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# An extended view on inequality and redistribution in the European Union - The role of indirect taxation and in-kind benefits

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## Abstract

This paper refines the concept of disposable income by incorporating government-provided in-kind benefits for education and health services, as well as imputed VAT payments, following Figari and Paulus (2015). Our analysis reveals that including these elements significantly reduces income inequality, as seen in a decrease in the Gini coefficient across all examined countries. While direct taxes and cash benefits are the main drivers of redistribution, in-kind benefits also play a substantial role, while VAT having a smaller, negative impact. Our study highlights that additionally extending the income concept increases also the targeting of the tax benefit system to low-income households, however to a very different extend across the EU Member States. Our new, broader approach allows for more accurate assessments of redistribution and cross-country comparisons, offering valuable insights for EU-level policy evaluations.

***JEL classification:*** H23, I38, H24, D31

***Keywords:*** tax-benefits model, EUROMOD, welfare state, in-kind benefits, indirect taxes, redistribution

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## 1. Introduction

Most of the existing research on income redistribution only examines direct taxes and cash transfers. However, at the EU level, there is a high degree of heterogeneity across countries in the level of cash benefits vs. in-kind benefits and direct taxes vs. indirect taxes. As shown in the literature, both in-kind benefits (André et al., 2023; Aaberge et al., 2023; Paulus et al., 2010; Verbist and Grabka, 2017) as well as indirect taxes (Maier and Ricci, 2023; Blasco et al., 2023) lead to a very different assessment of inequality and redistribution. Therefore, in order to get a comprehensive view of the different levels of redistribution across countries, it is important to consider indirect taxes as well as in-kind transfers.

In this paper, we use data from Christl and Köppl-Turyna (2024) to go beyond the standard concept of disposable income, which is defined as income after (direct) taxes and benefits. These data use EU-SILC as the base dataset and include in-kind benefits provided by the government for education and health services to the population. In addition, VAT is imputed by using the Household Budget Survey (HBS) to estimate households' effective VAT tax rates. This micro-data set allows us to get a clearer picture of government redistribution, leading to a more accurate estimate of redistribution within a country as well as to more comprehensive comparisons across countries. Our work is strongly related to the work of Figari and Paulus (2015), who investigate how the distribution of income changes when the standard disposable income (DI) is replaced by an extended income (EI) concept that includes indirect taxes, imputed rent, and in-kind benefits. They analyze data from 2003/2004 in three European countries: Belgium, Greece, and the United Kingdom and show that the overall redistributive effect of the tax-benefit

systems depends heavily on the income concept considered, and the differences across countries are smaller when considering the extended income concept. The study also finds that the inclusion of non-cash incomes, such as imputed rent and in-kind benefits, reduces income inequality, particularly at the bottom of the distribution.

In a first step, we extend the traditional income concept to include these two government interventions (extended income). We then analyze the impact of this extension on standard measures of inequality and redistribution. Compared to Figari and Paulus (2015) or Christl et al. (2020), we do not only update the analysis to 2023, but also extend the analysis to 25 EU Member States in our analysis, which allows us to compare countries across the EU.

We show that including both elements of the tax-benefit system significantly reduces income inequality, with the Gini coefficient decreasing in all countries when VAT and in-kind benefits are included. Our analysis highlights that direct taxes and benefits play the most important role in redistribution, but that in-kind transfers also have a significant impact. The effect of VAT is negative but relatively small compared to in-kind transfers, direct taxes and cash transfers.

In terms of targeted redistribution, our analysis shows that the net benefit ratio (Q1-NBR), i.e. the net benefits received by low-income households as a share of total disposable income, is significantly higher in Luxembourg, Spain and Hungary, and in general that extending the income concept increases targeting in all countries. Additionally, also the net benefit share (Q1-NBS), i.e. the share of net benefits received by the bottom quintile of income redistribution as a percentage of total net benefits, is also higher when VAT and in-kind benefits are taken into account, indicating that in-kind benefits for health and education increase the

targeting of the tax-benefit system towards low-income households.

Our paper sheds light on a very important aspect from a policy perspective. At the EU level, policy proposals are often based on common standard indicators, such as the Gini coefficient, the redistributive effect and the at-risk-of-poverty rate, which are based on the concept of disposable income. In this paper, we extend the concept of disposable income by adding in-kind transfers received by households and VAT paid. This allows for a more accurate assessment of redistribution within a country as well as a more accurate comparison between countries.

The structure of the paper is as follows Section 2 describes our methodology and the data used for the analysis. Section 3 presents the results of our analysis of the impact of indirect taxes and in-kind benefits on inequality (subsection 3.1), redistribution (subsection 3.2), and targeted redistribution (subsection 3.3). The section 4 then concludes.

## **2. Methodology**

In this paper we provide a comparative approach to compare the redistributive dimension of the tax-benefit system across EU Member States. We use the data of Christl and Köppl-Turyna (2024), which combines three sets of information. The main part is based on EUROMOD, the tax-benefit microsimulation model for the European Union<sup>1</sup>. EUROMOD uses the EU-SILC datasets, which are representative of the household population in each EU Member State. We focus on the post COVID-19 period, i.e. the tax-benefit systems in place in 2022. EUROMOD allows us to simulate all direct taxes and cash benefits paid and received by house-

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<sup>1</sup>For more details see Sutherland and Figari (2013) and Sutherland (2007).

holds in 2022. The dataset also includes two of the most important transfers in kind, namely those related to health care and education. In addition, VAT on household consumption is imputed using information from the Household Budget Survey (HBS). More details on the imputation of in-kind transfers and VAT can be found in Christl and Köppl-Turyna (2024).

### 2.1. Extending the income concept

Building on the work of Figari and Paulus (2015) and Christl and Köppl-Turyna (2024), we propose a new extended income (EI) concept that includes indirect taxes and in-kind benefits, replacing the conventional measure of disposable income. This EI concept builds on disposable income by incorporating in-kind benefits and accounting for indirect taxes. Specifically, we take the original household income  $h$  ( $Y_h^{orig}$ ), subtract direct taxes (social security contributions ( $SSCh$ ) and income taxes ( $TIN_h$ )) and indirect taxes ( $VAT_h$ ), and add all cash benefits received (unemployment benefits ( $BUN_h$ ), pension benefits ( $BPEN_h$ ) and other benefits ( $BOTH_h$ )) as well as benefits in kind ( $BINK_h$ ). The equations below illustrate the distinction between these approaches.

- **Disposable income of household  $h$ :**

$$DI_h = Y_h^{orig} - (SSCh + TIN_h) + (BUN_h + BPEN_h + BOTH_h)$$

- **Extended income of household  $h$ :**

$$EI_h = Y_h^{orig} - (SSCh + TIN_h + VAT_h) + \\ + (BUN_h + BPEN_h + BOTH_h + BINK_h)$$

We can define the net fiscal contribution (NFC) for a household  $h$  as the difference between taxes paid and transfers received, according to both income concepts. Using the standard concept (DI), the net fiscal contribution ( $NFC_h^{DI}$ ) is defined as follows:

$$NFC_h^{DI} = (SSC_h + TIN_h) - (BUN_h + BPEN_h + BOTH_h)$$

Second, we define the net fiscal contribution (NFC) for a household  $h$  using the extended income concept (EI) ( $NFC_h^{EI}$ ) as:

$$NFC_h^{EI} = (SSC_h + TIN_h + VAT_h) - (BUN_h + BPEN_h + BOTH_h + BINK_h)$$

## 2.2. *Measuring Inequality and Redistribution*

Several measures can be used to measure inequality. Given its common use in policy, we measure income inequality using the Gini coefficient. The Gini coefficient is a measure of the statistical dispersion of a variable (such as income) that is intended to represent inequality within a country. The Gini coefficient ranges from 0 to 1, where 0 corresponds to perfect equality (everyone has the same income) and 1 corresponds to perfect inequality (one person has all the income and everyone else has none).

To measure redistribution, we are interested in the effect of government policies on the distribution of income among the population. Specifically, we want to measure how a particular policy reduces income inequality. Therefore, we use the Redistributive Effect (RE), which compares the Gini coefficient of pre-policy and post-policy incomes, allowing us to quantify the reduction in inequality due to

(redistributive) policies.

### 2.3. Measuring Targeted Redistribution

As argued and empirically shown by Hammer et al. (2023), the Redistributive Effect (RE) is strongly correlated with redistribution across age groups and with the generosity of the pension system, especially to richer households in European countries.

We therefore compute two measures of redistribution that more accurately capture redistribution to low-income households. We follow (Hammer et al., 2023) and Christl et al. (2024) who introduce two micro-data indicators to measure targeted redistribution. Hammer et al. (2023) introduces the *net benefit ratio* (*NBR*), which is defined as the total net benefits targeted to a given subpopulation  $Q_x$  (i.e. individuals belonging to quintile  $x$ ) relative to total disposable income ( $DI = \sum di$ ).

$$Q_x - NBR(DI) = \frac{\sum_{\forall i \in Q_x \ \& \ NFC_i^{DI} \geq 0} NFC_i^{DI}}{DI}, \quad (1)$$

We extend this concept also to the Extended Income concept:

$$Q_x - NBR(EI) = \frac{\sum_{\forall i \in Q_x \ \& \ NFC_i^{EI} \geq 0} NFC_i^{EI}}{EI}, \quad (2)$$

A major advantage of NBRs is that they can be defined for the whole population as well as for any subpopulation of interest. We are interested in distinguishing between retirees and the working-age population, as well as by income. Consequently, we define NBRs to capture total redistribution and each of these groups: The NBR measures the net benefits of all households relative to their disposable



income.

In addition, we also follow the approach of Christl et al. (2024), who introduces the *Net Benefit Shares (NBS)*, which measures the total net benefits targeted to a particular subpopulation relative to the total net benefits in the economy. Net benefits are defined as the sum of all benefits received by a household minus all taxes paid by a household. By measuring net benefits to specific subpopulations relative to total net benefits, the NBS can be interpreted as the share of effective redistribution to the specific subgroup, in our case low-income (and high-income) households.

We are specifically interested in the subpopulation of low-income and high-income households, so we look at households in the lowest quintile of the income distribution ( $Q1 - NBS$ ) as well as those in the highest quintile ( $Q5 - NBS$ ).

$$Q_x - NBS^{DI} = \frac{\sum_{\forall i \in Q_x \ \& \ NFC_i^{DI} \geq 0} NFC_i^{DI}}{\sum_{\forall j \in N \ \& \ NFC_j^{DI} \geq 0} NFC_j^{DI}} \quad (3)$$

We extend this concept also to the Extended Income concept:

$$Q_x - NBS^{EI} = \frac{\sum_{\forall i \in Q_x \ \& \ NFC_i^{EI} \geq 0} NFC_i^{EI}}{\sum_{\forall j \in N \ \& \ NFC^{(EI)}_j \geq 0} NFC_j^{EI}} \quad (4)$$

With  $N$  we refer to the total size of the population, with  $Q_x$  to the number of individuals in Quintile  $x$  receiving net benefits ( $b_j \geq t_j$ ).

### 3. Results

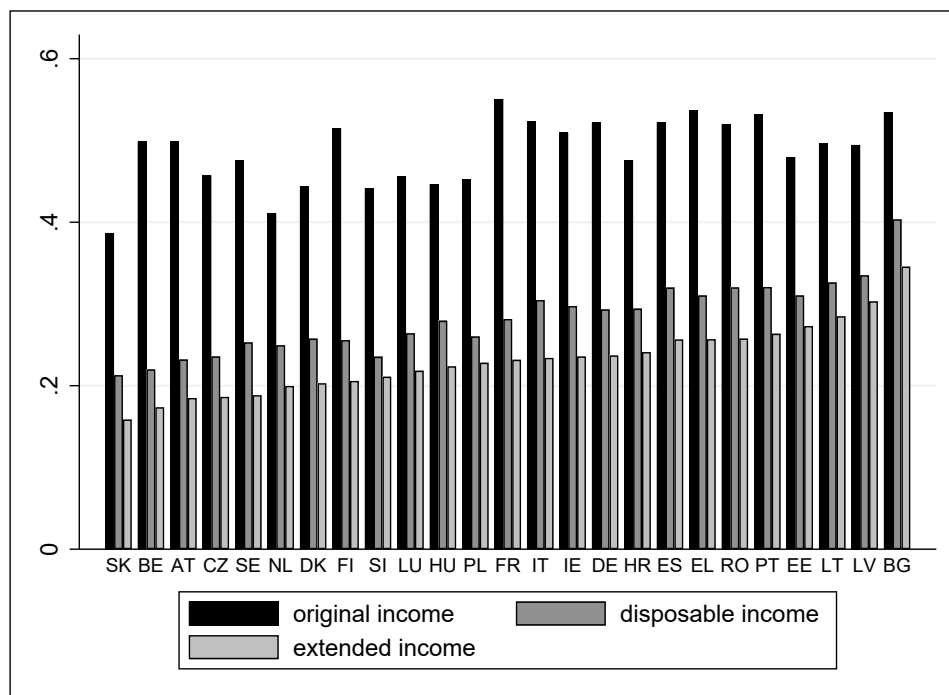
#### 3.1. Inequality

We begin by analyzing inequality using the Gini coefficient on three income concepts (see Figure 1). Pre-tax inequality (i.e. the Gini of initial income) is

above 0.4 in almost all countries. When direct taxes and cash transfers are taken into account, income inequality in terms of disposable income (DI), as measured by the Gini coefficient, decreases significantly, but with a high variability across countries, ranging from 0.40 in Bulgaria to 0.21 in Slovakia.

If we also include VAT and in-kind health and education services in income inequality (extended income), we see that the Gini coefficients decrease in all countries. Again, there is a high degree of heterogeneity across countries. The impact is particularly strong in countries such as Sweden, Ireland and Spain, while it is small in countries such as Austria, Slovenia, Poland and Estonia. More importantly, we see a significant re-ranking of EU countries when comparing inequality in the extended income concept, suggesting that a comparison of disposable incomes may only partially reflect inequalities after government intervention.

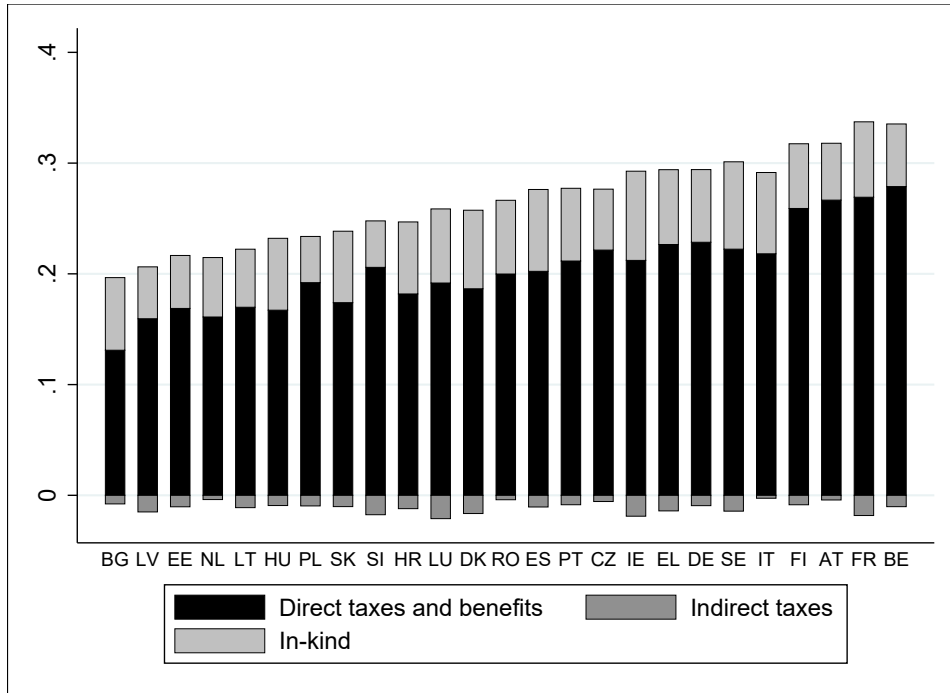
Figure 1: Gini coefficient



### 3.2. Redistribution

To assess the redistribution of the different measures, we calculate the redistributive effect of each policy intervention. As highlighted in Figure 2, the overall redistribution is highest in Belgium, France and Austria, while it is lowest in Bulgaria, Latvia and Estonia. Looking at the components, direct taxes and benefits play the most important role in redistribution in all countries. Nevertheless, the impact of transfers in kind is significant, ranging from around 0.08 in Ireland or Sweden to 0.04 in Slovenia and Poland.

Figure 2: Redistribution of direct (taxes and cash benefits), indirect taxes and in-kind benefits

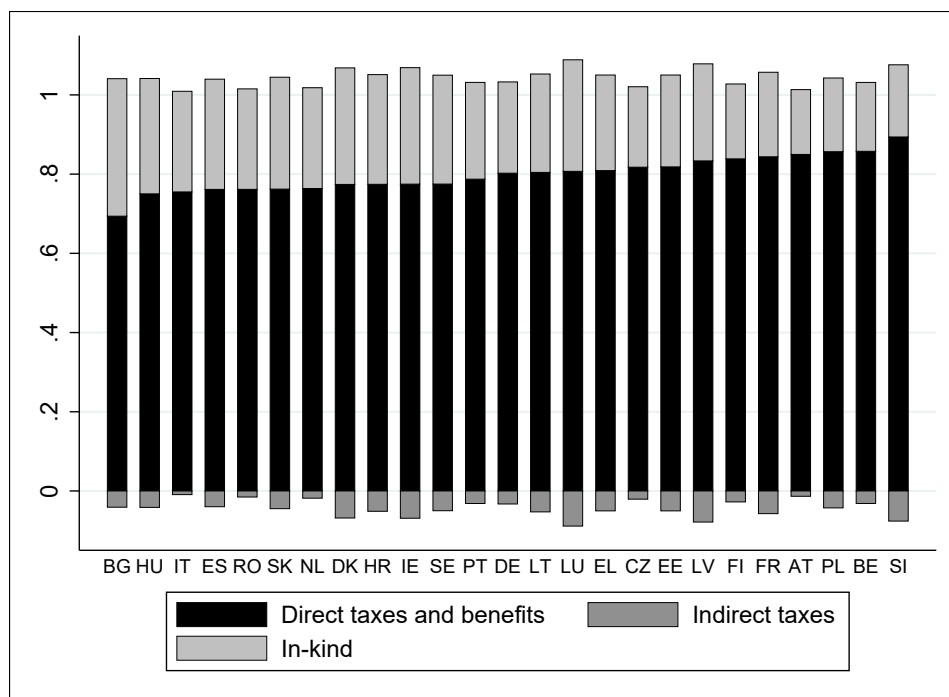


On the contrary, the effect of VAT is negative, indicating that low-income households pay relatively more taxes than high-income households. This progressive effect, which is well known in the literature (Maier and Ricci, 2023), leads to an increase in the Gini coefficient (negative redistributive effect) of about -0.02 in

countries such as Luxembourg, France or Ireland, while the effect is much smaller in countries such as Italy or the Netherlands (above -0.005).

Figure 3 highlights each redistributive measure as a share of total redistribution. In countries such as Austria, Poland, Belgium and Slovenia, most of the redistribution (over 80%) is derived from the standard tax-benefit system (direct taxes and benefits), while in countries such as Bulgaria, Hungary, Italy and Spain, more than 20% of the redistribution is derived from in-kind benefits. The overall share of VAT is negative but relatively small compared to transfers in kind and direct taxes and cash benefits.

Figure 3: Redistribution of direct (taxes and cash benefits), indirect taxes and in-kind benefits as share of total redistribution



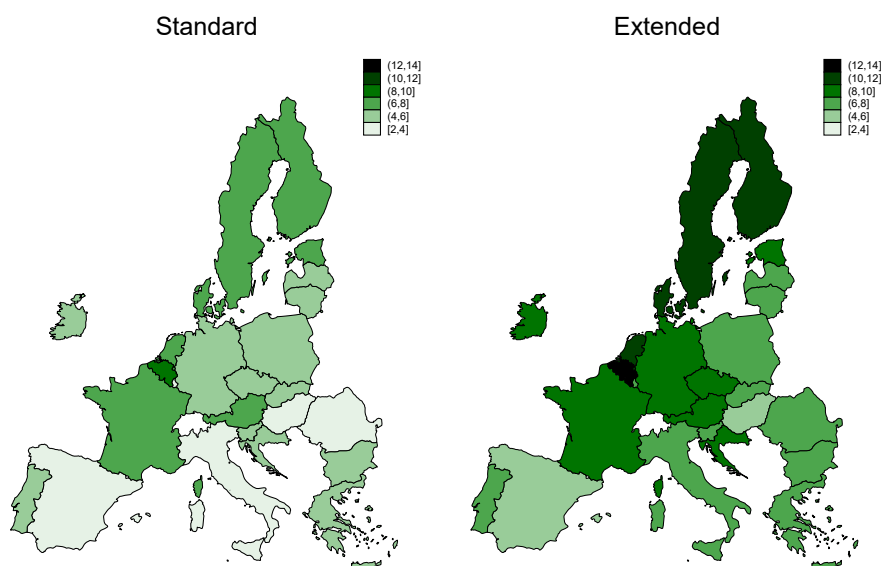
### 3.3. Targeted redistribution

As mentioned above, Hammer et al. (2023) shows that the Redistributive Effect (RE) is strongly correlated with redistribution across age groups and with the

generosity of the pension system. We therefore look first at the net benefit ratio received by both low-income (Q1-NBR) and high-income (Q5-NBR) households. This measure takes into account the net benefits received by the bottom 20% of the income distribution as a percentage of disposable (or extended) income in a country. More intuitively, this measure allows for a comparison of targeted (net) redistribution to low-income countries across countries.

Figure 4 shows that targeted redistribution to poor households, measured as Q1-NBR, is substantially higher in the Nordic countries, the BENELUX and Austria than in other countries.

Figure 4: Q1-NBR according to standard and extended concept

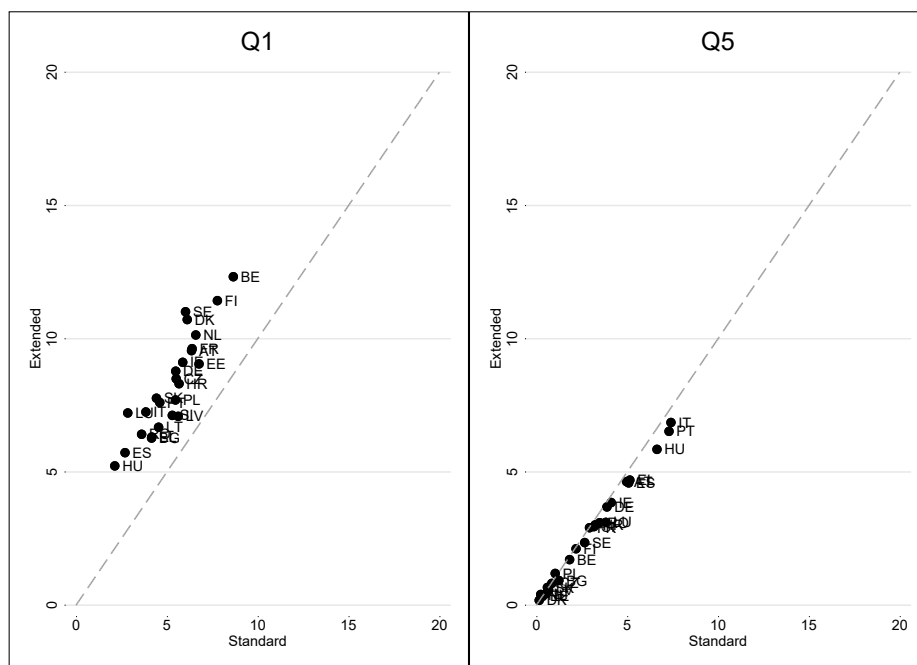


Expanding the income concept (right graph) increases targeting in all countries, highlighting that a higher share of expanded income is redistributed to low-income households (compared to the standard concept). This is in line with the findings

on inequality, where the Gini coefficient of extended income is significantly lower compared to the standard concept.

Figure 5 shows the change in NBR when only direct taxes and benefits are taken into account (i.e. standard, x-axis) and when also VAT and benefits in kind are taken into account (i.e. extended, y-axis). It can be seen that the Q1-NBR is significantly higher when using the extended income concept than when using the standard (disposable) income concept in each of the EU countries.

Figure 5: Q1-NBR (left panel) and Q5-NBR (right panel) according to standard and extended concept



The differences are particularly large in Luxembourg, Spain and Hungary, while they are smaller in countries such as Slovenia, Latvia or Estonia. On the other hand, when looking at the Q5-NBS, the extended income concept and the standard (disposable) income concept show exactly the opposite behavior. The Q5-NBS

based on the standard (disposable) income concept is higher in most countries, and significantly higher in countries such as Hungary or Portugal. This underlines the strong redistributive effect of transfers in kind.

We now focus on the net benefit share received by low-income households (Q1-NBS) as well as by high-income households (Q5-NBS). On the one hand, the Net Benefit Ratio (NBR) allows a direct comparison between countries, since it is measured in relation to the general disposable income of a country. On the other hand, the Net Benefit Share (NBS) is a measure of targeted redistribution within a country. In other words, it does not directly account for the amount of redistribution of a country, since it is measured as a share of total net benefits. For example, a country could redistribute more to low-income households in nominal terms than another country, but have a lower Q1-NBS because it also redistributes a larger share of net benefits to other parts of the income redistribution.

The Q1-NBS measure takes into account the net benefits received by the bottom 20% of the income distribution as a percentage of the total net benefits in a country. For example, a Q1 NBS of 60% implies that 60% of the total net redistribution in a country goes to low-income households (Q1). More intuitively, the NBS measures how targeted a country's redistributive system is, ignoring the overall level of redistribution in a country.

Figure 6 shows the distribution of NBS across the EU. We can see very high Q1-NBS in countries such as Estonia, Denmark, the Netherlands and Latvia (above 40%), which means that more than 40% of disposable income is redistributed to low-income households. On the other hand, Q1-NBS are quite low (below 20%) in countries such as Hungary, Greece, Spain or Italy. As we can see, when the income concept is extended, the ratio of net benefits received by Q1 to extended

income increases in all countries, leading to some re-ranking between countries. This also suggests that the targeted redistribution of tax-benefit systems does not only depend on direct taxes and benefits, but is also significantly influenced by the way in which in-kind benefits are redistributed and the way in which VAT is passed on to households.

Figure 6: Q1-NBS according to standard and extended concept

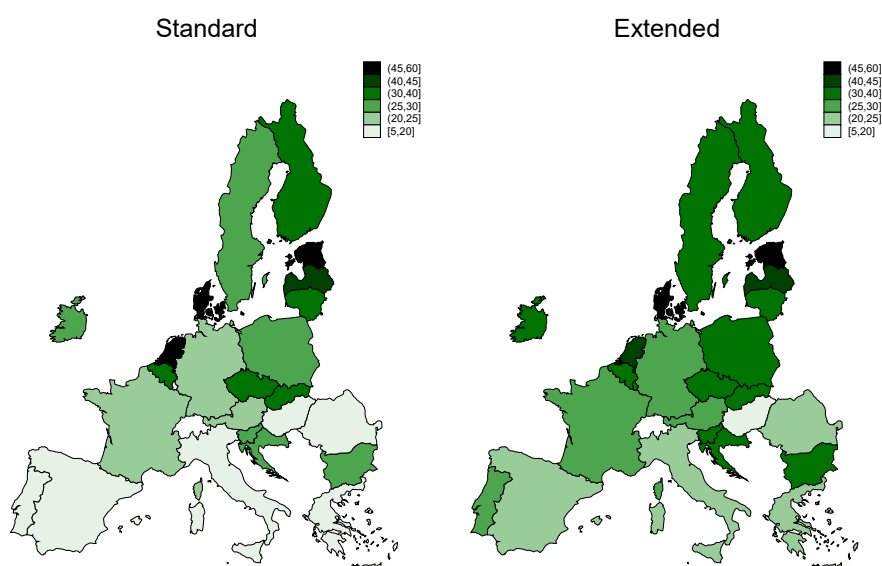
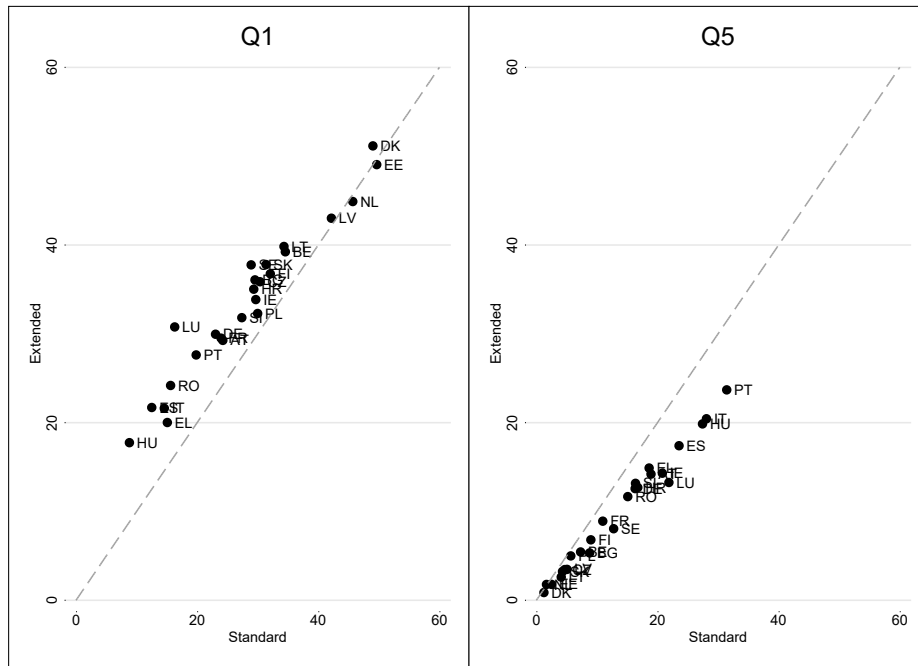


Figure 7 shows the change in NBS when only direct taxes and benefits are taken into account (i.e. standard, x-axis) or when VAT and in-kind benefits are also taken into account (i.e. extended, y-axis). We see a higher level of Q1-NBS when VAT and in-kind benefits are taken into account, suggesting that the inclusion of in-kind benefits and VAT increases the share of disposable income received by the lower part of the income distribution in all countries. The opposite result is observed when looking at the upper part of the income distribution, where the net



benefits received by Q5 as a share of disposable income is reduced in all countries. This suggests that in-kind benefits and VAT (together) increase the targeting of the tax-benefit system towards low-income households.

Figure 7: Q1-NBS(left panel) and Q5-NBS (right panel) according to standard and extended concept



## 4. Conclusions

In this paper, we extend the conventional notion of income, which typically considers disposable income (income after direct taxes and cash transfers), by following the approach of Figari and Paulus (2015) and Christl and Köppl-Turyna (2024). We use the data from Christl and Köppl-Turyna (2024), which adds in-kind benefits for education and health services provided by the state in 25 EU member states. It also includes consumption taxes.

Using this new dataset, we analyze the redistributive effects of these two government interventions, which are typically not included in standard empirical analysis. As a result, our paper provides a more nuanced understanding of redistribution within a country and facilitates cross-country comparisons.

We show that accounting for indirect taxes and in-kind benefits has a significant impact on inequality, redistribution, and targeting of tax-benefit systems in the EU.

First, we find that including both indirect taxes and in-kind benefits in the analysis significantly reduces income inequality. The Gini coefficient, which measures income inequality, decreases in all countries when VAT and in-kind benefits are included, highlighting that in-kind benefits more than offset the regressive nature of indirect taxes. The effect is particularly strong in countries such as Sweden, Ireland and Spain, while it is small in countries such as Austria, Slovenia, Poland and Estonia. This leads to a significant re-ranking when looking at inequality after government intervention across EU member states.

Second, we calculate the Redistributive Effect (RE) to measure the impact of government policies on the distribution of income among the population. We

show that total redistribution is highest in Belgium, France and Austria, while it is lowest in Bulgaria, Latvia and Estonia. The effect of transfers in kind is substantial, ranging from 0.07 in some countries to 0.4 in others. On the contrary, the effect of VAT is negative but relatively small compared to in-kind transfers, direct taxes and cash transfers. The negative effect of VAT suggests that low-income households pay more taxes than high-income households, which is a well-known phenomenon in the literature.

Third, we analyze targeted redistribution by looking at the net benefit ratio (NBR) and net benefit share (NBS) received by low-income households. We find that the Q1-NBR (which measures the net benefits of households in the lower income distribution as a share of total disposable income in a country), is significantly higher in the Nordic countries, the Benelux countries and Austria than in other countries. When the income concept is extended, the Q1-NBR increases, indicating an increase in targeted redistribution to low incomes (first quintile) in all countries. We also use an additional measure for targeted redistribution, the Q1-NBS. The Q1-NBS measure takes into account the net benefits received by the lowest 20% of the income distribution as a percentage of total net benefits in a country. We show that a higher level of Q1-NBS is observed when VAT and in-kind benefits are taken into account, suggesting that both factors increase the share of net benefits received by the lower part of the income distribution in all countries, and therefore the targeting to low-income households.

Overall, our results highlight that including indirect taxes and in-kind benefits in the analysis of redistribution and inequality provides a more comprehensive understanding of the impact of the tax-benefit system. Including these factors reduces income inequality, increases the targeting of the tax-benefit system to

low-income households, and highlights the importance of indirect taxes and in-kind benefits in redistribution efforts of countries.

Our analysis shows that, from a policy perspective, it is crucial to understand the underlying data when estimating redistribution. Currently, policy recommendations and comparisons at the EU level often rely on standard indicators such as the Gini coefficient or the redistributive effect, which are based on disposable income. This paper takes a step forward by extending the concept of disposable income to include in-kind transfers received by households and VAT paid. This refinement allows for a more accurate assessment of income redistribution within countries and facilitates more accurate cross-country comparisons.

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The authors declare that they have no competing interests with regard to the publication of this article.

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## **Data availability statement**

The data supporting the findings of this study are available from Eurostat, but there are restrictions on the usage of these data.<sup>2</sup>

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<sup>2</sup>Please consult <https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions> for more information on access to the data.