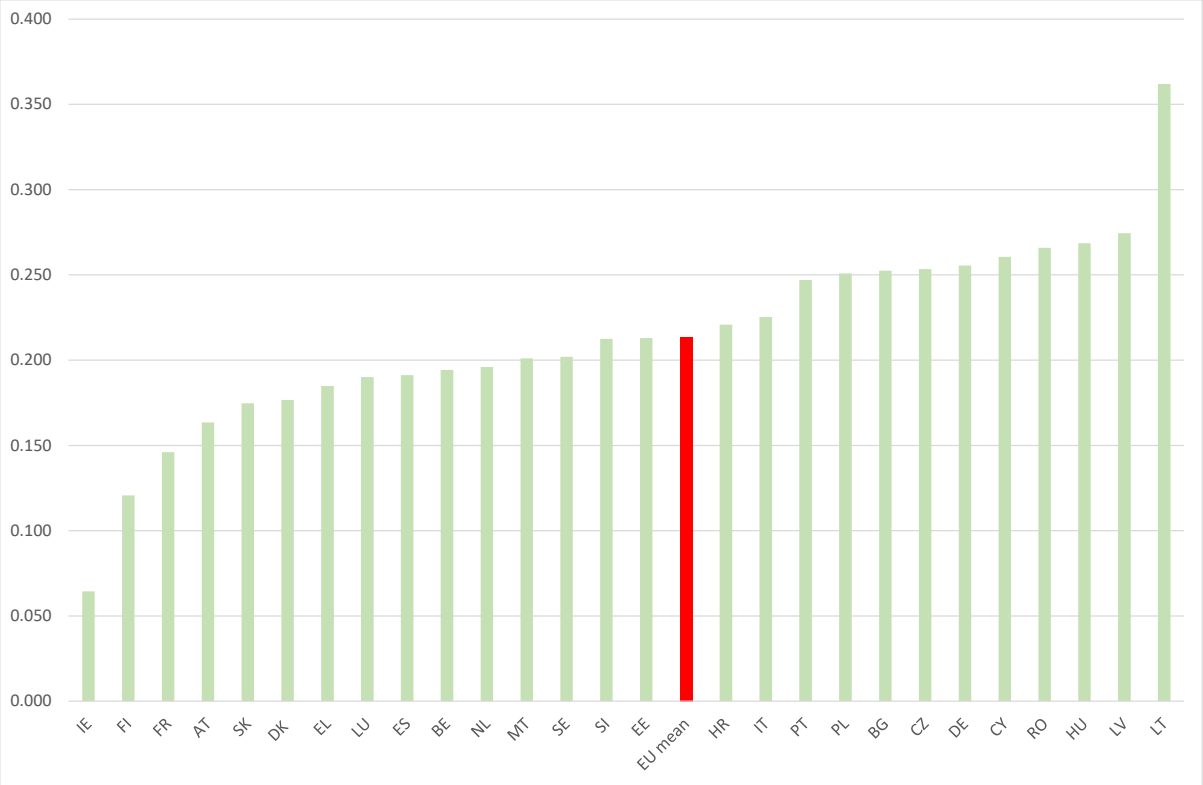
	IFC-1	IFC-2
AT	13	9
BE	12	11
BG	26	25
CY	18	20
CZ	8	13
DE	4	12
DK	3	4
EE	25	24
EL	9	7
ES	20	15
FI	10	2
FR	5	3
HR	15	16
HU	21	23
IE	14	1
IT	24	21
LT	19	26
LU	6	6
LV	27	27
MT	16	14
NL	1	5
PL	23	22
PT	2	10
RO	11	19
SE	7	8
SI	17	18
SK	22	17

Source: elaborations on EU-SILC data

For instance, Germany, a country where the pension system based on a points formula, is weakly redistributive, falls from fourth to twelfth place, according to whether pensions are excluded or included in market incomes, respectively. Likewise, when comparing IFC-1 and IFC-2 values, Portugal drops from second to tenth place, and the Netherlands falls from first to the fifth place, suggesting that the high redistribution effectiveness captured by IFC-1 is strictly associated with the provision of pensions to individuals and households with low or zero market incomes. Conversely, Finland appears to be a medium redistributive country according to the IFC-1 index but ranks second-most redistributive when computing compositional inequality excluding pensions from transfers. Ireland climbs from fourteenth to first place when the IFC-1 index is replaced with the IFC-2 index.

Comparing values of the IFC-1 and IFC-2 indices captures how much of the intensity of redistribution is due to pensions and might thus capture an intra-individual horizontal redistribution along different phases of life, rather than a pure inter-individual vertical redistribution (Figure 15). The greater the difference (e.g. Lithuania, Latvia), the higher the role played by pensions in the measure of redistribution and the higher the risk that a synthetic indicator of redistribution is merely capturing the differences in national pension system structures rather than the actual intensity of vertical redistribution among more and less-favoured individuals and households.

Figure 15 Difference between IFC-1 and IFC-2, EU-27, 2019 (absolute values)



Source: elaborations on EU-SILC data.

DISENTANGLING THE ROLE OF NON-CONTRIBUTORY AND MEANS-TESTED OTHER INCOME SUPPORT BENEFITS

Income composition inequality is a flexible approach that allows comparisons of the composition between different income sources. Exploiting the possibilities of the IFC index, the RN assessed the redistributive intensity exerted by non-contributory and means-tested other income support benefits (which may be considered a rough proxy for MI schemes). Income composition is measured in detail between disposable income net of non-contributory and means-tested other income support benefits and these benefits.

Measuring the redistributive intensity of MI schemes is important because one main objective of income support measures should be so-called target efficiency, i.e. the capacity of means-tested welfare transfers to reach all individuals in need (those without other income sources) and avoid wasting resources by paying benefits to non-poor individuals and households.[19]

One major caveat should be noted before the analysis is discussed: the EU-SILC does not explicitly record transfers for MI schemes as a specific income source; rather, it records non-contributory and means-tested other income support benefits, which might severely bias the measurement of national MI schemes (Figari et al., 2013). MI might be included in various EU-SILC variables, and, at the same time, these variables might include welfare transfers other than MI. The EU-SILC is thus unlikely to be the best source for empirical cross-country analysis of MI scheme adequacy, coverage and target efficiency, as non-contributory and means-tested other income support benefits may – at most – be considered proxies for MI. Ideally, detailed cross-country comparisons would be carried out using homogenised national information recorded in administrative datasets, as only these data allow researchers to precisely identify MI schemes as the type of benefit in question. Nevertheless, from 2014 onwards, the EU-SILC records the amount of non-contributory and means-tested welfare transfers received by households, and MI in all countries should be classified within non-contributory and means-tested benefits. Notwithstanding the previous substantial caveat therefore, the EU-SILC waves were used to approximately measure the redistributive intensity of MI schemes relying on income compositional inequality, as they record the amount received by households as non-contributory and means-tested allowances related to family, housing and social exclusion not elsewhere classified.[20]

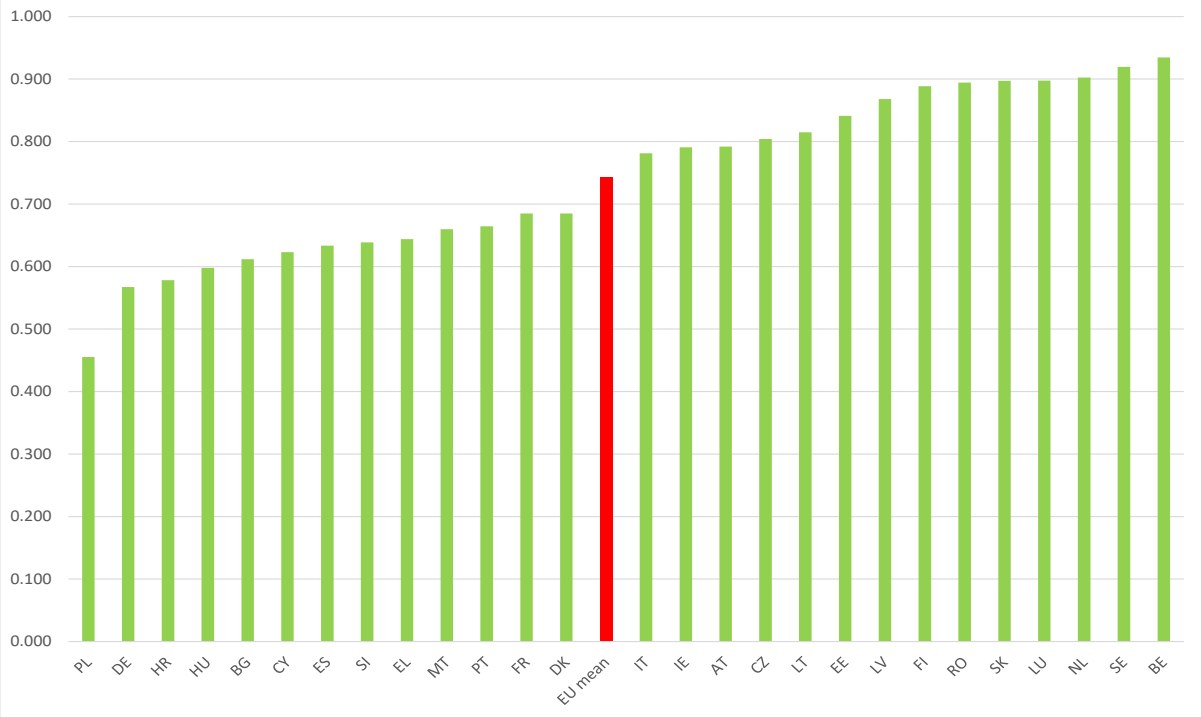
[19] See Raitano et al. (2021) on the issue of target efficiency of MI schemes.

[20] Variables coded as hy053, hy073 and hy063 in the EU-SILC. No country-level study investigating the overlap between these variables and MI was identified.

Figure 16 shows that, on average, non-contributory and means-tested other income support benefits are indeed highly redistributive: the EU mean value of the IFC-NCMT (i.e. non-contributory and means-tested other income support benefits) between those benefits and the remaining part of disposable income is 0.743, with countries ranking between the lowest value of 0.455 (Poland) and the highest value of 0.934 (Belgium). A high heterogeneity in the value of this specific IFC-NCMT index thus emerges within the EU. No clear geographical country clustering emerges when the country position with respect to the EU mean value is assessed (see Figure 16).

The redistribution effectiveness of non-contributory means-tested other income support benefits should be analysed together with a measure of the relative importance of those benefits in national economies. In other words, a high IFC-NCMT level indicates where a certain amount of non-contributory means-tested other income support benefits is directed but does not provide any information on the size of the resources devoted to improving the living conditions of poor individuals.

Figure 16 Value of the IFC index considering the composition between non-contributory means-tested other income support benefits and disposable income minus those benefits, EU-27, 2019

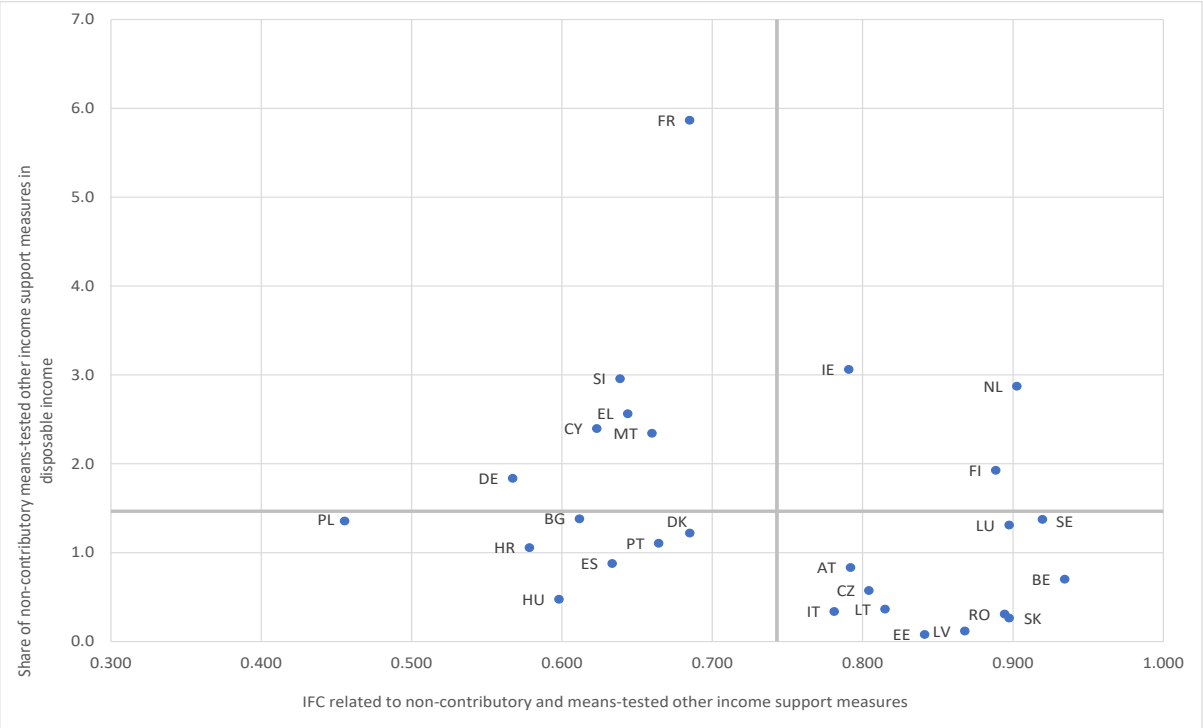


Source: elaborations on EU-SILC data.

Figure 17 shows the correlation between the value of the IFC-NCMT index and the ratio between mean amount received as non-contributory means-tested other income support benefits at country level, and total disposable income. The correlation between these two dimensions is negative (-0.248) and not negligible, suggesting that if social protection systems are to be compared, an index of effectiveness of redistribution (capturing where EUR 1 of redistribution is destined) should be matched with

indicators of the role played by the various types of welfare transfers with respect to incomes from other sources.

Figure 17 Values of IFC related to non-contributory means-tested other income support benefits and share of these benefits in disposable income, EU-27, 2019



Source: elaborations on EU-SILC data

CORRELATES OF IFC LEVELS AND TRENDS: AN EMPIRICAL ESTIMATE

A multivariate regression analysis was carried out to test the country characteristics that correlate with the IFC-1 and IFC-2 indexes. Regressions considered the time trends of the two indexes from 2006 to 2019 as the dependent variable, together with a set of country characteristics taken from the Eurostat website as independent variables. They were run through both ordinary least squares (OLS) and panel fixed-effect (FE) models. The latter allowed for testing the association between a within-country variation in a certain characteristic and the dependent variable.

The specifications were run by adding stepwise to the estimates the following sets of time-varying country-level variables:[21]

[21] All OLS and FE model estimates controlled for time dummies.

i. Country structural demographic characteristics (share of population aged under 15 and over 65);
ii. Proxies for the business cycle (unemployment rate; Gross Domestic Product (GDP) growth rate);
iii. Proxies for fiscal stance (ratio between public debt and the GDP; ratio between budgetary deficit and GDP);
iv. Level of pre-transfer income inequality, as captured by the Gini index (including or excluding pensions, according to the type of IFC);
v. Size of welfare spending, proxied by per-capita social protection spending in purchasing power standards (PPS) and by the share of means-tested social protection spending of total social protection spending;
vi. Proxy for the general living standard in the country (log median income).

Results of the regressions are purely indicative of a possible association, as the methods do not allow for identifying any causal link between the independent and dependent variables. In addition, some independent variables, when included jointly in the estimated models, might be correlated, creating a multi-collinearity effect for the estimated coefficients.

Nevertheless, some interesting evidence emerges when OLS specifications are run (see Tables 3 and 5). Focusing on the richer m5 specification where all covariates are included, the effectiveness of re-distribution as captured by the IFC-1 index appears to be positively linked with pre-transfer inequality (the estimated coefficient of the pre-transfer Gini is positive and statistically significant) and with the generosity of the welfare state (the estimated coefficients of social protection spending and the share of means-tested spending are positive and statistically significant). Conversely, the effectiveness of redistribution as captured by the IFC-1 index is negatively correlated with the country log median income. A higher public debt is also associated with a stronger redistribution, while the opposite is evident for fiscal deficits because a higher budgetary surplus is associated with a higher IFC-1.

However, in addition to the endogeneity and reverse causality issues that may also plague FE estimates, OLS estimates are significantly affected by an omitted variable bias, as the estimated association might be due to the missed consideration of crucial further country-level variables that are correlated with the dependent and independent variables. This is confirmed when the estimate is repeated through a FE model (Table 4), as almost all variables lose their statistical significance, apart from public debt and the value of the pre-transfer Gini, which are still associated with a higher IFC-1. This outcome suggests that the statistically significant association between country characteristics and IFC-1 shown by OLS estimates in Table 3 is likely due to cross-correlated 'time-invariant' country features not considered among the covariates in the OLS model, rather than to the robust influence of a certain variable on the IFC-1 value.

Similar evidence emerges when the focus is on IFC-2 as the dependent variable. Indeed, while most variables are statistically significant in OLS specifications (Table 5), most variables are no longer statis-

tically significant when a panel FE regression is run (Table 6). Nevertheless, the intensity of redistribution proxied by the IFC-2 index is positively associated with the size of the debt-to-GDP ratio and to the pre-non-pension transfer inequality and is, instead, negatively associated with the country median income, suggesting that the richer the individual in a country, the less intense the redistribution.

Table 3: Estimated association between IFC-1 and country characteristics, OLS specifications

	m0	m1	m2	m3	m4	m5
Share of population under 15	1.453***	1.361***	1.148***	0.604***	-0.378**	-0.281*
	0.165	*0.163*	*0.169*	*0.169*	*0.188*	*0.157*
Share of population over 65	0.875***	0.807***	0.477**	-0.223	-0.465**	-0.486***
	0.143	*0.157*	*0.192*	*0.184*	*0.180*	*0.147*
Unemployment rate		-0.148**	-0.295***	-0.468***	-0.263***	-0.237***
		0.067	*0.066*	*0.060*	*0.058*	*0.048*
GDP growth		-0.162**	-0.090	-0.103*	0.045	0.087*
		0.072	*0.065*	*0.058*	*0.061*	*0.049*
Ratio of public debt to GDP			0.060***	0.063***	0.034***	0.035***
			0.012	*0.011*	*0.009*	*0.009*
Public budget surplus			0.213**	0.243***	0.070	0.140**
			0.095	*0.078*	*0.067*	*0.065*
Pre-transfers Gini				0.577***	0.577***	0.306***
				0.059	*0.059*	*0.064*
Social protection spending					4.082***	13.932***
					0.642	*1.634*
Means-tested expenditure					0.538***	0.588***
					0.087	*0.081*
Median income						-12.316***
						1.712
Obs.	370	370	370	370	370	370

*Notes: Social protection spending is considered as log per capita spending in PPS. Means-tested expenditure is captured by the share of spending for means-tested transfers of total social protection spending. Median income is considered as log income in PPS. Standard errors in italics. Significance levels: *** P<0.01; ** P<0.05; * P<0.10.*

Source: elaborations on EU-SILC data.

Table 4: Estimated association between IFC-1 and country characteristics, country FE specifications

	m0	m1	m2	m3	m4	m5
Share of population under 15	-0.718	-0.645	-0.938**	-0.615	-0.704	-0.697
	0.498	*0.428*	*0.403*	*0.409*	*0.473*	*0.483*
Share of population over 65	0.070	0.115	-0.047	0.013	-0.031	-0.040
	0.450	*0.450*	*0.454*	*0.421*	*0.510*	*0.501*
Unemployment rate		0.317***	0.116	-0.067	-0.045	-0.065
		0.065	*0.089*	*0.106*	*0.146*	*0.184*
GDP growth		0.063*	0.047	0.036	0.051	0.056
		0.035	*0.029*	*0.025*	*0.061*	*0.052*
Ratio of public debt to GDP			0.081***	0.068***	0.071***	0.070***
			0.021	*0.019*	*0.022*	*0.024*
Public budget surplus			0.102	0.122	0.133	0.129
			0.099	*0.095*	*0.108*	*0.110*
Pre-transfers Gini				0.436***	0.438***	0.427***
				0.126	*0.127*	*0.110*
Social protection spending					2.324	3.745
					7.847	*5.901*
Means-tested expenditure					-0.012	-0.025
					0.167	*0.183*
Median income						-1.630
						5.520
Obs.	370	370	370	370	370	370

*Notes: Social protection spending is considered as log per capita spending in PPS. Means-tested expenditure is captured by the share of spending for means-tested transfers of total social protection spending. Median income is considered as log income in PPS. Standard errors in italics. Significance levels: *** P<0.01; ** P<0.05; * P<0.10.*

Source: elaborations on EU-SILC data.

Table 5: Estimated association between IFC-2 and country characteristics, OLS specifications

	m0	m1	m2	m3	m4	m5
Share of population under 15	2.926***	2.753***	2.405***	2.675***	0.715**	0.550**
	0.255	*0.255*	*0.264*	*0.323*	*0.321*	*0.265*
Share of population over 65	0.369*	0.213	-0.314	-0.126	-0.624**	-1.144***
	0.215	*0.237*	*0.295*	*0.313*	*0.265*	*0.206*
Unemployment rate		-0.205**	-0.464***	-0.386***	-0.047	-0.112
		0.094	*0.109*	*0.109*	*0.106*	*0.091*
GDP growth		-0.330***	-0.206**	-0.185*	0.072	0.139*
		0.106	*0.095*	*0.096*	*0.097*	*0.077*
Ratio of public debt to GDP			0.099***	0.091***	0.041**	0.043***
			0.018	*0.018*	*0.016*	*0.013*
Public budget surplus			0.291*	0.237	-0.031	0.090
			0.148	*0.154*	*0.129*	*0.108*
Pre-transfers Gini				-0.240**	-0.192**	-0.273***
				0.108	*0.092*	*0.093*
Social protection spending					6.642***	23.119***
					1.070	*2.281*
Means-tested expenditure					1.369***	1.430***
					0.109	*0.137*
Median income						-20.567***
						2.285
Obs.	370	370	370	370	370	370

*Notes: Social protection spending is considered as log per capita spending in PPS. Means-tested expenditure is captured by the share of the spending for means-tested transfers on total social protection spending. Median income is considered as log income in PPS. Standard errors in italics. Significance levels: *** P<0.01; ** P<0.05; * P<0.10.*

Source: elaborations on EU-SILC data.

Table 6: Estimated association between IFC-2 and country characteristics, country FE specifications

	m0	m1	m2	m3	m4	m5
Share of population under 15	-0.319	-0.162	-0.519	-0.549	-0.297	-0.160
	0.566	*0.417*	*0.463*	*0.538*	*0.465*	*0.486*
Share of population over 65	-0.600	-0.469	-0.657	-0.408	-0.294	-0.379
	0.734	*0.598*	*0.626*	*0.601*	*0.586*	*0.537*
Unemployment rate		0.671***	0.428***	0.329*	0.261	0.045
		0.075	*0.141*	*0.167*	*0.192*	*0.174*
GDP growth		0.086	0.069	0.061	0.017	0.055
		0.054	*0.048*	*0.046*	*0.049*	*0.059*
Ratio of public debt to GDP			0.096**	0.099**	0.091**	0.079**
			0.039	*0.042*	*0.039*	*0.037*
Public budget surplus			0.098	0.162*	0.146	0.110
			0.075	*0.090*	*0.104*	*0.091*
Pre-transfers Gini				0.492**	0.514**	0.484**
				0.211	*0.219*	*0.177*
Social protection spending					-6.196	7.268
					4.843	*7.662*
Means-tested expenditure					0.167	0.038
					0.295	*0.280*
Median income						-15.323**
						6.896
Obs.	370	370	370	370	370	370

*Notes: Social protection spending is considered as log per capita spending in PPS. Means-tested expenditure is captured by the share of the spending for means-tested transfers on total social protection spending. Median income is considered as log income in PPS. Standard errors in italics. Significance levels: *** P<0.01; ** P<0.05; * P<0.10.*

Source: elaborations on EU-SILC data.

CONCLUSIONS

The measurement of redistribution is a complex issue that deserves considerable methodological and policy attention. It is standard practice to measure government redistribution by comparing the values of specific inequality indices (typically the Gini coefficient) before and after taxes and transfers. This practice has severe theoretical limitations, in that it precludes understanding where the recipients of public transfers, or the taxpayers, lie along the income ladder and thus the extent to which the tax and benefit system is target-efficient.

This RN relied on the novel concept of compositional inequality, as well as on the IFC index recently developed in Ranaldi (2022). By adopting the IFC index, this RN provided new estimates of the intensity and effectiveness of redistribution in EU countries from 2006 to 2019, while also trying to distinguish – through various definitions of income sources – the role played by pensions from the role played by other cash transfers. It provided an overview of the advantages and disadvantages of existing indices of redistribution, including the benefits of the IFC index as an alternative measure of economic redistribution. Using the IFC index, and based on EU-SILC microdata, the RN then investigated trends in the effectiveness of redistribution in the EU-27 between 2006 and 2019. The income compositional inequality concept proved particularly fruitful in that it allowed for a simple comparison of roles of market incomes and cash transfers along the income distribution.

Measures of redistribution are often biased by the role of pensions, which represent more of a horizontal transfer across individuals' phases of life than a vertical transfer from the 'rich' to the 'poor'. To better disentangle the role of pensions, market incomes were considered both excluding and including pensions. Special attention was paid to investigating whether the effectiveness of redistribution changed across the EU-27 before and since the economic crisis. When focusing on the IFC-1 index (redistribution considering pensions as a transfer), the value was found to be quite high, ranging from 0.626 in Latvia to 0.857 in the Netherlands, suggesting that cash transfers tend to be received far more by those in the bottom of the market income distribution. The country rankings showed no clearcut geographical country clustering, nor any homogenous time pattern between 2006 and 2019. Interestingly, the country ranking that emerged when using the IFC-1 index was quite different to that related to the percentage reduction in the Gini coefficients from market to disposable index.

Including pensions among the transfers may create an overestimation of redistributive transfers, as it captures as a very redistributive transfer those pensions related to a previous successful working career, benefiting retired individuals with low market income. The analysis focused on the IFC-2 index, where pensions were considered a deferred source of market income rather than a redistributive transfer. This index was considered a more reliable indicator of inter-individual redistribution. Given the strict link between individuals' labour market outcomes when active, and pension benefits when retired, in most EU countries, pensions may largely represent an intra-individual rather than an inter-individual redistribution. As expected, the IFC-2 value reduced compared to the IFC-1, and no single time pattern in 2006-2019 emerged. A much clearer geographical country clustering was evident when

pensions were considered a market income. Most Eastern European and Southern countries were characterised by IFC-2 values lower than the EU mean, while the intensity of redistribution captured by the IFC-2 index was relatively higher in Central and Northern European countries and Ireland.

As a further robustness check in respect of the influence of pension benefits on redistribution, the IFC-NMTP included only means-tested (contributory and non-contributory) pension benefits in the transfers. The value of that index rose in most countries when the types of pensions were distinguished, suggesting that means-tested pensions exert a non-negligible redistributive effect in countries where these types of pensions are provided. Further analyses distinguished non-contributory and means-tested other income support benefits and disposable benefits net of these benefits found that, on average, non-contributory and means-tested other income support benefits we highly redistributive, with high heterogeneity across the EU.

The RN povided an innovative database on redistribution intensity in EU countries, which may prove useful in policy-making, to assess drivers of past trends or to measure redistributive effects of planned new measures.

Focusing on redistribution – and looking for innovative tools to more properly measure its intensity – is increasingly relevant. The COVID-19 crisis highlighted the importance of redistribution policies to cushion rising market income inequality in EU countries (Christl et al., 2021). Nevertheless, the economic literature continues to lack the robust redistribution indices necessary to monitor the effectiveness of redistribution policies across countries and over time, i.e. properly measuring, with synthetic indicators, the population groups benefiting more from social protection measures. Using suitable indices of redistribution is crucial if lessons are to be learned from the policy experiences of the economic crisis and the COVID-19 pandemic.

REFERENCES

Barr, N. and Diamond, P. (2008). *Reforming pensions: Principles and policy choices*. Oxford: Oxford University Press.

Canberra Group (2011). *Handbook on Household Income Statistics*. Geneva: United Nations.

Christl, M., De Poli, S., Figari, F., Hufkens, T., Leventi, C., Papini, A. and Tumino, A. (2021). *The cushioning effect of fiscal policy in the EU during the COVID-19 pandemic*. European Commission Joint Research Centre (JRC) Technical Report. Luxembourg: Publications Office of the European Union.

Dekkers, G., Buslei, H., Cozzolino, M., Desmet, R., Geyer, J., Hofmann, D., Raitano, M., Steiner, V., Tanda, P., Tedeschi, S. and Verschueren, F. (2010). 'The flip side of the coin: the consequences of the European budgetary projections on the adequacy of social security pensions'. *European Journal of Social Security*, 12(2), 94-120.

Esping Andersen, G. and Myles, J. (2009). 'Economic inequality and the welfare state'. In Salverda, W., Nolan, B. and Smeeding, T. (Eds.). *The Oxford Handbook of Economic Inequality.* Oxford: Oxford University Press.

Figari, F., Matsaganis, E. and Sutherland, H. (2013). 'Are European social safety nets tight enough? Coverage and adequacy of Minimum Income schemes in 14 EU countries'. *International Journal of Social Welfare*, 22(1), 3-14.

Foster, J.E. and Shorrocks, A.F. (1987). 'Transfer-sensitive inequality measures'. *Review of Economic Studies,* 54, 485-498.

Franzini, M. (2018). 'Redistribuire non basta: perché e come intervenire sulle diseguaglianze di mercato'. In Franzini, M. and Raitano, M. (Eds.). *Il mercato rende diseguali? La distribuzione dei redditi in Italia*. Bologna: Il Mulino.

Hacker, J.S. (2011). *The institutional foundation of middle-class democracy*. London: Policy Network.

Iacono, R. and Ranaldi, M. (2022). 'The evolution of income composition inequality in Italy, 1989-2016. *Review of Income and Wealth*, online first.

Jenkins, S., Brandolini, A., Micklewright, J. and Nolan, B. (Eds.) (2012). *The Great Recession and the Distribution of Household Income.* Oxford: Oxford University Press.

Kakwani, N.C. (1977). 'Measurement of tax progressivity: an international comparison'. *The Economic Journal*, 87(345), 71-80.

Lerman, R.I. and Yitzhaki, S. (1985). 'Income inequality effects by income source: a new approach and applications to the United States'. *Review of Economics and Statistics*, 67(1), 151-156.

Organisation for Economic Co-operation and Development (2011). *Divided we stand: why inequality keeps rising*. Paris: OECD Publications.

Raitano, M. (2019). 'Trends and structural determinants of income inequality: an overview'. In European Commission (Eds.). *Addressing Inequalities: A Seminar of Workshops*. Luxembourg: Publications Office of the European Union.

Raitano, M. (2022). *The influence of housing and equivalence scales on inequality, poverty and on individuals' ranking in the income distribution*. Social Situation Monitor. Research Note. Luxembourg: Publications Office of the European Union.

Raitano, M., Gallo, G., Jessoula, M. and Pagnini, C. (2021). *Fighting poverty and social exclusion, including through minimum income schemes*. European Parliament. Luxembourg: Publications Office of the European Union.

Ranaldi, M. (2022). 'Income composition inequality'. *Review of Income and Wealth*, 68(1), 139-160.

Ranaldi, M. and Milanovic, B. (2022). 'Capitalist systems and income inequality'. *Journal of Comparative Economics*, 50(1), 20-32.

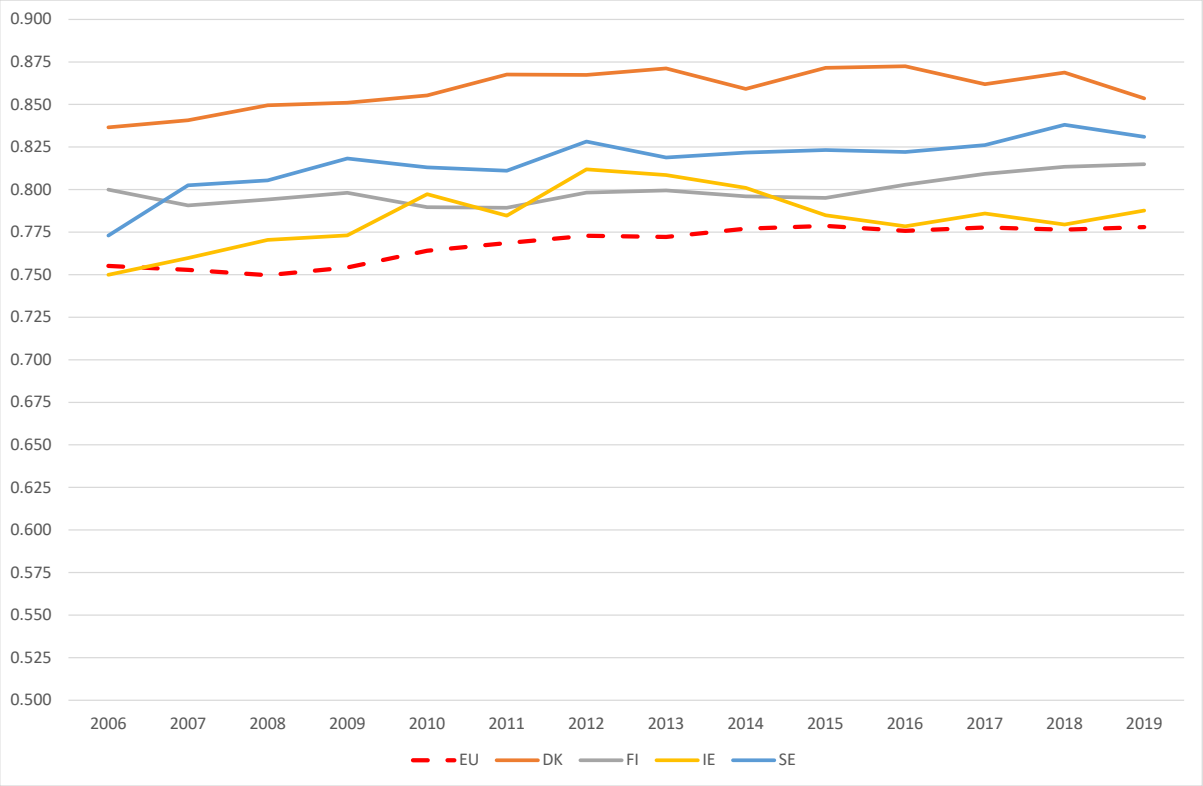
Simons, H.C. (1938). *Personal income taxation.* Chicago: Chicago University Press.

Villar, A. (2017). *Lectures on inequality, poverty and welfare*. New York: Springer.

APPENDIX

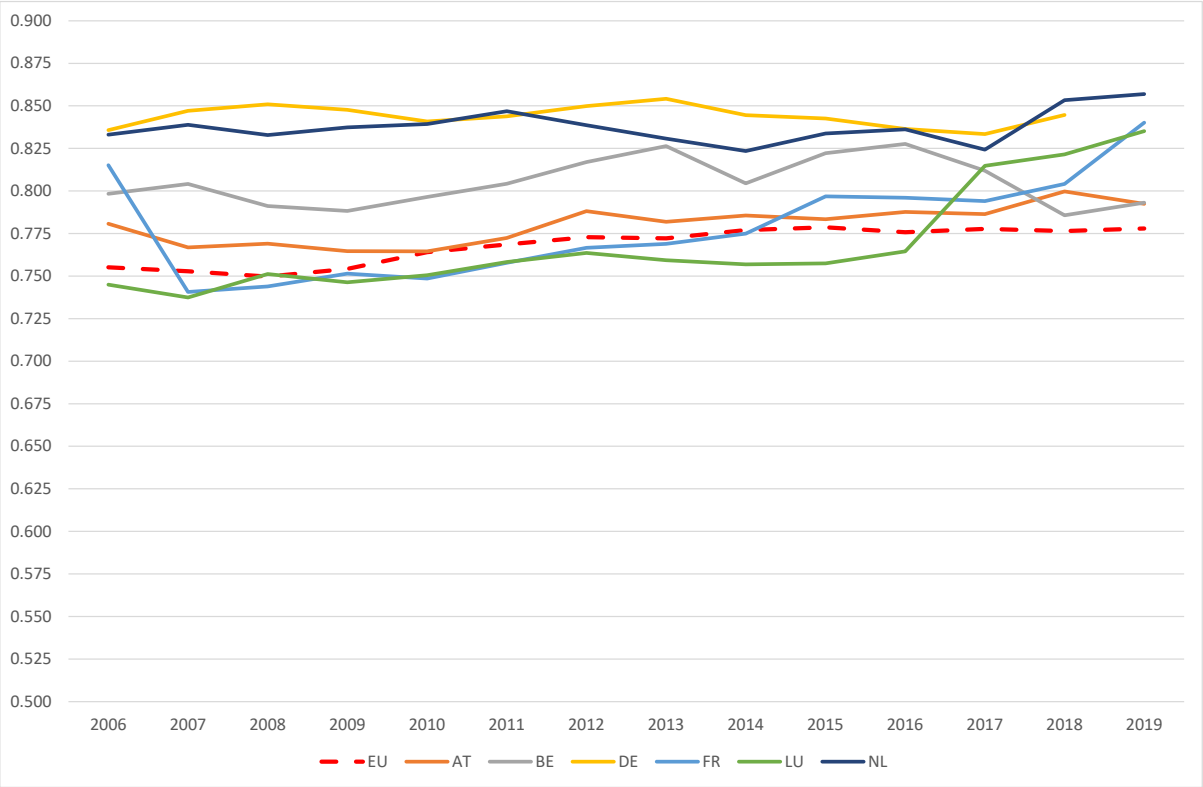
APPENDIX A1. TREND OF IFC-1 IN 2006-2019

Figure A1.A IFC-1 trend in Northern European countries, 2006-2019



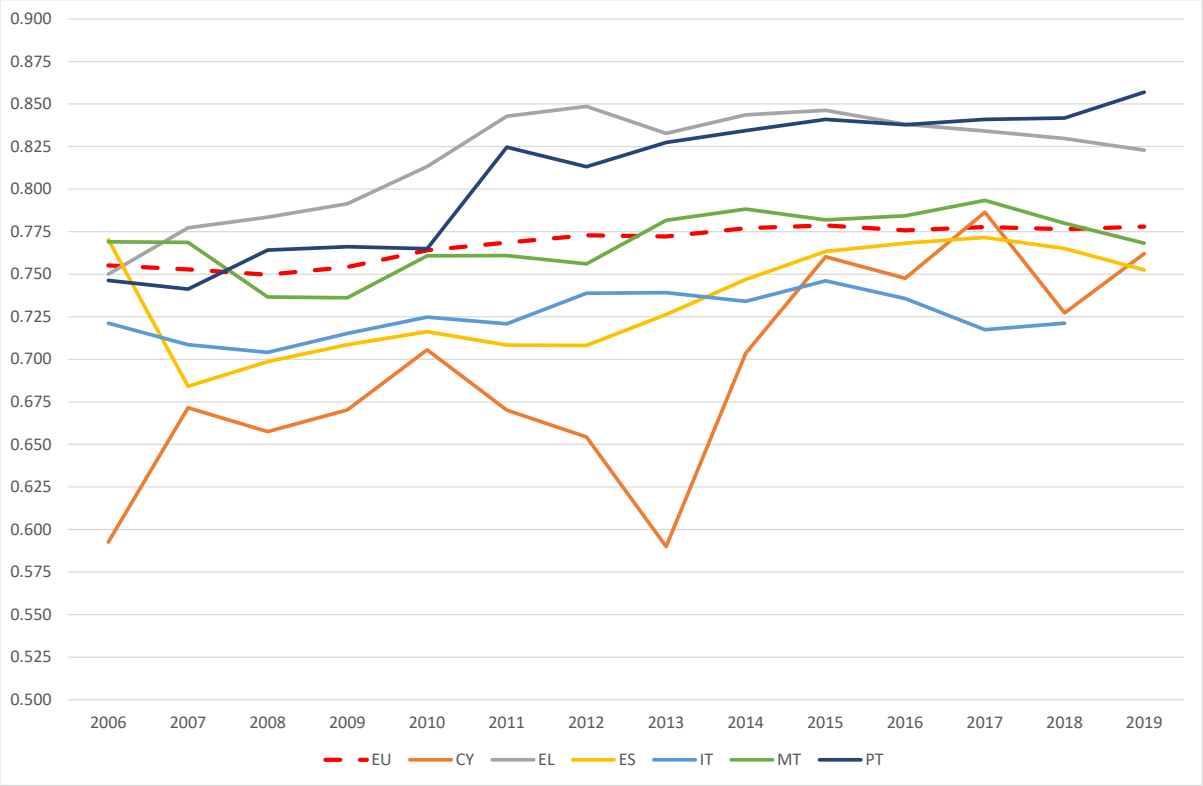
Source: elaborations on EU-SILC data.

Figure A1.B IFC-1 trend in Central European countries, 2006-2019



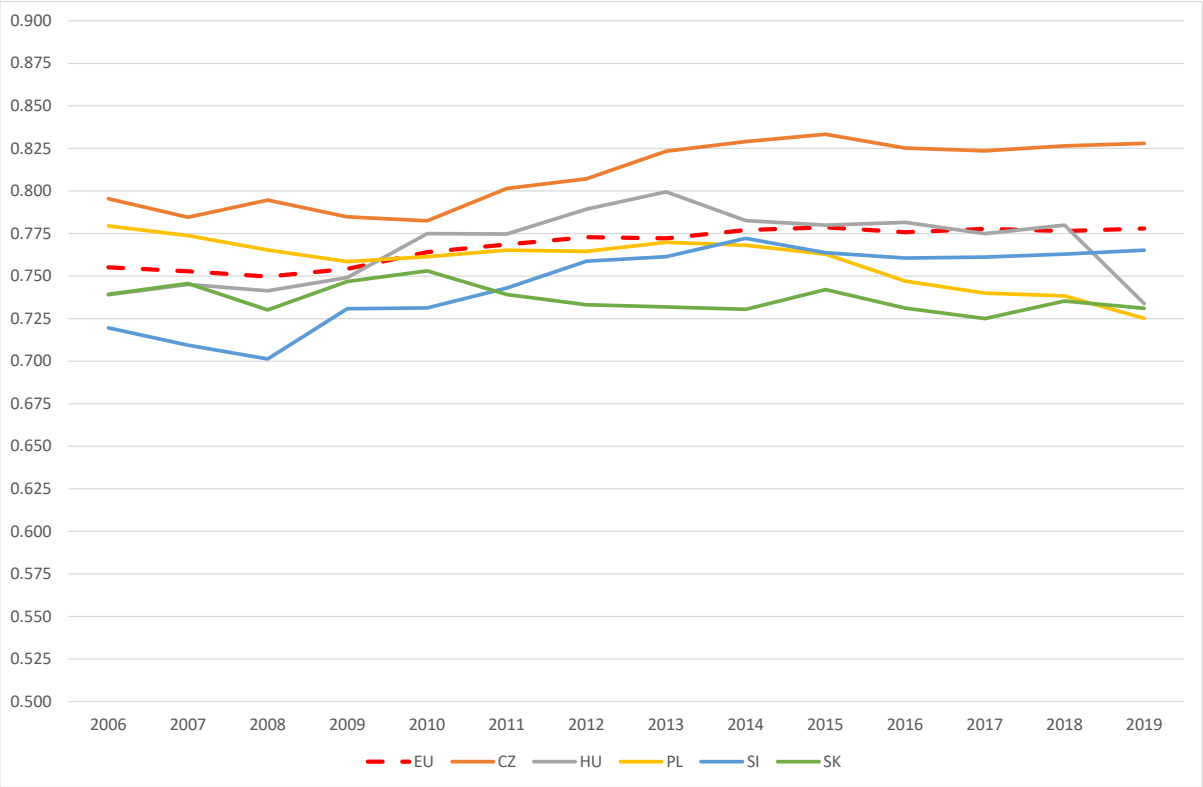
Source: elaborations on EU-SILC data.

Figure A1.C IFC-1 trend in Southern European countries, 2006-2019



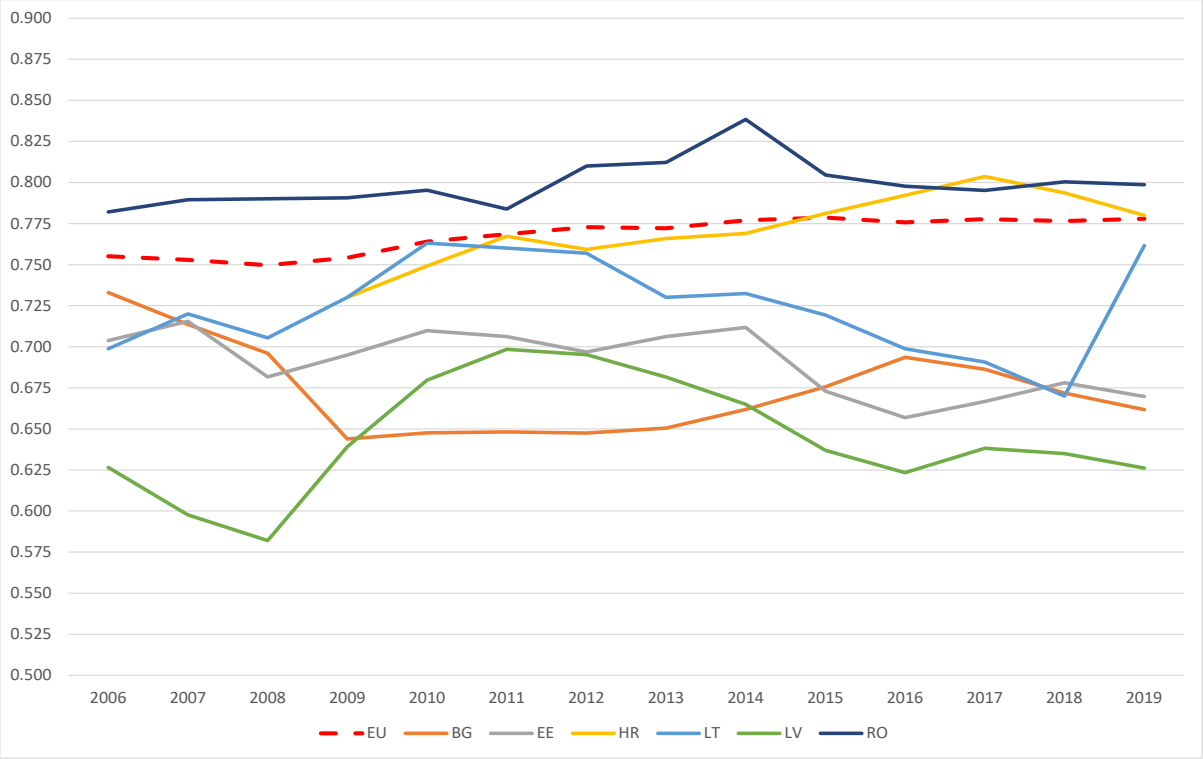
Source: elaborations on EU-SILC data.

Figure A1.D IFC-1 trend in Eastern European countries, 2006-2019



Source: elaborations on EU-SILC data.

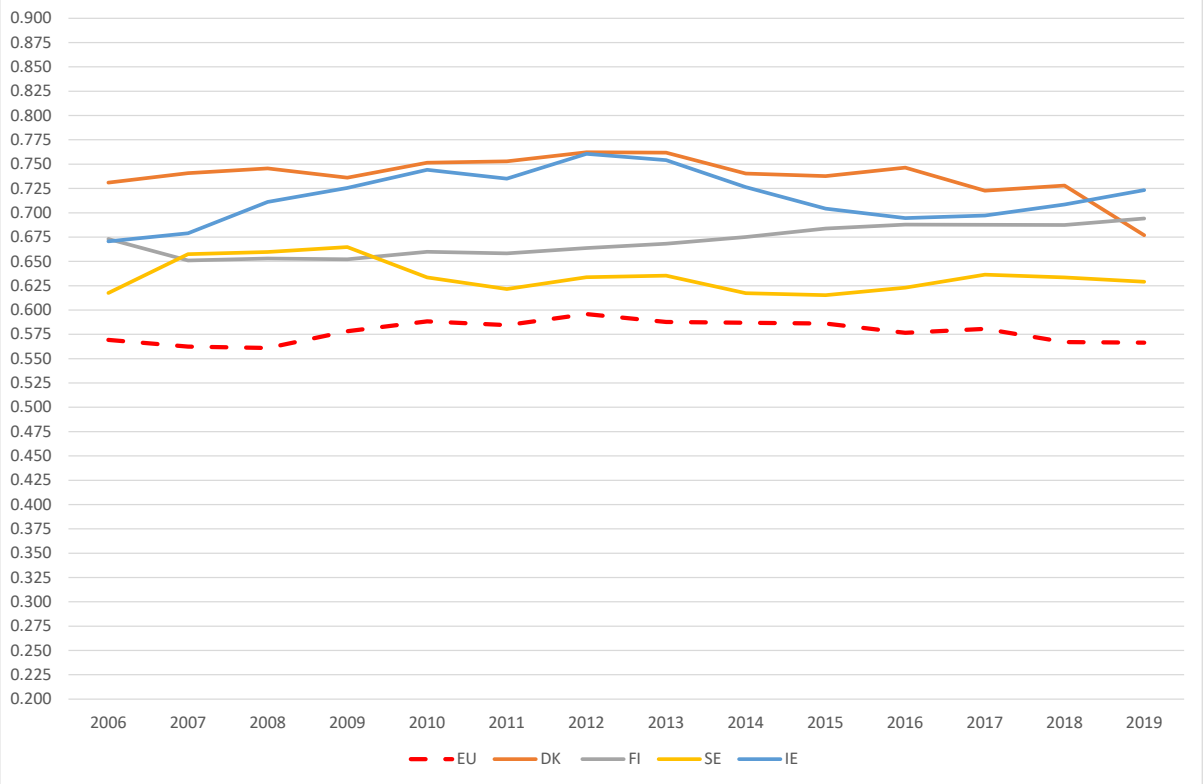
Figure A1.E IFC-1 trend in Baltic countries and post-2005 accession countries, 2006-2019



Source: elaborations on EU-SILC data.

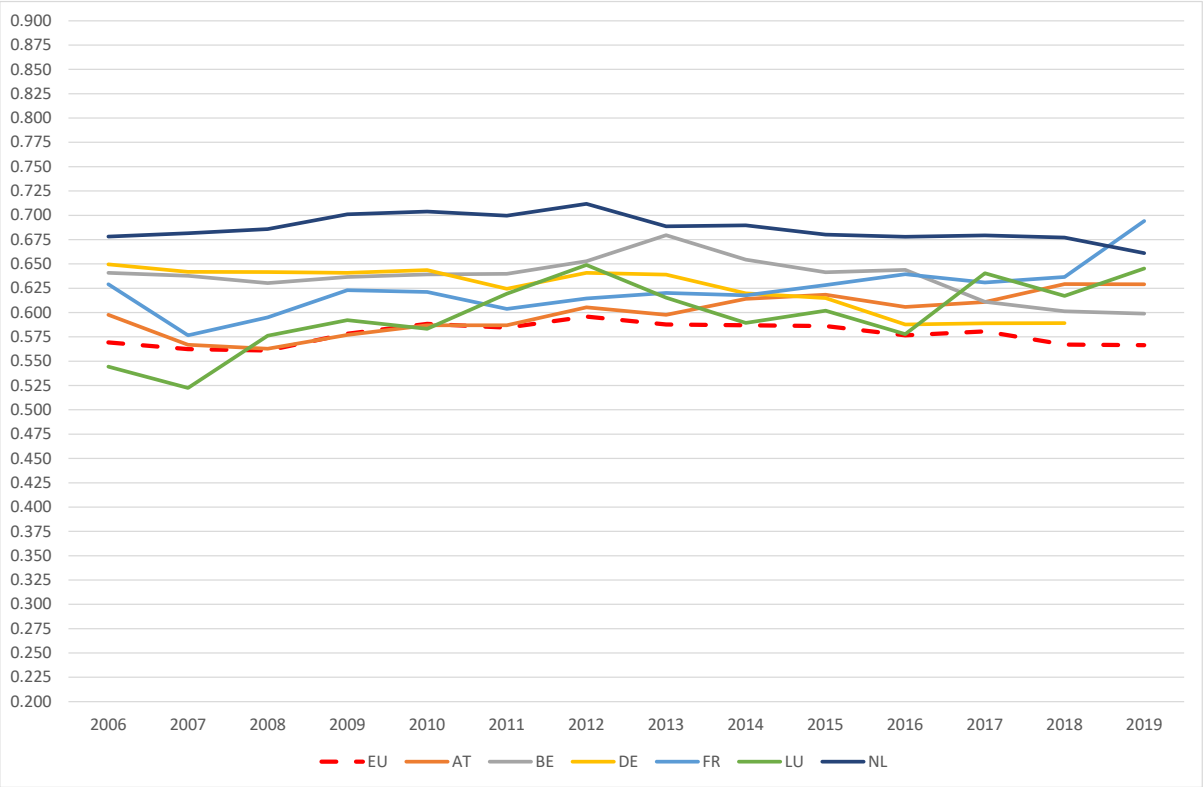
APPENDIX A2. TREND OF IFC-2 IN 2006-2019

Figure A2.A IFC-2 trend in Northern European countries, 2006-2019



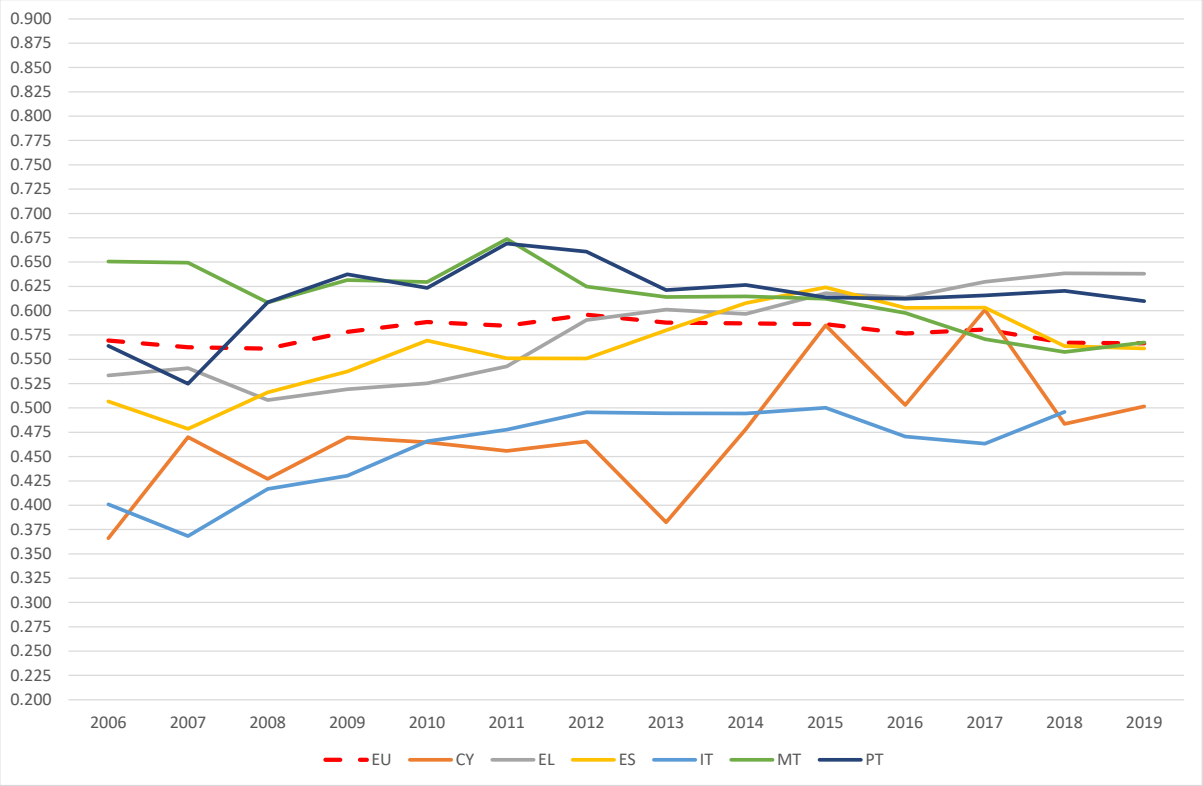
Source: elaborations on EU-SILC data.

Figure A2.B IFC-2 trend in Central European countries, 2006-2019



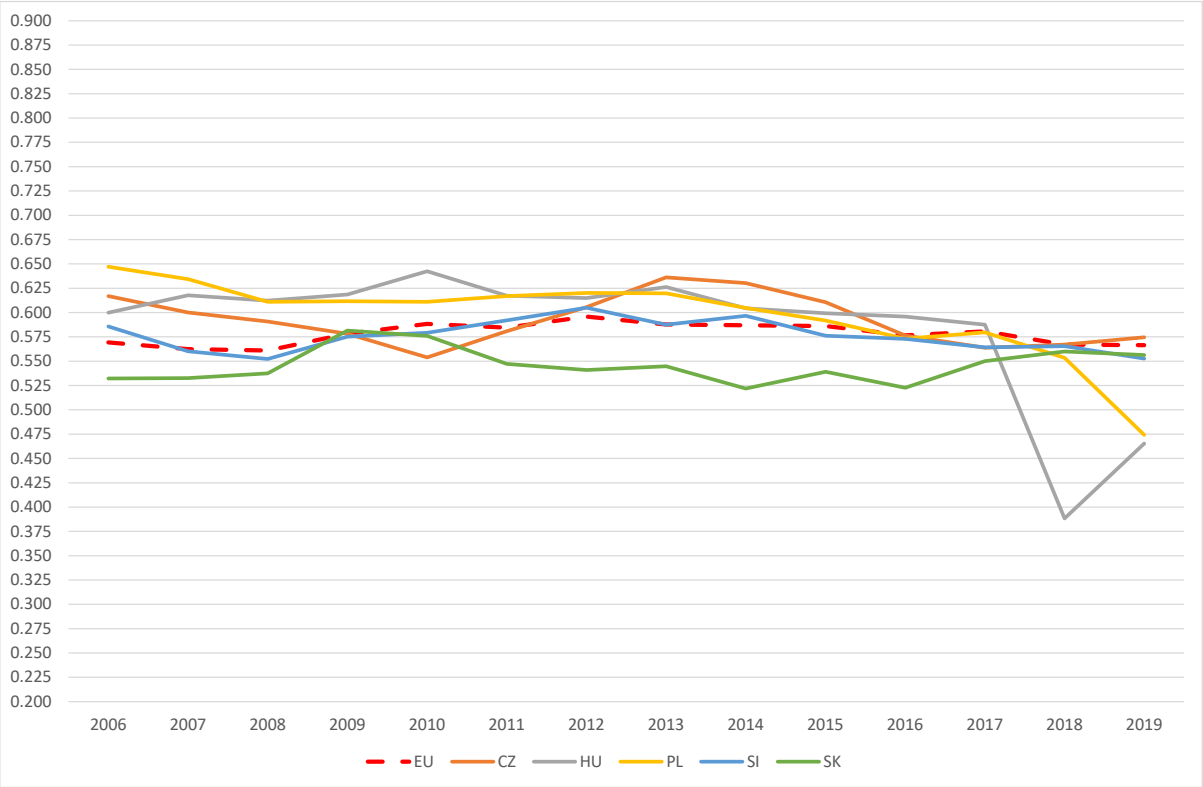
Source: elaborations on EU-SILC data.

Figure A2.C IFC-2 trend in Southern European countries, 2006-2019



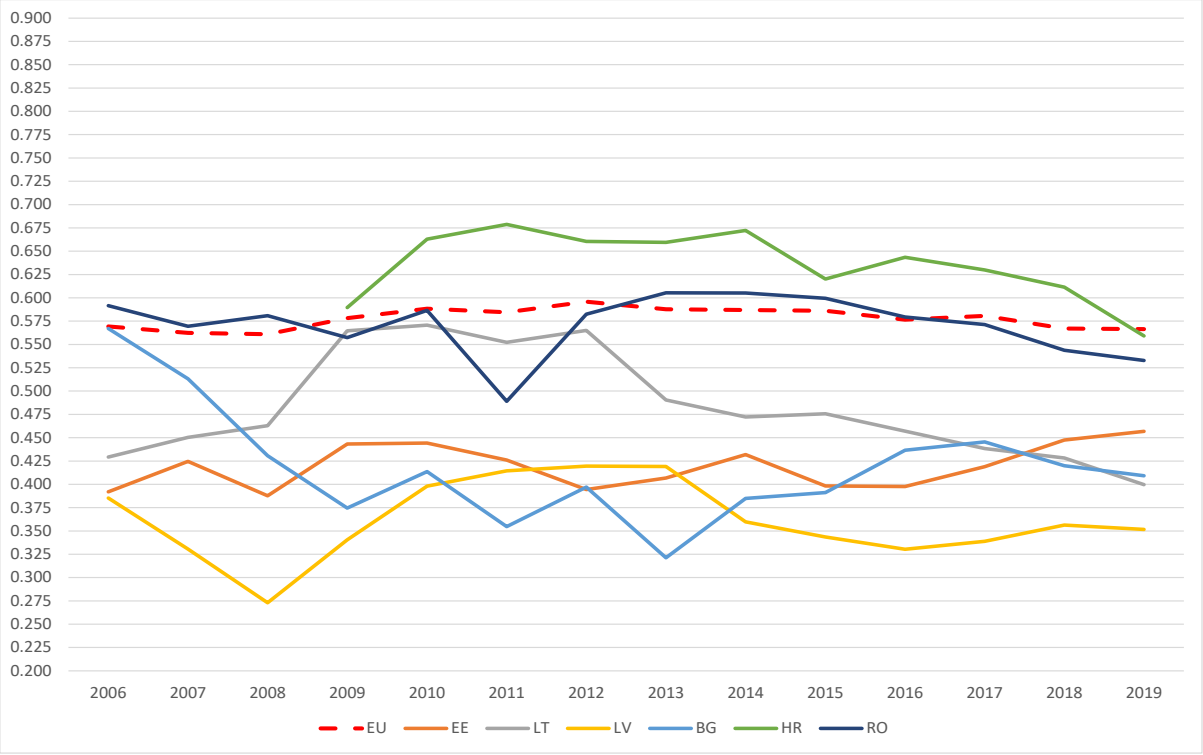
Source: elaborations on EU-SILC data.

Figure A2.D IFC-2 trend in Eastern European countries, 2006-2019



Source: elaborations on EU-SILC data.

Figure A2.E IFC-2 trend in Baltic countries and post-2005 accession countries, 2006-2019



Source: elaborations on EU-SILC data.

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

– by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

– at the following standard number: +32 22999696 or

– by email via: https://europa.eu/european-union/contact_en

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

EU publications

You can download or order free and priced EU publications at: https://publications.europa.eu/en/publications. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/european-union/contact_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1952 in all the official language versions, go to EUR-Lex at: http://eur-lex.europa.eu

Open data from the EU

The EU Open Data Portal (http://data.europa.eu/euodp/en) provides access to datasets from the EU. Data can be downloaded and reused for free, for both commercial and non-commercial purposes.

Publications Office
of the European Union