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# Measuring deep poverty in developed countries. A cumulative indicator of income and material deprivation

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**Measuring deep poverty in developed countries.**

**A cumulative indicator of income and material deprivation**

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# Measuring deep poverty in developed countries

## A cumulative indicator of income and material deprivation

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### Abstract

In developed countries, income-based measures of poverty identify large shares of the population (17.1% of the EU at the 60% threshold in 2018). Defined as such, the ‘poor’ are very diverse in terms of the severity of their situations. In this work, we propose an indicator that targets those of the income-poor that experience harsher living conditions. We show that it not possible to achieve a significant targeting of deep poverty using income data only: at the lowest levels of income, it ceases to be correlated with other indicators of economic distress. The insufficiency of income to identify deep poverty still holds when imputed rents of owners or remunerations in kind are taken into account. Adding material deprivations, however, allows to take into account non-income components of a household’s standard of living, such as wealth, health or occupational status. Using European data on households income and living conditions, we show that households who combine low income and a high number of material and social deprivations suffer from a more severe situation of poverty, in terms of subjective well-being and other measures of economic distress, and stay longer in poverty.

**Keywords:** Poverty ; Income ; Material deprivation ; EU-SILC

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# 1 Introduction

In developed countries, income-based measures of poverty identify large proportions of the population: in 2018, 17.1% of people in the European Union live below the poverty line at 60% of the national median income in 2018. This is more than one in six Europeans, or around 80 million people. Defined as such, the "poor" experience a significantly disadvantaged situation compared to the rest of the population (in terms of employment, education, health, deprivation). However, they are also very diverse in terms of income, wealth, living conditions, life satisfaction or life trajectories.

Given this heterogeneity, it may not be efficient to combat poverty the same way for all these individuals. In particular, it might be relevant to try and identify those that suffer from the most difficult situations, in order to enact specific actions.

In this paper, we tackle the following question: *can we find an statistical indicator that identifies the poorest among the poor?* The difficulty residing here in finding a relevant way to define "poorest".

We first present some advances in the measurement of poverty, and of what is known on the relative heterogeneity of the people identified by usual measures of poverty. We also review some arguments in favor of the measurement of deep poverty, and some attempts to define it.

After presenting the data and core indicators used in this paper, we present our preliminary findings: income or material deprivations alone are not sufficient to identify deep poverty in developed countries. We show that this is mainly due to the fact that, below a certain threshold, there is no significant correlation between income and deprivations. After a more in-depth analysis based on French data, we show that this pattern holds for most of the EU.

We then present our main contribution: a cumulative indicator of deep poverty that combines income and material and social deprivation. We show that it defines a sub-population of poverty that 1) suffers more hardship according to living conditions, employment status and subjective life satisfaction, and 2) remains in poverty longer. We demonstrate how this affects the European cross-country perspective on poverty.

Finally, we offer two elements for discussion. First, we consider the implications of the choice of thresholds in measures that include income and/or material deprivations. Second, we examine the mismatch between income and deprivations, and propose two extensions to the definition of income, in an effort to strengthen the link between income and material and social deprivations. We show that including additional components in order to fill in missing parts of the equalized income is not sufficient to correct the mismatch between income and material poverty, and discuss the implications for poverty indicators.

## 2 Literature

The measurement of poverty has undergone major developments in recent decades. While indicators based on household income have long been the dominant statistical measure of poverty, there has been increasing efforts to implement other poverty indicators. One example is the measure of material and social deprivations,

another measure of poverty based on household surveys collected annually in the European Union (Nolan and Whelan, 1996; Anne-Catherine Guio, 2009; Guio et al., 2016). In such measures, households are asked whether they can afford some goods and services, or whether they suffer financial deprivations.

Whether based on income or living conditions, most measures can be seen as an application of Peter Townsend’s influential definition of poverty in developed countries, established in his 1979 book “Poverty in the United Kingdom” (Townsend, 1979):

Individuals, families and groups in the population can be said to be in poverty when they lack the resources to obtain the types of diet, participate in the activities and have the living conditions and amenities which are customary, or are at least widely encouraged or approved, in the societies to which they belong. Their resources are so seriously below those commanded by the average individual or family that they are, in effect, excluded from ordinary living patterns, customs and activities.

In light of this definition, measures of material and social deprivation differ from income poverty in that they directly measure deprivations of what can be considered characteristic of a “customary” equivalized income, whereas measures of income identify a lack of resources that is believed to cause these deprivations. In this respect, income poverty is sometimes referred to as an “indirect” measure of poverty, whereas measures of material deprivation are called “direct” (Ringen, 1988). Income measures can therefore be problematic if low incomes are not effectively associated with a lack of what can be considered customary goods and services, especially if there are problems in the measure of income (which can be the case for such specific populations). On the other hand, measures of material and social deprivations can miss their target if the observed lacks (or non-consumption) of such goods and services are not caused by low resources.

The populations identified by each of these indicators can be very heterogeneous in terms of employment, wealth, economic difficulties, or income (Fusco, Guio, and Marlier, 2010; European Commission. Statistical Office of the European Union., 2018). While the flaws of these indicators are often seen as necessary evils for the purpose of tracking changes in poverty over time and across countries, they can become problematic if one wants to focus on the very poor, i.e. the most vulnerable fraction of the poor. Considering these indicators separately, it may not be enough to tweak income or deprivation thresholds to identify the most extreme situations in terms of economic difficulties, exclusion from society or persistence of poverty.

In this work, we show that it is not possible to identify a subpopulation of standard income poverty that experiences harsher and more persistent difficulties using only a lower income poverty line. We also show that the link between income and material and social deprivations is very strong in the middle of the income distribution, but weakens at the bottom. We investigate the mismatch between low incomes and high deprivations, and argue that material and social deprivations alone cannot be used to define deep poverty, as such an indicator would capture households with quite significant income, in particular some households close to the median.

We thus draw on the existing literature on multidimensional poverty indicators (notably [Nolan and Whelan \(1996\)](#) and [Whelan, Nolan, and Maître \(2014\)](#)) to propose an indicator of deep poverty for developed countries, based on income and material deprivations taken together. This indicator identifies a subgroup of standard income poverty that meets two criteria. First, the identified population suffers from more intense economic difficulties than other people identified as poor (as measured by employment status, material deprivation, and subjective well-being). Second, this population remains significantly longer in poverty than other people identified as poor.

With an application on European data, we demonstrate that this indicator can be used as a tool to identify the profiles of the most vulnerable part of the poor population in developed countries, while allowing for time and cross-country comparisons.

## 2.1 Poverty: a large and heterogeneous part of population

In developed countries, the most commonly used statistical measure of poverty is the share of individuals whose household income is below a defined threshold, called the poverty line. In the European Union, one generally defines the poverty threshold at 60 percent of the median equivalized disposable income of the country. In the United States, the Census Bureau uses a monetary threshold based on the valuation of a basket of goods, which depends on family composition and is updated annually to account for inflation ([Semega et al., 2020](#)).

In both cases, income is defined at the household level, after application of an equivalence scale that allows for comparisons of households with different compositions. These measures simply provide two different responses to [Townsend \(1979\)](#)'s definition of what constitutes "customary" living standards.

These income poverty indicators identify significant portions of the population as being in poverty, even in the richest countries. In the European Union in 2019, 16.5% of the population is considered to be in income poverty [Eurostat \(2022\)](#). This figure exceeds 20% for seven countries (Romania, Latvia, Bulgaria, Estonia, Spain, Lithuania and Italy) and is above 10% for all countries, with the lowest rates below 13% for six countries (Czech Republic, Finland, Slovakia, Slovenia, Hungary and Denmark).

The income poor have significantly different characteristics than the rest of the population, that characterize their relative exclusion from the customary way of life: they are much more often unemployed, less educated, less healthy ([Eurostat, 2022](#)), and more often report material and social deprivations ([Blasco and Gleizes, 2019](#)) and low subjective well-being ([Clark, D'Ambrosio, and Ghislandi, 2016](#)).

While they experience more economic difficulties than the rest of the population, the poor defined by these indicators remain very heterogeneous in terms of their income and wealth ([Kyzyma, 2020](#); [Azpitarte, 2012](#)), their living conditions ([European Commission. Statistical Office of the European Union., 2018](#)) but also in terms of their situation on the labor market ([Eurostat, 2022](#)) or life satisfaction ([Diener et al., 1993](#)).

Moreover, the poor also have very diverse life trajectories: in particular, a large share of the population in income poverty one specific year moves durably out of poverty from the following year, while others remain

durably in poverty (Hill, 1981; Muffels, Fouarge, and Dekker, 2000; Cappellari and Jenkins, 2002). In France, while 20 percent of the poor one year move out of poverty for at least the next three years, 40 percent of the poor remain durably below the poverty threshold during this period (Albouy and Delmas, 2020).

## 2.2 Motivation for an indicator of deep poverty

Given that the poor as defined by the usual indicators can represent a large share of the population and are very heterogeneous, one can ask whether it is possible to define an indicator that focuses on the very poor, i.e. the most vulnerable fraction of the poor population.

According to the definition of Townsend (1979), poverty is a situation in which insufficient resources cause exclusion from the standard way of life of the population. We can therefore assume that deep poverty should meet such a definition, but would also have a more intense, more extreme or more urgent character that remains to be defined.

The measurement and treatment of deep poverty are recurrent demands in the public debate, reflected in the objectives of various national and international institutions: the first of the United Nations' Sustainable Development Goals is the eradication of extreme poverty (United Nations Department for Economic and Social Affairs, 2021), and the French National Council for Statistical Information identifies the measurement of deep poverty as a necessity (recommendation no. 6 of the Demographics and Social Issues Committee of the medium-term recommendations, CNIS (2019)). It thus seems necessary to complement the current indicators for measuring poverty with indicators focused on the most vulnerable and most exposed part of poverty.

However, while several measures of poverty have been proposed, definitions of deep poverty remain quite simple, are generally not based on theory and do not win consensus. In France the 2019 report of the Economic, Social and Environmental Council (CESE) considers as living in “deep poverty” anyone living on less than half the median equivalized income of the population, or 885 euros per month in 2018 (CESE, 2019). Lecerf (2016) considers that “severe poverty” can be measured using a threshold at 40% of the population's equivalized income, although “extreme poverty” would occur when people cannot meet their most basic needs, and cannot be measured relatively. The World Bank establishes an international threshold of “extreme poverty” at \$2.15 per person per day, or just under 60 euros per person per month World Bank (2022).

The definition of the World Bank, whose main function is to monitor the evolution of extreme poverty in developing countries, is not relevant for Europe and the majority of developed countries, where almost the entire population has an income of more than 60 euros per month. The definitions of CESE (2019) and Lecerf (2016), if simple, have no particular theoretical or empirical justification other than being a tweak of the commonly used income poverty line. One can try and define an indicator of deep poverty that has better properties, starting by determining the criteria it should meet.

A definition of deep poverty was first proposed in a landmark report to the French Economic and Social



Council by [Wresinski \(1987\)](#). It was subsequently taken up by the United Nations in a more recent report ([United Nations Human Rights, 2012](#)):

The combination of income poverty, human development poverty and social exclusion, when a prolonged lack of basic security simultaneously affects several aspects of people’s lives, seriously compromising their chances of exercising or regaining their rights in the foreseeable future.

This definition highlights two properties that can define deep poverty: a situation of great hardship that can be assessed on several dimensions, and one that is persistent over time. The relevance of the indicator in identifying real situations of hardship will therefore be judged by its association with multiple dimensions of poverty (distance from employment, material deprivation, subjective feeling of poverty, etc.).

The other desirable property of the indicator is its persistence over time. As the life trajectories of people in poverty are quite heterogeneous, the aim is to identify people who remain in situations of poverty, and are thus in more severe hardship than those who manage to escape. This dimension falls in line with the vision of [Sen \(1999\)](#), who defines poverty not only as a lack of material resources, but also as a deprivation of the “capabilities” of the population, i.e. the material and non-material resources necessary to act and improve one’s situation.

Finally, unsurprisingly, deep poverty is conceived as something exceptionally serious, and therefore particularly rare. It is expected that the population in deep poverty will be significantly less numerous than that in poverty, ideally a sub-part of it.

The aim is thus to define an indicator of deep poverty that would identify a subgroup of standard poverty, suffering multiple social and economic difficulties together, and characterized by a certain persistence of the situation.

### **2.3 The measure of material and social deprivations**

Material and social deprivation is a non-monetary measure of poverty based on household surveys ([Nolan and Whelan, 1996](#); [Anne-Catherine Guio, 2009](#); [Guio et al., 2016](#)). Respondents are asked whether they can afford certain goods and services, or whether they suffer from specific economic difficulties.

These difficulties are related to housing (not being able to maintain adequate temperature, to change out-of-use furniture), to their financial situation (having payment arrears, not being able to meet an unexpected expense), to clothing and food (not being able to replace worn-out clothes with new ones), or to social life and leisure.

This type of indicator has theoretical foundations in common with income poverty, since it defines poverty as a situation of relative deprivation: the basket of goods and services does not correspond to a minimum of survival, but is chosen in such a way as to represent a common equivalized income, i.e. “the goods and services necessary to lead a decent life”. The existence of a norm in the population is therefore necessary to

define the list of items. In the case of material and social deprivation, the basket of goods and services is defined at the EU level.

Material deprivation, however, differs from income poverty in the object that is measured: while income poverty aims to measure the resources needed to avoid the deprivation of goods and services customary of a decent life, material deprivation directly measures whether the household has access to these items or whether its resources prevent it from doing so. In this respect, material deprivation is deemed a “direct” measure of poverty, while income poverty is an “indirect” measure (Ringen, 1988). Moreover, the measurement of material deprivation by survey is not affected by the methodological difficulties of measuring income.

It is known that material deprivation and income poverty do not necessarily identify the same populations (Nolan and Whelan, 1996; Anne-Catherine Guio, 2009; Godefroy and Ponthieux, 2011; Bertrand Maître, Brian Nolan, and Christopher T. Whelan, 2014; Hick, 2013). In particular, a significant share of those experiencing material and social deprivation are not among the lowest income earners, especially among retirees or those in poor health. Conversely, a significant proportion of people living below the income poverty line are not among those experiencing the most deprivations, particularly among the young and self-employed. This can arise from the fact that measured income is not a sufficient description of the household’s financial resources, whether because of supplementary resources (in-kind benefits, auto-consumption, wealth, inter-households transfers) or because of additional difficulties. It may also come from the fact that individuals with similar resources do not experience similar deprivations because of different needs, preferences, or self-assessed perception of one’s situation.

The indicator combining income poverty at the 60% threshold and material deprivation is called consistent poverty in some works (Nolan and Whelan, 1996; Whelan, Nolan, and Maître, 2014). This type of indicator is also referred to as “cumulative poverty” in some francophone work (Godefroy and Ponthieux, 2011). It is known that people identified by these cumulative indicators are associated with greater social and economic vulnerabilities than people who suffer from income poverty alone. In this paper, we use an updated version of this “consistent poverty”, by including items of social deprivations that were not present in previous versions. But more importantly, we build a “severe” version of this indicator by tightening the income and deprivation thresholds, and argue that it is to date the most adequate answer to the problem of measuring deep poverty in developed countries.

## 3 Data and method

### 3.1 The Statistics on Income and Living Conditions survey

The European Union Statistics on Income and Living Conditions (EU-SILC) is a set of harmonized national household surveys conducted by the members of the European Union and their partners. They cover topics such as income, poverty, social exclusion and living conditions. They have been conducted annually since 2004 and form the basis for official statistics on income and living conditions at the EU level. These surveys

include detailed information on income (before and after taxes) and multiple non-monetary variables, such as education, employment status, occupation, health, material deprivations, subjective well-being, etc. They have a panel dimension: all respondents are interviewed four years in a row. The French survey that we use for most of this work also includes additional variables that are not part of the harmonized European questionnaire.

These surveys cover information at the household level, as well as information at the individual level for respondents aged 16 years or older. The sample size is large: most national surveys include between 10,000 and more than 50,000 individual-level observations. In this study, we primarily use the 2019 survey, one of the most recent available for all EU countries, for both cross-sectional and longitudinal analysis<sup>1</sup>. To increase the sample size, longitudinal analyses are conducted using three stacked panels: 2014-2017, 2015-2018, and 2016-2019. When we study four-year trajectories, we therefore present average results over these three periods.

The EU-SILC household surveys cover all national territories, but are limited to people living in permanent, independent private households. They therefore exclude people living in institutions such as old people’s homes, university dormitories, prisons, and so on. They also exclude homeless people and people living in mobile homes. In general, the population covered by these surveys represents more than 98 percent of the total population (see [Section A](#)). In France, the remaining portion consists mainly of people living in retirement homes and students living in collective housing, while the homeless represent about 0.3 percent of the population.

To measure the different dimensions of poverty and the characteristics of vulnerable populations, we can therefore mobilize numerous themes covered by the SILC surveys, whether it be demographic data (age, gender, education, nationality, family situation), data on employment and occupation, income (including taxes and benefits, inter-household transfers, self-consumption), financial situation (including savings, indebtedness, financial comfort), living conditions (housing, material and social deprivations), health, subjective well-being.

In EU-SILC, the reference period for income data is not the same as for the other variables of the survey. Indeed, income data refers to the calendar year before the survey was taken, while most other variables refer to the moment the survey is taken. Depending on when the survey was taken, this creates a lag of 1 to 11 months between the end of the income reference period and that of the other variables. This is a feature that is specific to SILC surveys, but it does not represent a major challenge. Indeed, the definition of the right time frame for income data is a problem for every possible definition of current income, and it is not obvious that the total income aggregated on the current calendar year –including income not yet received at the date of the survey– is a better determinant of living conditions. Using the panel component of this data, we checked and confirmed that income of calendar year N is actually not significantly better correlated with living conditions than income perceived at calendar year N-1.

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<sup>1</sup>At the time of this study, the 2020 wave is available but might not be suitable for our work, as households experienced unprecedented shocks on their income and living conditions.

The EU-SILC survey is a panel in which each respondent is interviewed for at least 4 consecutive years<sup>2</sup>. This is useful because it allows for greater depth in the assessment of a household’s situation and because it can be used for analysis of short-term life trajectories. However, selective attrition can bias panel analyses: the proportion of individuals missing at least one of the four consecutive waves is between 10% and 50% for most countries, and these are not randomly distributed (e.g. younger individuals are more likely to drop out). While this is a situation that needs to be taken into account, especially for countries with high dropout rates, it is not a major concern for the present work for two reasons. First, we use longitudinal weights provided by the EU-SILC producers, which account for most of the attrition bias (Van Kerm et al., 2017). Second, when using the panel dimension (e.g. to compare the duration of poverty between two groups), we never compare estimates based on the subsample of consecutive respondents with estimates based on the full cross-sectional sample.

We use mainly French data for most of the demonstration, as it would be tedious to describe the characteristics of poverty in every country. On the other hand, it would be difficult to make sense of an aggregation of all European households into the same population, as the income poverty thresholds and the standards of living are different in each country. Therefore, both for the preliminary results and for the main results, we conduct the main analysis using French data then provide a broader perspective using European data.

### 3.2 Measuring income and material deprivations

The income poverty line is defined relatively, generally at 60% of the median equivalized income of the population. Equivalized income is defined here as the household’s disposable income in relation to an equivalence scale based on the number and age of the household members: the first adult weighs 1 unit, each subsequent adult (person aged 14 or over) weights 0.5, and each child under 14 weights 0.3. Disposable income includes all income from labor or capital, plus social benefits, minus taxes. A more restrictive version of the poverty line can also be defined, at 50% of the median equivalized of the population. As an example, this brings the poverty threshold in France at approximately 1100€ per month in 2019, with 9 million people living under it, or 14.6% of the population (Yann Guidevay and Jorick Guillaneuf, 2021).

The other poverty indicator used in this study is material and social deprivation: it is based on a list of deprivations defined at the European level and collected in all SILC surveys (Guio et al., 2016). The list of deprivations is as follows (and the proportion of the population affected in France in 2018):

- Not being able to face an unexpected expense in the range of the monthly poverty line (31%)
- Not being able to afford a week’s vacation away from home (22%)
- Not being able to afford to replace worn-out furniture (22%)
- Not being able to spend a small amount of money on oneself without consulting anyone else ( 13%)
- Not being able to afford a regular leisure activity (15%)

---

<sup>2</sup>4 years is the minimum mandatory panel duration, but some Member States (such as France until 2019) enforce longer panel durations.

- Having unpaid loan payments, rent or utility bills (9.2%)
- Not being able afford to buy new clothes (9.0%)
- Not being able to afford a meal with meat, fish or vegetarian equivalent at least every other day (6.8%)
- Not being able to afford two pairs of good shoes (5.4%)
- Not being able to afford to keep one’s home at the right temperature (4.9%)
- Not being able to afford to meet up with friends or family at least once a month for a drink or meal (8.1%)
- Not being able to afford a personal car (3.2%)
- Not being able to afford an access to the Internet (1.7%)

A person is in material and social deprivation if they suffer at least 5 deprivations from the list of 13. A more restrictive version, called severe material and social deprivation, is when a person experiences at least 7 out of 13 deprivations. Importantly, the lack of some goods and services is considered a deprivation only if this is an *enforced* lack, that is to say that the individual does not access a good or service for financial reasons, and not because they do not need or want it. More precisely, the question that defines the deprivation “furniture” is as follows<sup>3</sup>:

**Does your household replace any worn out furniture?**

and proposed answers are (one answer only):

1. We do this
2. We would like to do this but cannot afford this at the moment
3. We do not want/need this at the moment

Other deprivations are measured via a card, where the respondent selects everything that they can “afford”:

**Looking at this card, can I just check whether your household could afford the following?**

and listed items are (select all that apply)

- To have a week’s annual holiday away from home
- To eat meat, chicken or fish (or vegetarian equivalent) every second day
- To pay an unexpected, but necessary, expense of £800<sup>4</sup>
- To keep your home adequately warm

This measure has the advantage of being based on direct observation of living conditions. On the other hand, it does not impose any constraint on income, so that one can be in a situation of material and

---

<sup>3</sup>These questions are those of the British questionnaire. Exact wordings of other questionnaires may differ due to translations.

<sup>4</sup>This amount varies for every country, so that it roughly equals the monthly poverty line.

social deprivation (including severe deprivation) while having a disposable income around the median of the population (see *infra*).

Moreover, this measure is subjective in its assessment of certain deprivations (e.g. “face” an unexpected expense, “afford” an item) or in determining whether the deprivation is present for financial reasons or not. This poverty indicator may therefore be sensitive to heterogeneity in response behavior across individuals, or even to changes in response behavior over time (e.g. due to preference adjustment, see [Pan Ké Shon, 2015](#)).

## 4 Preliminary results: unidimensional measures

### 4.1 The intersection of low income and high deprivations

In EU countries, the rates of income poverty at 60 percent and of ordinary material and social deprivation (5 out of 13 deprivations) are of the same order of magnitude, with an average of 16.5 percent for the former and 12.3 percent for the latter in 2019 ([Figure 1](#)). However, the variations between countries are much greater for material and social deprivation, with rates ranging from 4 percent in Luxembourg to 38 percent in Romania, while income poverty ranges from 10 percent in the Czech Republic to 24 percent in Romania. The observation is similar when comparing income poverty at 50% and severe material and social deprivation (7 out of 13 deprivations).

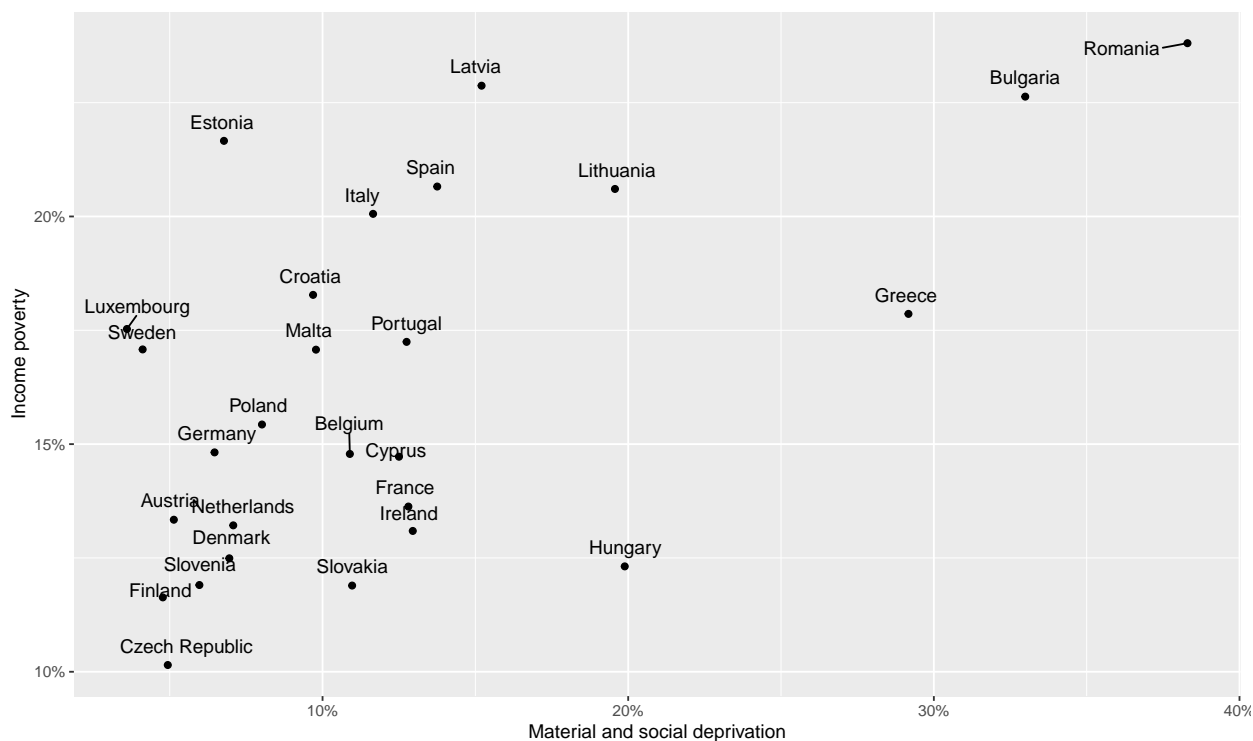


Figure 1: Income poverty and material and social deprivation rates in the EU

In this subsection, we use France as an example in 2018, with a 60 percent income poverty rate of 13.6

percent and a 50 percent income poverty rate of 6.8 percent (Table 1). These rates place France among the 10 countries with the lowest income poverty rates in the European Union. Its rate of ordinary material and social deprivation is 12.8 percent, and that of severe material and social deprivation is 7.0 percent. These proportions place France in a median position in the European Union.

Number of deprivations	Income bracket (proportion of median)			Total
	< 50%	50–60%	> 60%	
≥ 7	1.9	1.4	3.6	7.0
5 or 6	1.2	1.1	3.5	5.8
< 5	3.6	4.4	79.2	87.2
Total	6.8	6.9	86.4	100.0

Table 1: Share of the population by poverty group (in %, France 2019)

The people affected by these two types of poverty are far from completely overlapping: 1.9 percent of the population is in a situation of severe material and social deprivation and income poverty at the 50 percent threshold.

People with low incomes thus have variable living conditions: between a quarter and a third of those living below the 50% poverty line are in a situation of severe material and social deprivation, and therefore in deep poverty. Half of them suffer strictly less than 5 material and social deprivations.

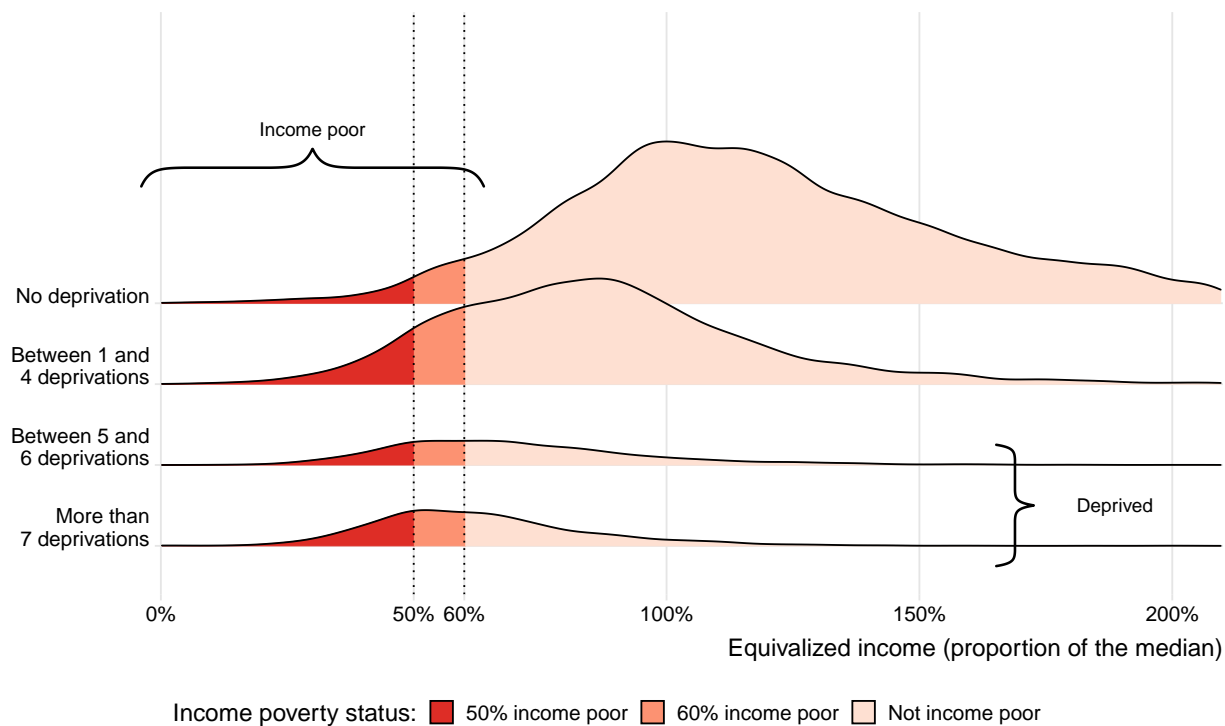


Figure 2: Income distributions by deprivation level

Similarly, people experiencing material deprivation do not necessarily have a equivalized income below the poverty lines (Figure 2): between one-third and one-quarter of people in severe deprivation live below the 50% poverty line.

There is thus a significant mismatch between these two types of poverty measures: the income distribution of people in material and social deprivation (ordinary or severe) extends all the way to the median. Similarly, the income distribution of people who experience no deprivation or between 1 and 4 deprivations, i.e. the majority of the population, extends below the income poverty lines.

## 4.2 Targeting deep poverty cannot be done with income alone

In this section, we show that it is not possible to approach deep poverty by varying the income threshold alone in order to make a restrictive version of income poverty.

First, we show that the link between income and material and social deprivation is strong, except for the highest and lowest parts of the income distribution. In particular, deprivation ceases to be correlated with income below a certain threshold. We then show that the population targeted by a very severe income poverty indicator (40%) does not have the properties of deep poverty as discussed above.

### 4.2.1 The three regimes of deprivation, and the “glass floor” of income poverty

Although material and social deprivation can have multiple causes, their main determinants are monetary resources, particularly income. All else equal, the higher the income, the lower the deprivation score. In France in 2018, the average number of material and social deprivations experienced by people in income poverty is 4.2, compared to 1.5 for the general population.

To go more in detail on the link between income and material deprivation, we reproduce here an approach initiated by Townsend (1979), who used the link between material deprivation and income to define a monetary poverty line:

Households are ranked according to income. [...] In descending the income scale, it is hypothesized that, at a particular point for different types of family, a significantly large number of families reduce more than proportionately their participation in the community’s style of living. They drop out or are excluded. These income points can be identified as a poverty line.

Here, Townsend was looking for a “kink” in the deprivation-income curve, i.e. a level of income below which the risk of deprivation increases much more significantly as income decreases (Figure 3).

In general, for a large part of the population, there is a strong relationship between the number of material and social deprivations experienced and the equivalized income (Figure 3). More specifically, there is a log-linear relationship between income and the deprivation score in a certain income domain: for the population between half and 130 percent of the median income, a 20 percent drop in the standard of living generates on average an additional material and social deprivation.



However, this link is not so linear across the distribution: above 130% of the median, there is no longer any link between income and the number of deprivations, which remains very close to zero. Below 60% of the median income, the number of material and social deprivations suffered is very heterogeneously distributed, and below 50% of the median, it is no longer correlated with income.

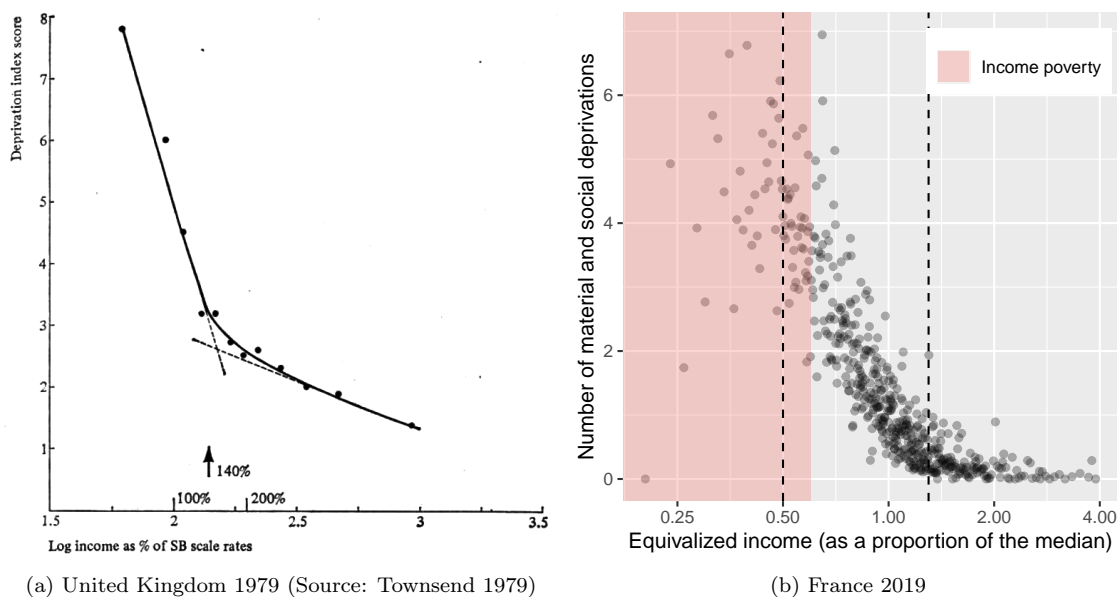


Figure 3: Number of material and social deprivations by log of income

A similar picture emerges for all European countries: in every country, income is strongly negatively correlated with material and social deprivation. There is a log-linear relationship between income and the deprivation score in some income domains: depending on the country, a one-point decrease in the average deprivation score requires an increase in equivalized income of between 50 percent and over 200 percent. At both ends of the income distribution, however, the number of material deprivations is no longer correlated with income. Above a certain income threshold, material deprivation is very rare and is not associated with income. On the other hand, below a certain threshold, material and social deprivations are very high on average, but are not correlated with income and have a high variance.

The analysis of the relationship between income and material deprivation thus no longer reveals two regimes as in (Townsend, 1979), but three regimes of relationship between income and material deprivation:

1. Low income: a high average number of deprivations, with high variance and no correlation with income.
2. Middle income: Decreasing log-linear relationship between deprivation and income.
3. High income: an average number of deprivations close to zero, with low variance and no correlation with income.

We perform a piecewise linear regression using the MARS (multivariate adaptive spline, see Friedman, 1991) algorithm to identify these patterns for each of the 28 EU countries. This allows us to compute the

associated cut points as well as the correlation coefficient in the middle income area. The cutpoints and regression coefficients are determined by the algorithm to minimize the sum of squares of the residuals, under the constraint of having no more than three different slopes. The results are presented in [Figure 4](#) for each of the 28 countries.

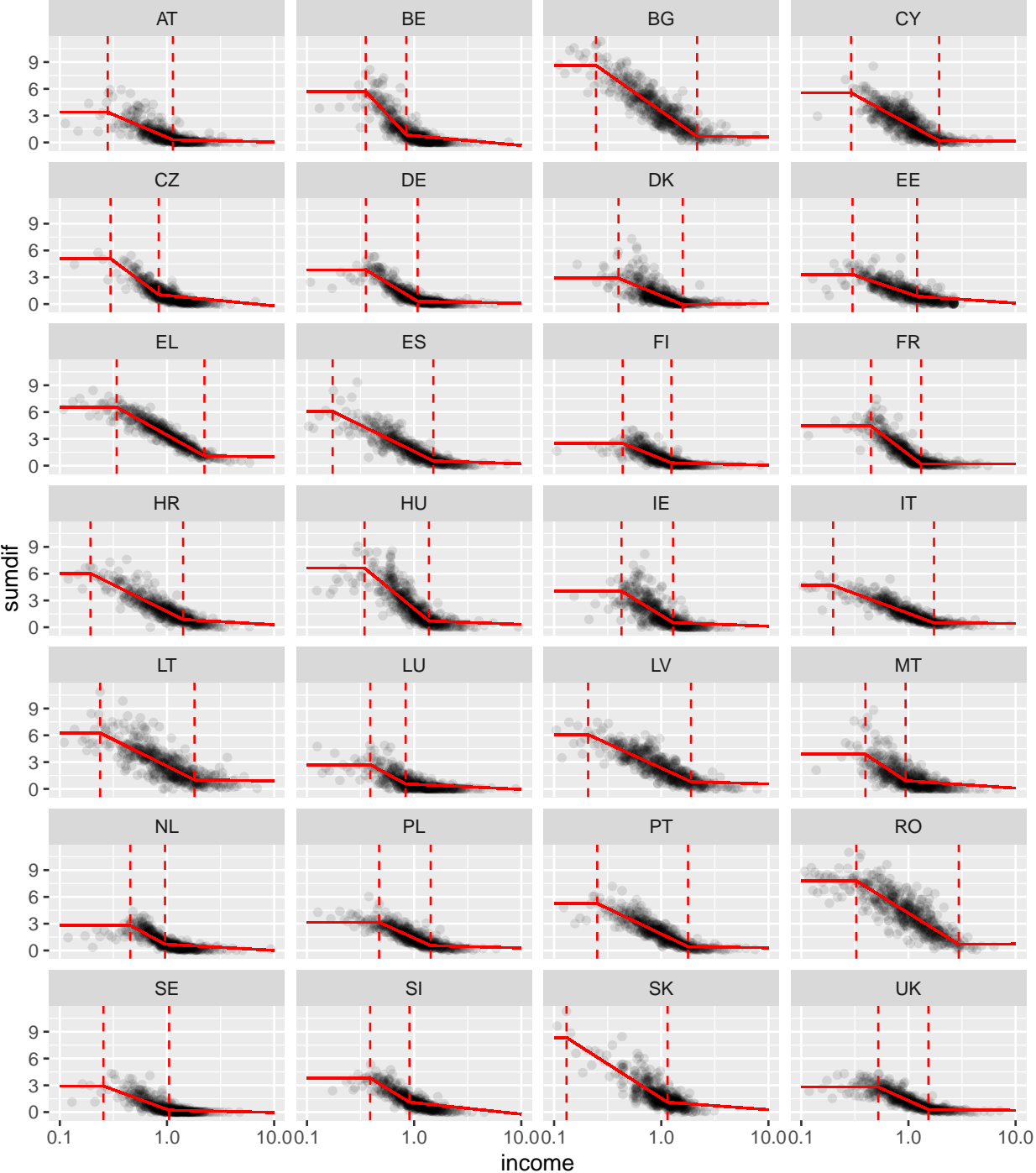


Figure 4: Piecewise log-linear regressions of deprivation by income

The algorithm clearly shows three regimes of relationship between income and the number of material and social deprivations. Interestingly enough, the intermediate regime of deprivation, the one where the mean number of deprivations rises continuously with income, extends well beyond the median of income for most countries. On the other hand, the thresholds determined by the algorithm for the lower bound (the first regime) are mainly between 0.20 and 0.45 times the median.

When selecting the population whose equivalized income is below 50% of the median for each country, there is a significant negative correlation between income and the number of material and social deprivations for only 9 out of 28 countries (Figure 5). For the other countries, the correlation is not significant.

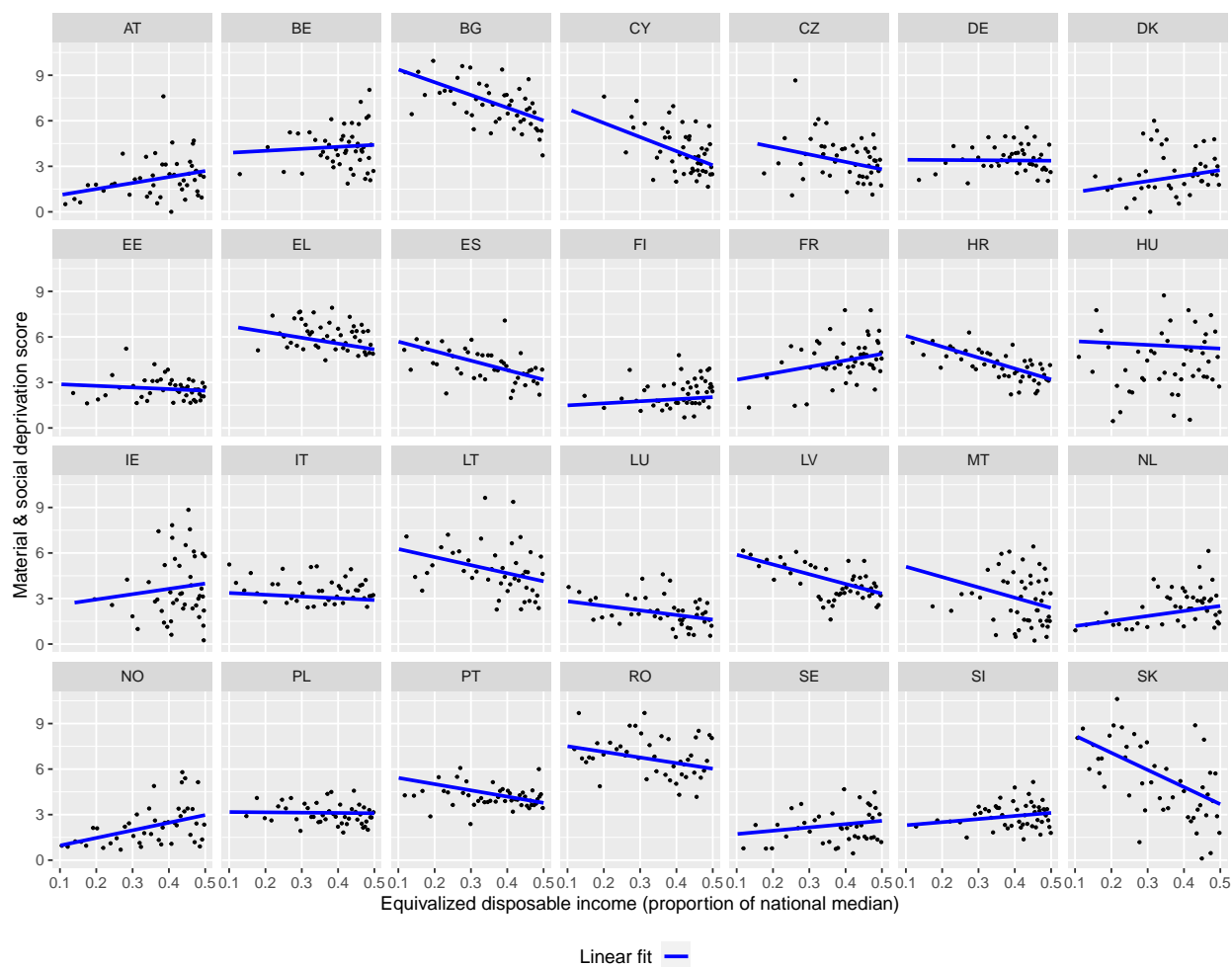


Figure 5: Correlation between income and material and social deprivation under 50% of the median

The existence of such a low-income domain where the average deprivation score does not depend on income implies that it is not possible to define an ever lower income threshold in order to focus on more and more severe hardship, with respect to material and social deprivation. In most countries, an income poverty line below 50 percent of the median already makes it impossible to target a poorer population in terms of deprivations.

## 4.2.2 Characteristics of an indicator of deep income poverty

In this section, we define what an income-only indicator of deep poverty would be, in the line of [Lecerf \(2016\)](#), that is to say a poverty threshold at 40% of the median equivalized income. In France 2019, this represents 752€ per month and per consumption unit in 2019. While we have shown in the previous section that this 40% threshold is located in a zone where income is no longer correlated with material and social deprivations, we nevertheless present here the characteristics of such a sub-population.

Students and the self-employed are particularly overrepresented among people living below the 40% income threshold ([Figure 6](#)). This can be problematic because, for these households, income (in particular income measured by tax sources) may not fully represent their capacity to consume, due to greater reliance on financial assistance from other households, the possibility of self-consumption, or the more significant presence of assets or highly variable or untaxed income.

As for the first half in terms of financial assets<sup>5</sup>, they are much less frequent in each of the poverty groups than in the general population. They are, however, not less frequent in extreme income poverty (17%) than in standard income poverty (15%).

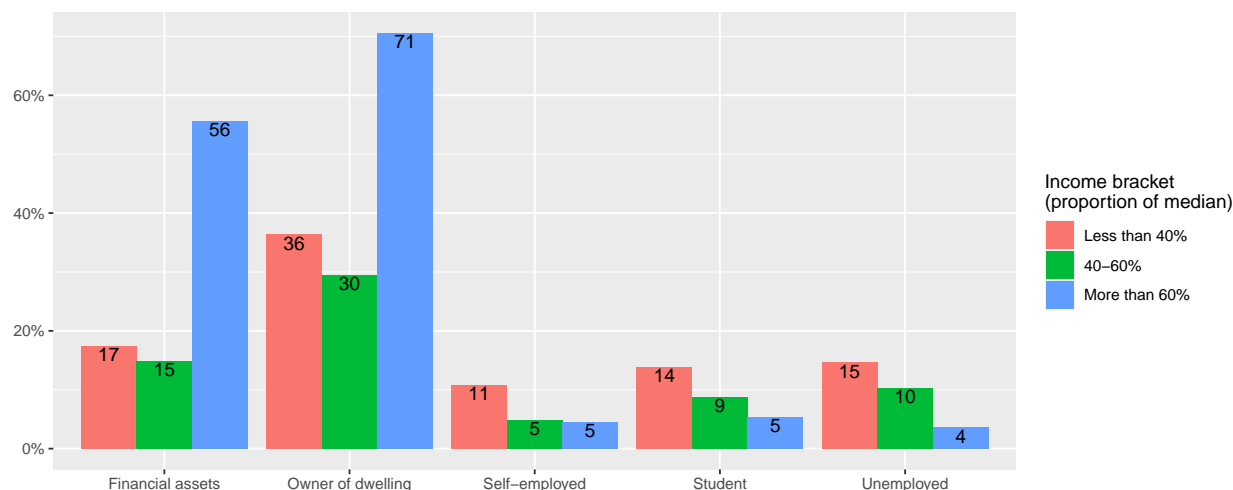


Figure 6: Characteristics of households under 40% threshold

Consistent results are found when looking at the ability to “make ends meet” financially. People with an equivalized income below the 60% threshold are much more likely than the rest of the population to say they can’t make ends meet it without incurring debt. In contrast, people with an equivalized income below the 40 percent threshold are no more likely than those with an income between the 40 percent and 60 percent thresholds to be in this situation. From this point of view, lowering the income poverty line does not therefore identify a population with greater difficulties.

This ineffective targeting of people below the 40% threshold is confirmed when looking at the persistence

<sup>5</sup>Here, financial assets are assessed in a very simple way: for each asset category, the household is asked in which bracket the total value of their assets falls. These bins are ordered from 1 to 7 (and correspond to wealth fractiles), and the number of the highest band among all categories is taken. The top 50% in terms of financial assets corresponds to a score of at least 4.

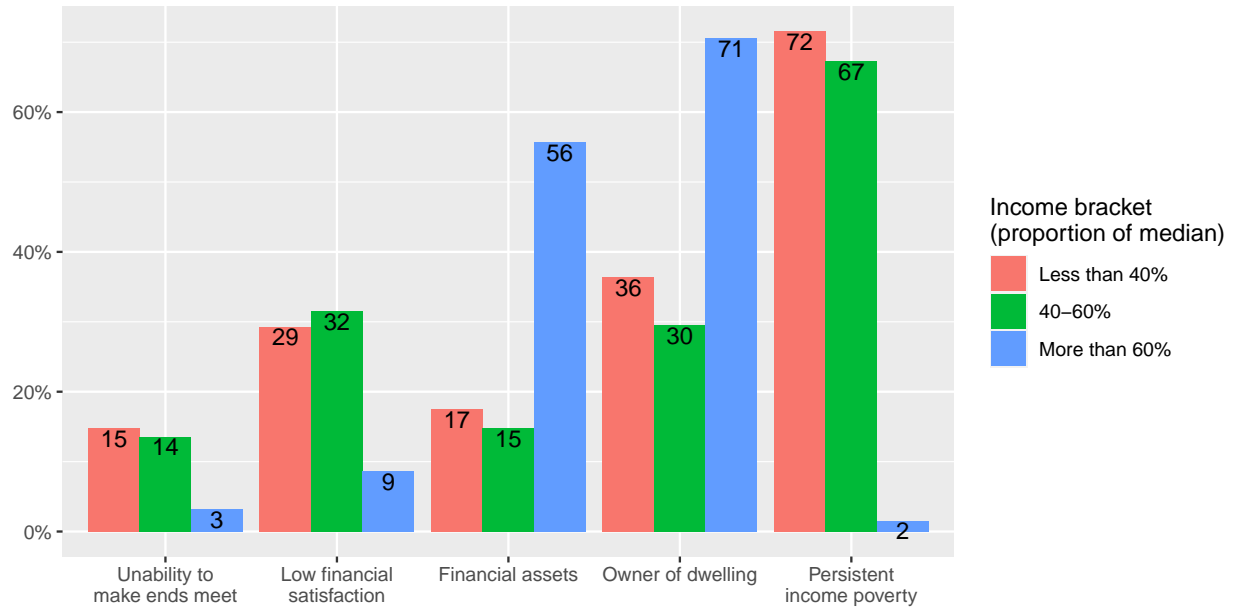


Figure 7: Economic hardship depending on income bracket (France 2018)

of poverty situations: people below the threshold at 40% of the median are not significantly more likely than those in the superior income ebracket to remain durably in poverty at 60%.

## 5 Main results: the cumulative indicator of deep poverty

The indicator of deep poverty that we develop in this work corresponds to being in a situation of severe income poverty and material and social deprivation, i.e. having an equivalized income below 50% of the median equivalized income of the population, as well as suffering at least 7 material and social deprivations from the list of 13.

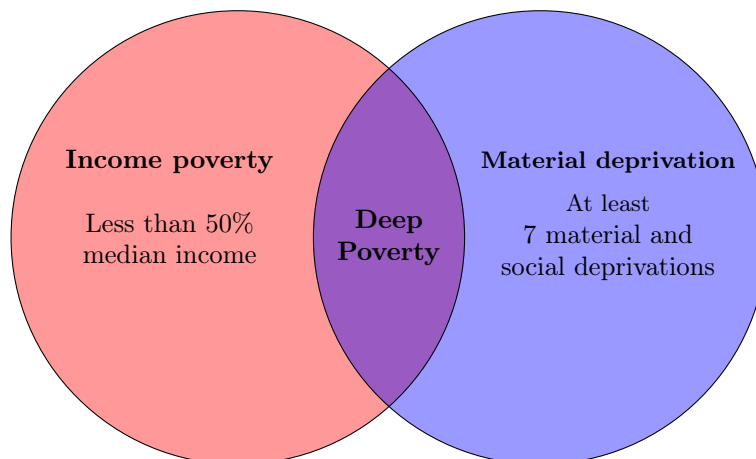


Figure 8: Definition of cumulative deep poverty

This indicator updated (with new items of social deprivation) and tightened (to focus on deep poverty) version of the “consistent poverty” proposed by Nolan and Whelan (1996) and Whelan, Nolan, and Maître (2014). In what follows, after describing the populations covered by such an indicator, we show that it does indeed define a subgroup of the poor population, whose socioeconomic difficulties are greater along many dimensions, and who experience a more persistent form of poverty. We then show how this indicator can be used to provide an alternative view of international comparisons of poverty. Finally, we show that targeting a poverty group with similar properties cannot be done using an income-based measure alone.

In the following section, we analyze the profile of these people at the intersection, and compare the characteristics of this poverty subgroup relative to the rest of the income poor, according to different dimensions of socioeconomic hardship, as well as according to the persistence of their situation. We perform this analysis on data from a single country (here France) to keep a population with a homogeneous income poverty line. In the third section, we extend the demonstration to other European countries, and we show how this indicator of deep poverty completes the European panorama of poverty.

## 5.1 Profiles of households in cumulative deep poverty

In order to measure the differences between the situation of people experiencing deep poverty and those affected by only one or other of the indicators, we separate the poor populations into disjointed subgroups.

People experiencing income poverty or material and social deprivation share certain characteristics: they are more often unemployed, in single-parent or large families, and more often workers than managers.

On the other hand, certain profiles are mainly affected by income poverty (young people and the self-employed), while others are more frequently poor in the material and social sense (retired people) (Table 2). In particular, the self-employed are much less frequent in cumulative deep poverty than they were below the 40% income threshold, with a frequency closer to that in standard income poverty.

Thus, 18% of adults in severe income poverty but experiencing less than 5 deprivations are self-employed, while this is the case for only 6% of adults experiencing neither income poverty nor material and social deprivation, and 2% of those experiencing at least 7 deprivations but not income poverty.

In the case of France, pensioners are more represented in high deprivation than in low income: they represent 15 percent of people experiencing both severe material and social deprivation and severe income poverty, but 30 percent of people in severe material and social deprivation living above the income poverty line. Their retirement pensions or the minimum old age pension coupled with any housing allowances generally enable them to have an equivalized income above the poverty line.

When the two indicators are combined, the profile of the poor changes significantly compared to one or the other of the indicators taken in isolation. In order to better understand what differentiates, within income poverty, those who suffer material and social deprivation from those who do not, we construct a logistic model that explains the probability of being in a situation of severe material and social deprivation as a function of different socio-demographic characteristics.

Deprivations	Income bracket (proportion of median)			Deprivations	Income bracket (proportion of median)		
	< 50%	50–60%	> 60%		< 50%	50–60%	> 60%
$\geq 7$	3	1	2	$\geq 7$	34	17	14
5 or 6	9	3	3	5 or 6	23	13	11
< 5	18	6	6	< 5	11	7	3
(a) Independent worker				(b) Unemployed			
Deprivations	Income bracket (proportion of median)			Deprivations	Income bracket (proportion of median)		
	< 50%	50–60%	> 60%		< 50%	50–60%	> 60%
$\geq 7$	15	36	30	$\geq 7$	15	9	12
5 or 6	10	26	28	5 or 6	17	17	11
< 5	14	26	31	< 5	9	9	3
(c) Retired				(d) Living in a single parent family			

Table 2: Frequency of each characteristic by deprivation and income status (in % of adults, France 2019)  
*Reading example:* 3% of adults with income below 50% of the median and at least 7 material and social deprivations are independent workers

Unemployed people are more frequent among those who suffer from both income and material poverty than in income poverty alone. Moreover, all other characteristics being equal (including equivalent incomes), living in a household where the reference person is unemployed significantly increases the chances of being in material and social deprivation (Table 3).

Similarly, blue-collar workers are more frequent among the cumulative poor than the rest of the poor in the income sense and, other characteristics being equal, are more likely to be in both types of poverty than to be in income poverty alone. This is the opposite situation for managers, whose rate of income poverty is already low, but who have an even lower risk of accumulating it with material and social deprivation. The difference in risk of material and social deprivation between workers, managers and the unemployed is therefore not solely due to differences in income between them.

From the point of view of family configuration, people living in single-parent families are over-represented in the accumulation of poverty, compared to income poverty alone. The fact that this type of family is more often in a situation of material and social deprivation than others, at equal equalized incomes, tends to suggest that, in measuring poverty, the equivalence scales commonly used underestimate the needs of single-parent families (Martin and Périvier, 2018).

Those results are confirmed using an alternative way of appraising the link between those socio-economic variables and material deprivations: a classification tree (Section C).

Compared to material deprivation alone, people accumulating both types of poverty have many similar characteristics: in particular, they are just as frequently blue-collar workers or living in single-parent families. On the other hand, the share of unemployed people is significantly higher among those combining income and material poverty, and the share of retired people is much lower.

Table 3: Effect of some characteristics on the probability of suffering material and social deprivation among those below the 60% income poverty line

	Term	Estimate	Odd-ratio	p-value
<b>Family type: Reference = Single adult</b>				
	Couple without children	-0.43	0.65	0.02**
	Single parent family	-0.28	0.76	0.08*
	Couple with one or two children	-0.50	0.61	0.01***
	Couple with three children or more	-1.09	0.34	0.00***
	Other type of household	-0.51	0.60	0.01***
<b>Occupation status: Reference = Service workers</b>				
	Farmers	0.02	1.02	0.97
	Independent craftsmen, merchants and directors	-0.47	0.63	0.05*
	Managers	-0.28	0.76	0.51
	Associate professionals	-0.24	0.79	0.26
	Manual workers	0.27	1.31	0.05**
	Retired	0.81	2.25	0.00***
	Other inactive	0.24	1.27	0.43
	Students	-1.63	0.20	0.00***
<b>Activity status: Reference = Employed, retired or student</b>				
	Unemployed	1.10	3.00	0.00***
	Other inactive	0.51	1.66	0.07*
<b>Housing status: Reference = Owner</b>				
	Tenant	0.20	1.22	0.10
	Free housing	0.10	1.11	0.72
<b>Financial assets: Reference = No assets</b>				
	First third	-0.24	0.79	0.02**
	Second third	-0.72	0.48	0.00***
	Third third	-1.55	0.21	0.00***
<b>Income bracket: Reference = 50-60%</b>				
	Less than 40%	0.60	1.82	0.00***
	40-50%	0.38	1.46	0.00***
<b>Loan repayment burden: Reference = No loan</b>				
	Not a burden	-0.07	0.93	0.67
	Slight burden	0.00	1.00	1.00
	Heavy burden	0.71	2.04	0.00***



Table 3: Effect of some characteristics on the probability of suffering material and social deprivation among those below the 60% income poverty line (*continued*)

	Term	Estimate	Odd-ratio	p-value
<b>Financial burden of housing: Reference = Not a burden</b>				
	Slight burden	0.88	2.40	0.00***
	Heavy burden	1.46	4.31	0.00***
<b>Limitations in activities due to health: Reference = None</b>				
	Limitations	-0.19	0.83	0.16
	Strong limitations	-0.32	0.72	0.07*
<b>Self-perceived health: Reference = Very good</b>				
	Good	0.43	1.54	0.01***
	Fairly good	0.51	1.66	0.00***
	Bad	1.38	3.99	0.00***
<b>Paris urban area: Reference = Not living in Paris</b>				
	Living in Paris	0.30	1.35	0.04**

*Note:* Age of the head of the household is included as a control, but not presented here.

## 5.2 Resources and difficulties

In addition to data on the employment or demographics of poor individuals, survey data also provide information on resources or expenses that allow for a more precise assessment of the standard of living, beyond disposable income.

Among people below the income poverty line, those in a situation of severe material and social deprivation are less likely to own their main residence and less likely to have financial assets. This is true for all other characteristics, especially at a given income (Table 3). This lack of real estate or financial assets partly explains why it is less easy to cope with deprivation. In particular, people with substantial financial assets are much less frequent in cumulative deep poverty than in income poverty at the 40% threshold. People with the first half of financial assets represent 3 percent of those in cumulative deep poverty, compared to 6 percent of those in severe material and social deprivation and 17% of the income-poor at the 40% threshold.

For people who are poor in the income sense, all other characteristics being equal, having high housing costs or repayments significantly increases the risk of being in material and social deprivation. People who have low or bearable credit repayments are less likely to be in material and social deprivation than those who have no repayments at all. Interestingly, the above model has been tested with debt ratios and housing effort rates, and subjective measures are much more correlated to the risk of being in material and social deprivations than objective ones. This suggests that the effective cost and the disposable income are not the only factors that make a burden “bearable”, and that the subjective assessment is more important than the

effective ratio when determining deprivations.

People living in a household where the reference person assesses their health status as poor or very poor are two to four times more likely to be in cumulative poverty than in income poverty alone. All other things being equal, among people in income poverty, a deteriorated health status of the reference person in the household, whether assessed subjectively or through the presence of functional limitations or a chronic disease, is very significantly associated with being in a situation of material and social deprivation.

Having repayment credits or functional limitations due to health may be indicative of additional burdens that are not included in the equivalized income measure. Thus, for a given income, people who face these are more likely to be in material deprivation. The cumulative deep poverty indicator therefore selects these people first.

The more difficult socio-economic situation of people in poverty can also be measured by a set of subjective indicators. For example, adult respondents to the SILC survey are asked to rate their satisfaction with their current life and financial situation on a scale of 0 to 10 (0 = most dissatisfied and 10 = most satisfied). Similarly, they are asked how easy it is to “make ends meet,” with possible responses grouped into five modalities representing increasing difficulty, the last being “can’t make it without going into debt.”

All of the subgroups affected by at least one of the poverty types report life satisfaction, and especially financial satisfaction, at a much lower level than the rest of the population (Figure 9). Among the different poverty groups, it is the people in income poverty only who declare on average a higher score (7.2 on average against 7.5 for those experiencing neither income poverty nor material and social deprivation, and 6.2 against 7.1 concerning the financial situation). The choice of the income threshold has no impact on the average satisfaction reported.

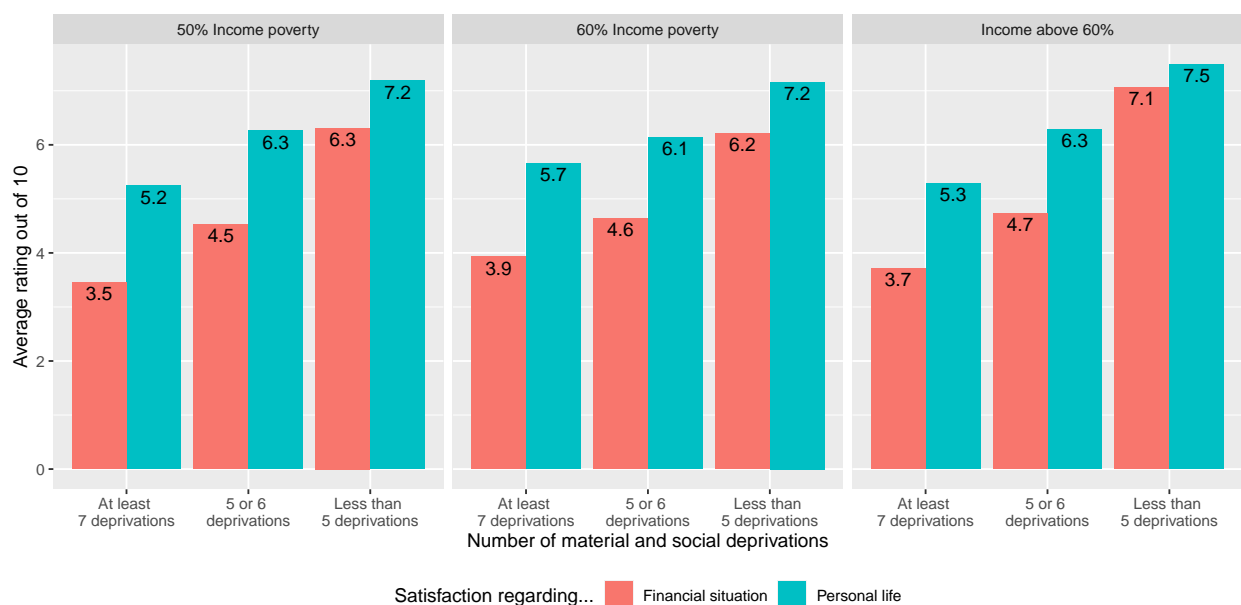


Figure 9: Life and financial satisfaction according to poverty status

People in situations of material and social deprivation report lower life satisfaction, and the threshold is important here: people in situations of severe material and social deprivation report a significantly lower average than those with between 5 and 6 deprivations at most.

People in deep cumulative poverty thus report lower satisfaction than other poor people in the income sense, but similar to those in material and social deprivation (5.2 for those with both income and severe material deprivation, and respectively 5.7 and 5.3 for those in severe deprivation but whose income is respectively less than 60% and greater than 60% of the median): the addition of income poverty does not reduce their satisfaction.

This gap between income poverty and material and cumulative poverty is even more important in terms of satisfaction with the household’s financial situation. While people with a low equivalized income declare an average satisfaction of 6.2 (6.3 for the 50% threshold) when they are not in a situation of material and social deprivation, people in a situation of material and social deprivation declare a satisfaction of between 4.5 and 4.7 depending on their income bracket, and those in a situation of severe material and social deprivation declare an average of up to 3.5 for people in a situation of cumulative poverty.

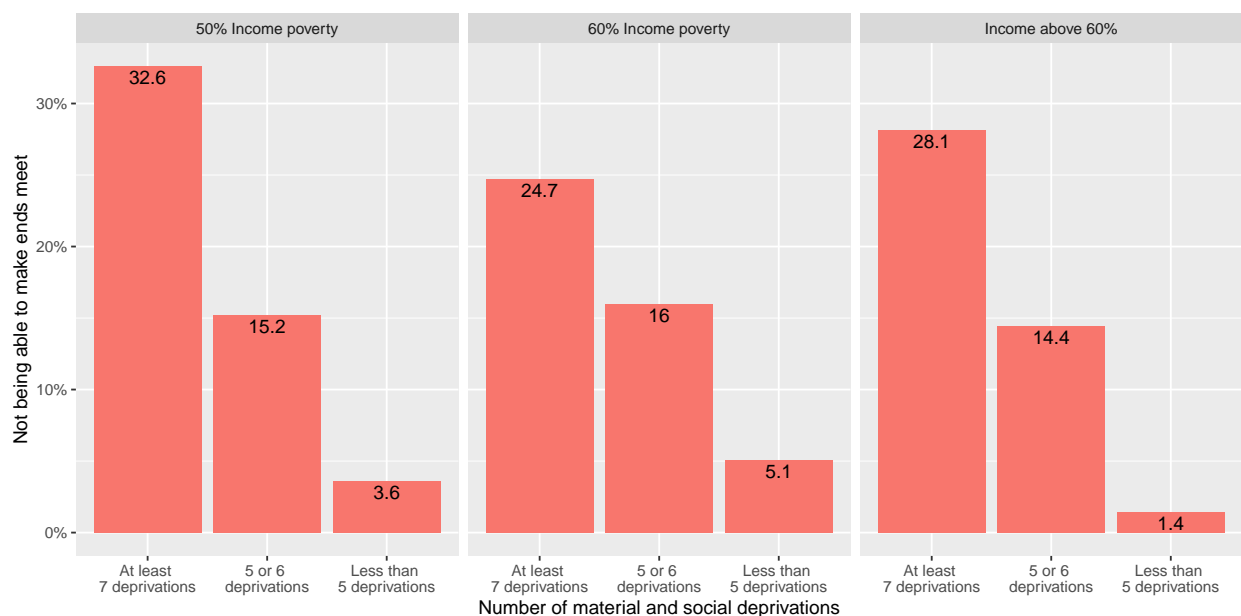


Figure 10: Share of people not able to make ends meet by poverty group

These same results are found when we look at the ability to “make ends meet” (Figure 10). People whose equivalized income is below the 60 percent threshold are much more likely to say that they “cannot make ends meet without incurring debt” than the rest of the population (between 3.6 percent and 5.1 percent of those who are not materially and socially deprived, depending on their equivalized income, compared to 1.4 percent of the rest of the population). On the other hand, among the populations that combine income poverty and material and social deprivation, the proportion of people who cannot manage without incurring debts is even higher than among the rest of the people living below the income poverty line, and reaches its

maximum for people in a situation of cumulative deep poverty (33%).

In conclusion, people who experience both income and material poverty are more often unemployed than people who experience only one of the two types of poverty, and they more often live in single-parent families. They are more often manual workers, in poor health and with heavy repayment or housing costs than people who are only in income poverty, and less often students, self-employed or with real estate or financial assets. On the other hand, they are less likely to be retired and more likely to be unemployed and, by definition, have a much lower equivalized income than the rest of the materially and socially deprived. These specific (lack of) resources and difficulties result in a more degraded situation as measured by subjective indicators of well-being or financial difficulties.

The fact of targeting, among poor people, those who suffer material and social deprivation, thus allows us to focus on a sub-section of the population that suffers more intense poverty.

### 5.3 Persistence of situation

Moreover, these people experience more lasting poverty: among people below the income poverty line, those who are also in a situation of severe material and social deprivation remain in poverty longer than others.

To measure whether indicators reflect persistent poverty, one cannot compare indicators that represent too different proportions of the population. This is because more inclusive indicators are inherently more likely to be persistent than more restrictive indicators (see [Section B](#)).

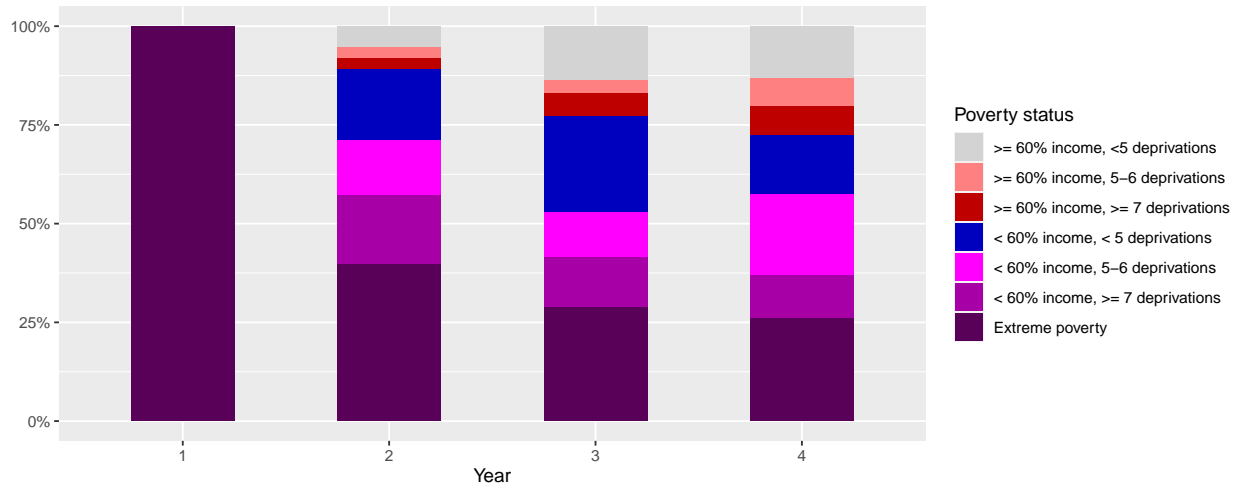
To assess the persistence of situations associated with the different forms of poverty, it is therefore necessary to look at all the subsequent poverty states of individuals. This avoids the possibility that the threshold by which individuals' poverty trajectories are assessed changes as one moves from one poverty group to another.

Thus, among those who were in 50% income poverty and severe material and social deprivation, 26% are still in this situation three years later ([Figure 11](#)). 73% of them are in income poverty at 60% (regardless of the number of deprivations), and 46% in severe material deprivation (regardless of their income). 13% experience neither income poverty nor material and social deprivation.

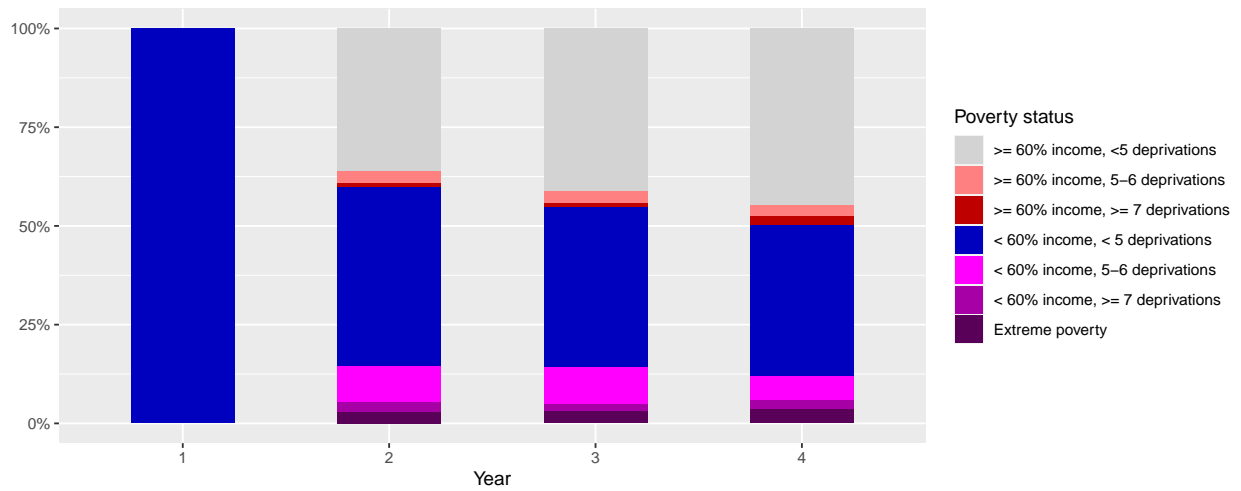
Individuals who experience a combination of income poverty and material deprivation, although relatively unlikely to remain in the most severe versions of these conditions, are nevertheless very likely to remain in at least one form of poverty. Compared to the 60% of all poor people in the income sense, almost half (43%) are no longer in income poverty three years later, so one third (34%) are not in material and social deprivation either.

[Table 4](#) uses a synthetic indicator to compare the persistence of poverty states: for each poverty subgroup in T0, we measure the probability of remaining at least 3 years out of 4 in each type of poverty.

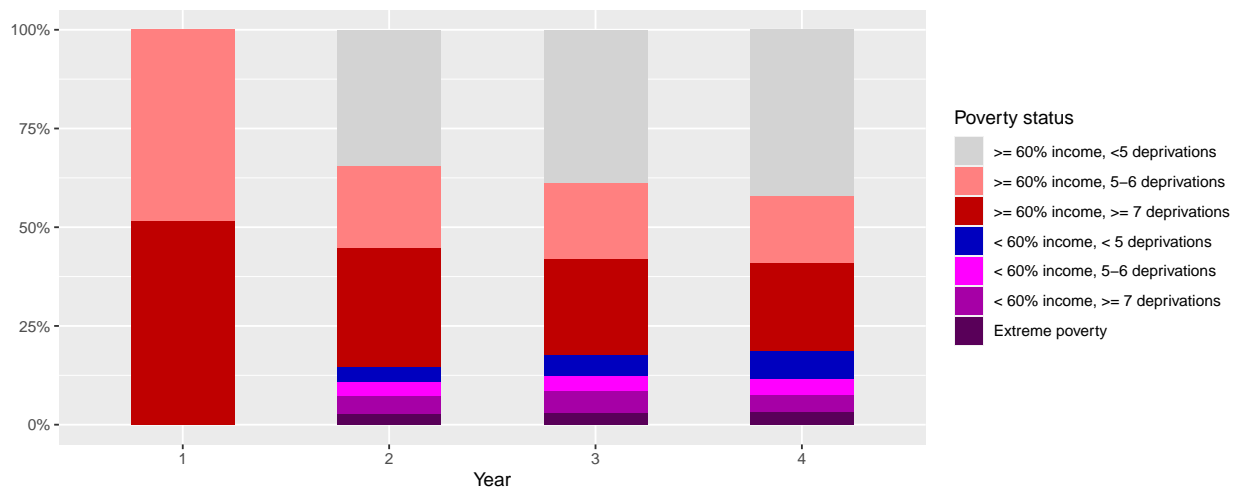
The states that give the highest risk of remaining 60% poor in the income sense for at least three years out of four (last column of the table) are, firstly, the states that combine income and material poverty, whatever the thresholds chosen, then the states of income poverty, then the states of material and social deprivation



(a) Deep poverty in Year 1



(b) Income poverty (and < 5 deprivations) in Year 1



(c) Material and social deprivation (and > 60% median income) in Year 1

Figure 11: Subsequent poverty states depending on state in year 1

Poverty status in T0	Probability of staying at least 3 out of 4 years in...				
	Deep poverty	Material and social deprivation	Severe material and social deprivation	50% income poverty	60% income poverty
< 50% median income ≥ 7 deprivations	29	71	49	59	84
< 50% median income 5 or 6 deprivations	1	49	5	45	71
< 50% median income < 5 deprivations	1	5	1	44	66
50-60% median income ≥ 7 deprivations	2	81	56	7	73
50-60% median income 5 or 6 deprivations	0	52	6	2	61
50-60% median income < 5 deprivations	0	4	1	5	47
> 60% median income ≥ 7 deprivations	0	72	48	2	8
> 60% median income 5 or 6 deprivations	0	41	7	1	5
> 60% median income < 5 deprivations	0	1	0	0	1

Table 4: Probability of staying at least 3 years out of 4 in poverty for each subgroup

(without income criteria). However, people in cumulative deep poverty are no more likely to remain in a situation of severe material and social deprivation than others.

People who combine income poverty and material and social deprivation are more likely to remain in income poverty than those who are not in material and social deprivation. Being in material and social deprivation thus reinforces the persistence of income poverty. This is not due to the fact that people who experience both types of poverty have a lower initial equivalized income than those who experience income poverty alone. Indeed, among people living below the 60% income poverty line, the median equivalized income of those who are also in a situation of severe material and social deprivation is 11,071 euros, compared to 11,136 euros for all the income poor. Using a regression model similar than in [Table 3](#) including longitudinal elements, we confirm that, all other characteristics being equal, being in material and social deprivation increases the probability of remaining in income poverty for several years.

The link between persistence in income poverty and material and social deprivation status is confirmed by the fact that people who have lived in income poverty for several years in previous years are more likely to be in material and social deprivation. This had already been noted in the European ECHP data by [Whelan, Layte, and Maitre \(2003\)](#).

People in cumulative deep poverty are thus, among those who are poor according to one or other of the criteria, those who have the most deteriorated socio-economic situation (absence of non-monetary resources,

burdens, low subjective well-being), and also those who remain the longest in poverty situations.

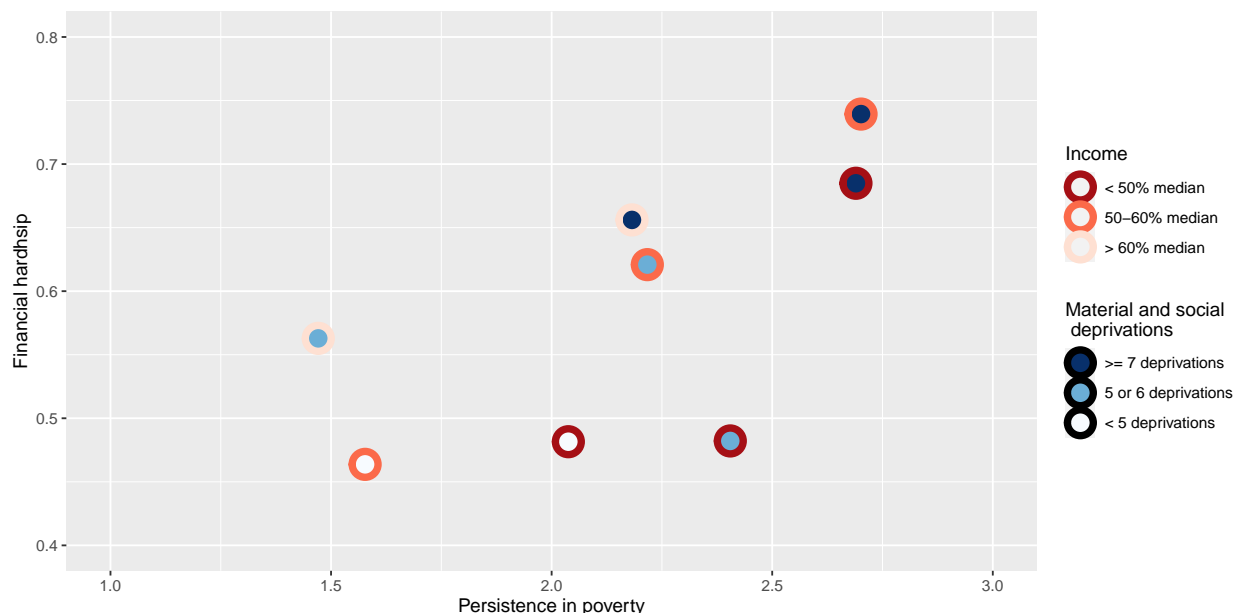


Figure 12: Summary of persistence in income poverty and frequency of self-assessed economic hardship according to poverty group

## 5.4 The European overview of deep poverty

The international data from the European EU-SILC system allows us to measure the prevalence of deep poverty in ordinary housing in the different countries of the European Union (EU) by applying a harmonized definition. In this situation, the poverty line is the national poverty line, at 50% of the median living standard of the population. It therefore varies from country to country. The list of 13 deprivations is the same, however, as is the threshold of 7 out of 13 deprivations to be considered in a situation of severe material and social deprivation.

Like the rates of income poverty and material and social deprivation, the share of the population in deep poverty varies greatly across the EU (Figure 13). The share of the population in deep poverty, i.e., combining these two poverty situations, varies from 10 percent in Romania to less than 1 percent in Finland, the Czech Republic and Slovenia, among others. France is in a median position, at 1.9%: of the 28 EU countries, 14 have a lower rate of deep poverty.

This is mainly due to France's material and social deprivation rate, which is in the middle position among EU countries. Moreover, as the range of material and social deprivation rates is higher than that of income poverty rates, the countries with the lowest share of the population in both poverty situations (mainly in Northern Europe) are also those with the lowest material and social deprivation rates. For these countries, the share of the population in deep poverty is almost zero. Conversely, countries such as Romania or Bulgaria, where severe material and social deprivation is very common, have high rates of deep poverty.

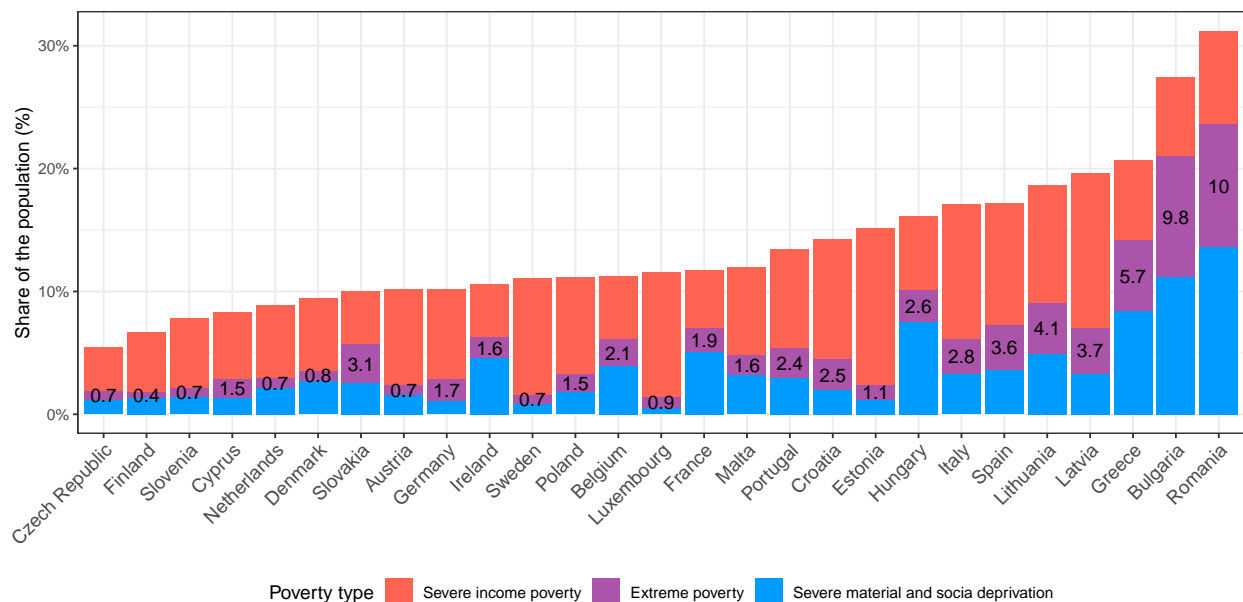


Figure 13: Share of income poverty, material deprivation and cumulative deep poverty in the European Union

The cumulative indicator of deep poverty thus has a hybrid nature that takes on a particular meaning in the case of international comparison. The list of material and social deprivations is the same for all countries, and aims to measure whether or not people can access a certain basket of goods and services considered necessary for a decent life in the European Union. In this respect, the people affected by these deprivations in the different countries share similar living conditions.

The income poverty line, on the other hand, depends on the median equivalized income of the national population, and is therefore different from one country to another. Taking into account price differences between countries, the equivalized income threshold to be considered as income poor in France is, for example, four times higher than in Romania and a quarter lower than in Luxembourg. The people affected by income poverty in the different countries do not therefore have a common equivalized income, but share the characteristic of having an equivalized income significantly lower than the equivalized income in their country.

The populations identified by deep poverty in the different countries of the European Union thus share two characteristics. The first is a characteristic of exclusion: their income places them in a marginal position in relation to the rest of the population of their country. The second is deprivation: what these people have in common is that they cannot access a common basket of goods and services because of their financial resources.

Due to the annual dissemination of the EU-SILC surveys, this indicator can be used to measure the evolution of deep poverty over time. Some work remains to be done on the impact of crises such as the COVID-19 pandemic and lockdowns on this measure of poverty. Recent work shows that household budgets generally appear to be less constrained in early 2021. This may be due to the fact that leisure activities are



limited and therefore households do not report deprivation for financial reasons. Life satisfaction, however, has fallen dramatically (Gleizes, Legleye, and Pla, 2022). This highlights the need for multiple indicators to capture the impact of such events.

## 6 Discussion

### 6.1 Which thresholds to choose?

The above evidence shows that the cumulative indicator of deep poverty has advantages over the use of income poverty alone in several respects:

- it is better correlated with indicators of economic hardship, in particular unemployment, material deprivation or subjective measures of well-being;
- it has a smaller share of measured very low income profiles whose characteristics suggest that they would have other resources (students, self-employed, people with financial savings);
- it is characteristic of more durable poverty situations: people who are affected by both types of poverty remain longer in one or the other type of poverty.

While these elements show the relevance of crossing the income and material dimensions of poverty, one may wonder whether there are income and deprivation thresholds that are more relevant than others, the choice of these levels being necessarily conventional and partly arbitrary. Without giving a definitive justification to this question, this section documents the impact of choosing a severe definition of income poverty (50% of median income rather than 60%) and material and social deprivation (7 deprivations rather than 5).

The first effect of choosing different thresholds is to vary the share of the target population in the total population. In France, the cumulative indicators vary from 1.9% of the population to 5.6% depending on whether one takes the severe or ordinary versions of the income and material thresholds.

Material and social deprivation	Income poverty	
	50% threshold	60% threshold
Severe (at least 7 deprivations)	1.9	3.4
Ordinary (at least 5 deprivations)	3.1	5.6

Table 5: Share of the population by each income and deprivation threshold (% , France 2019)

In varying the income poverty line, a notable effect is the variation of the share of the unemployed population in the target indicator. Indeed, employed people are more likely to have incomes above the 50% threshold. In some countries, such as France, which provides an income floor for the majority of the retired population, lowering the income threshold also means lowering their share of the target population (see Section E). Apart from this, the socio-demographic characteristics of the individuals identified remain similar.

		Mean number of deprivations, excluding the baseline and...												
		Unexpec	Furnitur	Arrears	Tempera	Holiday	Meat	Car	Shoes	Money	Internet	Go-out	Leisure	Clothes
		ted	e		ture									
Baseline people affected by...	Unexpected		6.5	7.0	7.2	6.6	7.0	7.3	6.9	6.7	7.4	6.8	6.6	6.7
	Furniture	6.5		7.0	7.2	6.6	7.0	7.3	7.0	6.7	7.4	6.9	6.6	6.7
	Arrears	6.8	6.8		7.4	6.9	7.2	7.6	7.2	7.1	7.7	7.2	6.9	7.0
	Temperature	7.0	7.1	7.5		7.1	7.5	7.8	7.5	7.3	7.9	7.3	7.2	7.2
	Holiday	6.6	6.6	7.0	7.2		7.0	7.3	7.0	6.8	7.4	6.9	6.7	6.7
	Meat	6.9	6.9	7.3	7.5	7.0		7.7	7.3	7.1	7.7	7.2	7.0	7.1
	Car	7.2	7.2	7.6	7.8	7.2	7.6		7.6	7.4	8.0	7.5	7.3	7.4
	Shoes	7.0	7.0	7.5	7.7	7.1	7.5	7.8		7.2	7.9	7.3	7.1	7.1
	Money	6.7	6.7	7.2	7.3	6.8	7.1	7.5	7.1		7.5	7.0	6.8	6.8
	Internet	7.5	7.5	8.0	8.1	7.5	7.8	8.2	7.8	7.6		7.7	7.5	7.6
	Go-out	6.9	6.9	7.3	7.5	6.9	7.3	7.6	7.3	7.1	7.7		6.9	7.0
	Leisure	6.6	6.6	7.1	7.3	6.7	7.1	7.4	7.0	6.8	7.5	6.9		6.8
	Clothes	6.7	6.7	7.2	7.3	6.8	7.1	7.5	7.0	6.9	7.5	7.0	6.8	

Table 6: Mean number of deprivations according to baseline deprivation (among people suffering from a least 7 deprivations)

It is also not obvious how to define a material deprivation threshold that would define qualitatively different populations on either side of the threshold. From the perspective of equalized income and other characteristics, the clearest qualitative distinction is known to be between those who report no deprivation and those who report at least one (Bedük, 2018). Beyond that, the differences by number of deprivations are rather continuous. In the following, we show however that targeting individuals who accumulate the highest deprivations gives unity to the target population insofar as these individuals almost all share the most frequent ones.

One must first note that, if there is indeed a hierarchy between the different material and social deprivations in terms of prevalence in the population, it is not the case that those who suffer the rarest deprivations all suffer the most common deprivations first. In fact, among people experiencing severe material and social deprivation, those who suffer the rarest deprivations do not have a higher average number of deprivations, and a fortiori do not necessarily suffer all the more frequent deprivations.

Table 6 shows, among people in severe material and social deprivation, the mean number of deprivations suffered by people affected by one baseline deprivation, when excluding the baseline and one other deprivation at a time. For example, the average number of deprivations suffered by people affected by the baseline “cannot face unexpected expenses” deprivation is 6.5 when excluding the baseline and the “cannot afford replacing furniture” deprivation, 7.0 when excluding the baseline and the “have housing or credit arrears” deprivation, and 7.2 when excluding the baseline and the “cannot afford adequate temperature in house” deprivation (in yellow in the table).

In particular, the deprivation “unexpected expenses” is experienced by 98% of people experiencing material and social deprivation, and the deprivation “cannot afford internet” is experienced by 16% of them. However, apart from these two deprivations, the average number of deprivations experienced by people in situation of material and social deprivation who experience the deprivation “unexpected expenses” is 7.4, while it is 7.5 for people who experience the deprivation “internet” (in green in the table). Thus, people

who experience the very rare “internet” deprivation do not necessarily have a worse situation than those who experience the “unexpected expense” deprivation, one of the most common. In other words, among those experiencing material and social deprivation, the distribution of individuals’ deprivation scores is close to what it would be if the deprivations were distributed independently of each other.

However, some deprivations stand out from this point of view. For example, the deprivation “not being able to afford two good pairs of shoes” is associated with a relatively larger number of other deprivations, while the deprivation “being in arrears” is associated with a relatively smaller number of other deprivations.

Thus, among those experiencing at least 7 out of 13 material deprivations (i.e. a state of severe deprivation), there is indeed a common core of deprivations shared by all, but it is much smaller than 7. Almost all of these individuals experience the deprivations “unexpected expenses” and “vacation”, the following two most frequent deprivations (“furniture” and “leisure”) each affect more than 90% of the population, and 80% combine the four altogether. Beyond this common base of the most widespread deprivations, there is no clear hierarchy between material and social deprivations: they do not follow in the same order for all individuals.

In this paper, we have focused on the poverty indicator of a standard of living below 50% of the median, and at least 7 out of 13 material deprivations. As discussed earlier, the people identified by this indicator are those who are least likely to escape income poverty or material and social deprivation. Because of their income, they are in the bottom half of the income-poor population and are even more frequently unemployed than the others. While their material and social deprivations are diverse, they all have in common that they suffer the most common deprivations.

## 6.2 Reducing the mismatch between income and deprivations

In this section, we discuss whether the mismatch between income and material poverty can be reduced depending on the definition and coverage of income. More precisely, we propose extended definitions of income, which allow to strengthen the link with material deprivation.

As seen in the previous sections, there is a significant mismatch between the population with the lowest incomes and those with the highest deprivations. This discrepancy might be explained in part by missing elements in the definition of income, or by the existence of additional expenses or resources that result in different living conditions for the same income.

More specifically, poor people in the income sense may benefit from resources that are not taken into account in the measurement of income: ownership of one’s main residence, financial savings, assistance from other households, self-consumption. These elements may allow a household to escape material and social deprivation despite a low disposable income.

On the other hand, some households may face significant burdens, such as loan repayments, or additional costs due to their health status. We have shown in the previous sections that these factors increase the probability of being in a situation of material and social deprivation, all other things being equal (including equal income). Moreover, the equivalence scales used in the standard way seem to underestimate the needs

of single-parent families for these parts of the population.

In this section, we propose an adjusted definition of disposable income, which includes income items such as imputed rent received by owners of their main residence, as well as non-monetary income: benefits in kind, self-consumption. We also adjust for local cost of living, using local purchasing power parities calculated by [Carbonnier \(2022\)](#). We then measure the extent to which this adjusted definition of income reduces the mismatch between income and material poverty, by measuring the proportion of people in income poverty who are also among the most materially and socially deprived. Namely:

$$\begin{aligned} \text{Adjusted income} = c_{PPP} \times (\text{Disposable income} + \text{Imputed rents} \\ + \text{Self-consumption} + \text{In-kind income}) \end{aligned}$$

where  $c_{PPP}$  is the sub-national purchasing power parity coefficient from ([Carbonnier, 2022](#)), that is different for every region and level of urbanization of the territory. It is a way of accounting for different costs of life depending on those two parameters. The adjusted income is then equivalized in the same way as is done for disposable income.

In order to take into account elements that cannot be directly assimilated to income, such as the possession of financial savings, the payment of reimbursement charges, or the costs induced by a deteriorated state of health, we propose an even more extensive definition of income (“extended income”). To the adjusted income is added the “monetary” value of the different elements mentioned. This value is calculated using a logistic regression model on the probability of being in a situation of material and social deprivation: the monetary value of each of these elements is thus equal to the amount of income necessary to equal its effect on the probability of being in material and social deprivation.

In order to do that, a regression model on the probability  $p$  of being in material and social deprivation is calculated, with independent variables being income, the level of financial savings<sup>6</sup> (discretized in five bins), health measured by self-assessment and by limitations, activity status (employed, self-employed, retired, unemployed, inactive), family type (single-parent family, single, couple, couple with kids). The following equation is estimated:

$$\log\left(\frac{p}{1-p}\right) = \alpha \log(\text{Adjusted income}) + \beta_S \text{Savings} + \beta_H \text{Health} + \beta_A \text{Activity} + \beta_F \text{Family}$$

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<sup>6</sup>The variables in which respondents estimate the value of their financial wealth are not included in the harmonized EU-SILC questionnaire, but rather in a specialized module of the French questionnaire.

Therefore, we can define an extended income<sup>7</sup> as:

$$\text{Extended income} = \text{Adjusted income} \times \exp\left(\frac{\beta_S \text{Savings} + \beta_H \text{Health} + \beta_A \text{Activity} + \beta_F \text{Family}}{\alpha}\right)$$

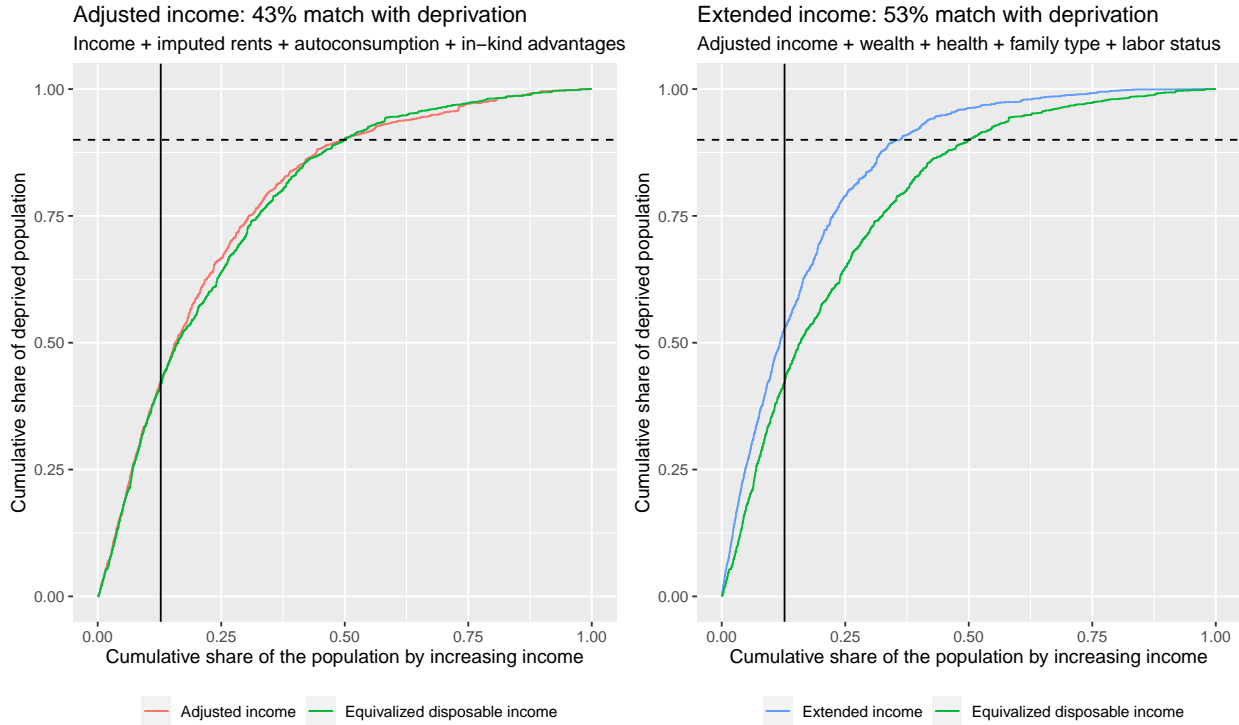


Figure 14: Intersection between lowest incomes and highest deprivations following definition of income

The mismatch between income and material poverty persists to a very large extent, even when adjusted by the local cost of living, income through imputed rent, self-consumption and benefits in kind. One reason for this is that the share of homeowners is relatively low in this part of the population, and the other two types of income are relatively rare or in small amounts. The mismatch is reduced by only 1 percentage point (Figure 14).

If we add the value of the various non-monetary elements mentioned above, the mismatch decreases much more significantly: 11 percentage points. Health in particular has a very strong impact.

Even if we assign a monetary value to the elements that can vary the utility associated with income, there is still a large part of the mismatch between the lowest income and the greatest material and social deprivation. This suggests that the presence of material and social deprivation cannot be explained simply by differences in household income. It is also possible that inter-household support is underestimated in income surveys. In particular, a large share of young people’s income comes from parental assistance: the amount

<sup>7</sup>Note that ranking individuals by this Extended income is the same as ranking them by the value of the linear predictor of the regression equation above. Expressing this as an extended income allows to interpret the “monetary value” of these different variables, with regards to the probability of being in material and social deprivation.

of this assistance measured by the survey is all the more important the more detailed the questionnaire is, as can be seen by comparing the amount of assistance provided to young people measured in the ENRJ survey (which is a survey dedicated to the income of the young) with that provided in the SILC survey. In particular, it appears that the use of administrative sources on income overestimates the income poverty rate of young people by 5 points on average, compared to a survey that includes a detailed questionnaire on parental assistance (Marteau et al., 2023).

Another possible explanation to the mismatch could be that the assessment of one’s own deprivation may vary from one individual to another. There is some degree of subjectivity in this assessment, as noted in Pan Ké Shon (2015). It is also worth noting that subjective assessments of the weight of housing or credit are much better correlated with material and social deprivation than actual measures of effort rate or debt ratios (Table 3). If we believe that at least some fraction of this subjective variability is undesirable because it does not inform on the individual’s actual situation, then it would be another argument for not using material and social deprivations alone as an indicator of poverty, and for imposing an income restriction, as long as one aims at a poverty indicator that is sufficiently correlated with economic factors.

However, it may also be the case there are other determinants to material and social deprivations than what can be captured by such economic measures. Indeed, budget constraints can arise from discrepancies between the time income is received and the time necessary expenses are due (Morduch and Schneider, 2017). It may very well be the case that households answer that they “cannot afford” something despite having the necessary income or savings at the moment, simply because they anticipate future difficulties, and feel they need to prepare for them. This specific relation with future and time is highlighted by Papuchon and Duvoux (2019), who note a discrepancy between self-perceived and income-based measures of poverty, and interpret the former as an indicator of “lasting social insecurity”.

## 7 Conclusion

We have shown that the material and social deprivations associated with low income allow us to identify a more vulnerable fraction of the population. The people targeted by these indicators constitute a subgroup of income poverty in the classical sense, and the socio-economic difficulties experienced by these people are more intense and more lasting. In this sense, we can speak of an indicator of deep poverty.

These two dimensions of poverty reinforce each other: adding a criterion of material deprivation to the criterion of income poverty not only increases the correlation with other external indicators of vulnerability, but also increases the duration of income poverty itself. The income measure, on the other hand, is not sufficient to identify those who suffer the most intense and persistent forms of poverty. It therefore seems necessary to use both dimensions together.

This proposed indicator of deep poverty can be used as a complement to the usual measure of poverty: it defines a sub-section included in poverty in the income sense, and the size of this sub-section can be

monitored over time and compared from one country to another, as is the case at the European level with income poverty.

The present work, while focusing on the bottom part of the income distribution, also provides some insights into the rest of the population. Indeed, the analysis of the joint distribution of material deprivation and income highlights the fact that the zone below which a loss of income is associated with a higher probability of deprivation starts quite high in the income distribution, and in most countries above the median. Thus, the zone of “vulnerability” to deprivation is much wider than the zone of poverty itself.

Moreover, the analysis of deep poverty in the cumulative sense excludes all populations that meet one of the two criteria without meeting both. If the present analysis shows that a partial measure of income for certain categories of the population may be the cause of the mismatch, it is important to question the fraction of the population that suffers a large number of material and social deprivations without living below the income poverty line. These populations are probably subject to specific difficulties or needs that require attention without being dismissed as having too high a measured income. Should we define another type of vulnerable population, the so-called “highly constrained budgets”?

In general, the difficulty of reconciling income and material measures of poverty points to an important line of research. The study of the distribution of material and social deprivation reveals a continuum that is highly correlated with, but does not exactly mirrors the distribution of income. It seems necessary to clarify why these measures differ, and to what extent they can be reconciled, so that informed choices can be made about which indicators to use.

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# Appendix

## A Comparison of populations between SILC surveys and the population census

With the exception of Luxembourg and France, SILC surveys cover more than 98% of the national population in all EU countries. In France, this is due to the fact that the overseas territories of Guadeloupe, Martinique, French Guiana and Reunion are not included in the survey. In each country, the missing part of the population is mainly made up of people who do not live in individual dwellings.

Country	SILC	Population Census	Ratio
Austria	8,652,285	8,822,267	0.98
Belgium	11,241,426	11,398,589	0.99
Bulgaria	7,062,605	7,050,034	1.00
Cyprus	860,478	864,236	1.00
Czech Republic	10,384,504	10,610,055	0.98
Germany	81,010,774	82,792,351	0.98
Denmark	5,730,396	5,781,190	0.99
Estonia	1,304,309	1,319,133	0.99
Greece	10,542,856	10,741,165	0.98
Spain	46,182,803	46,658,447	0.99
Finland	5,427,885	5,513,130	0.98
France	63,375,027	67,026,224	0.95
Croatia	4,064,395	4,105,493	0.99
Hungary	9,609,413	9,778,371	0.98
Ireland	4,860,657	4,830,392	1.01
Italy	60,239,812	60,483,973	1.00
Lithuania	2,808,901	2,808,901	1.00
Luxembourg	576,957	602,005	0.96
Latvia	1,911,538	1,934,379	0.99
Malta	467,291	475,701	0.98
Netherlands	16,932,312	17,181,084	0.99
Poland	36,894,291	37,976,687	0.97
Portugal	10,291,027	10,291,027	1.00
Romania	19,577,005	19,533,481	1.00
Sweden	10,117,667	10,120,242	1.00
Slovenia	2,016,211	2,066,880	0.98
Slovakia	5,352,011	5,443,120	0.98
United Kingdom	65,479,666	66,273,576	0.99

Table A.1: Coverage rate of SILC surveys compared to total population

## B Persistence of indicators of different sizes

It is difficult to compare the persistence of poverty indicators that cover very different sizes of the population. In general, the larger the share of the population covered by a poverty indicator, the smaller the proportion

of people who move out of poverty from one year to the next. This greater persistence of the most “inclusive” forms of poverty does not necessarily mean that these forms of poverty are more marked or compromise the chances of individuals improving their situation in the future. Rather, it is a mechanical effect due to the fact that the larger the share of the population covered by an indicator, the less likely it is that an individual will escape.

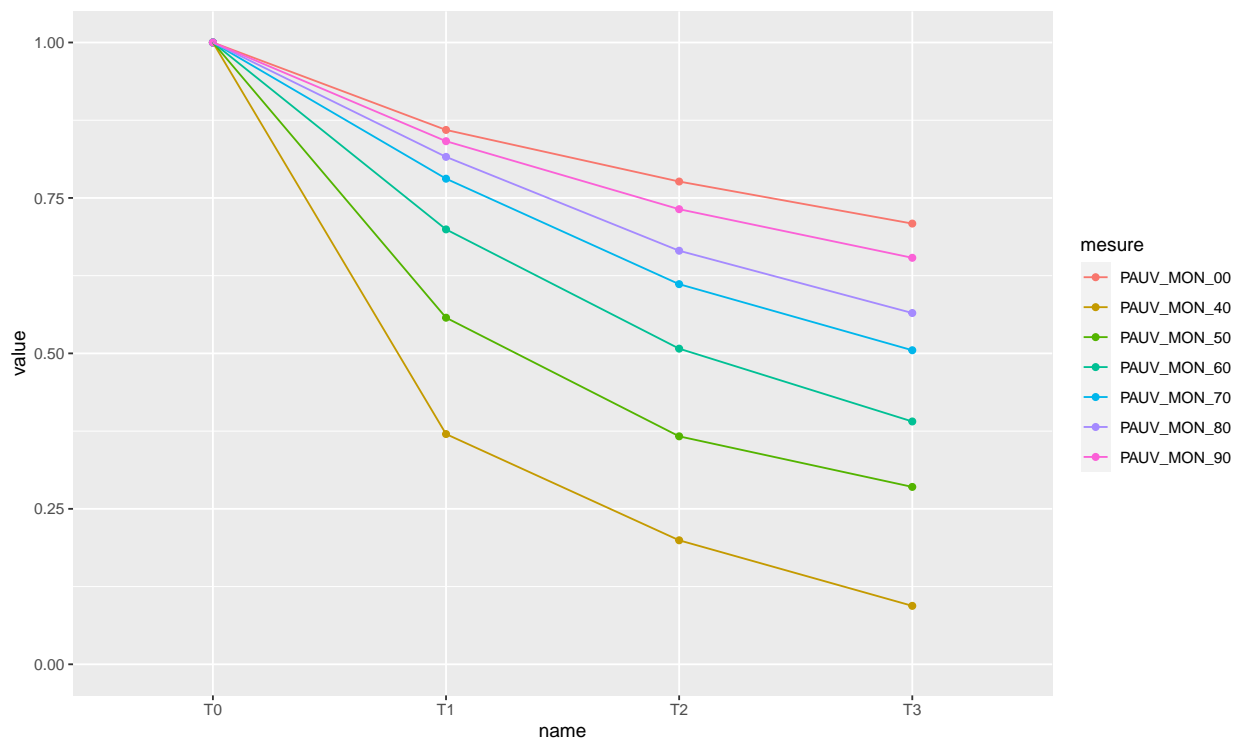


Figure B.1: Share of people staying continuously below the poverty line, by threshold

For example, 71% of people whose equivalized income was below the median in 2015 remained continuously below the median in 2016, 2017, and 2018, while 40% of people whose equivalized income was below the 60% poverty line in 2015 remained below that line in 2016, 2017, and 2018.

This mechanical effect is large enough that we cannot compare the persistence over time of two different poverty indicators, if the indicator that covers the largest share of the population is also the one from which one exits the least frequently. On the other hand, if the indicator that is exited from the least frequently is the one that covers the smallest share of the population, then we can conclude unambiguously that this form of poverty is more persistent.

## C Classification of the poor using classification trees

As a complement to the logistic model presented in Table 3, one can use a partition tree to get a sense of the different subgroups of poverty in terms of material and social deprivation.

Given a sample of individuals, a dependent variable, and a set of independent variables, one can build a decision tree to best predict the value of the dependent variable. Here, the goal is to use socio-demographic and economic variables about people in income poverty to determine whether they suffer from material and social deprivation. The process of choosing the best possible decision tree<sup>8</sup> will reveal interesting associations between the independent variables and the dependent variable.

We present in [Figure C.1](#) the result of a recursive partitioning based on the same variables used in [Table 3](#). Only the most informative variables are shown, according to a trade-off between complexity of the tree and predictive power (see [Therneau, Atkinson, and Foundation, 2022](#), for a description of how this trade-off is implemented). This decision tree consists of 16 classes that differ in their average rate of material and social deprivation. For example, the first group consists of individuals:

- who report a financial burden of housing as "not a burden" or "a slight burden".

*and*

- whose occupational status is "Farmers", "Business owners", "Managers", "Intermediate" or "Students".

This group has an average material deprivation rate of 0.12 and represents 18% of the population of the sample of people in income poverty.

The groups in red color are those where material and social deprivation is the most prevalent. For example, the group who reports that the financial burden of their housing is a "Heavy burden" and who are unemployed or inactive represents 14% of the sample, and their average material and social deprivation rate is 0.79.

This confirms several of the results of the logistic regression. First, the most important variable is a rather subjective one: it is a qualitative assessment of the “burden” of housing expenses. Second, occupations and activity statuses play a major role, in particular the fact of being unemployed. Third, the role of income (below the poverty threshold) is ambiguous. It appears as a decision rule within a subgroup, and being under the threshold of 43% of the median income actually *decreases* the probability of being in material and social deprivation.

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<sup>8</sup>There is actually no algorithm that can efficiently find *the* optimal decision tree, but some algorithms, such as the one used here, provide good enough second-best, i.e., locally optimal solutions.

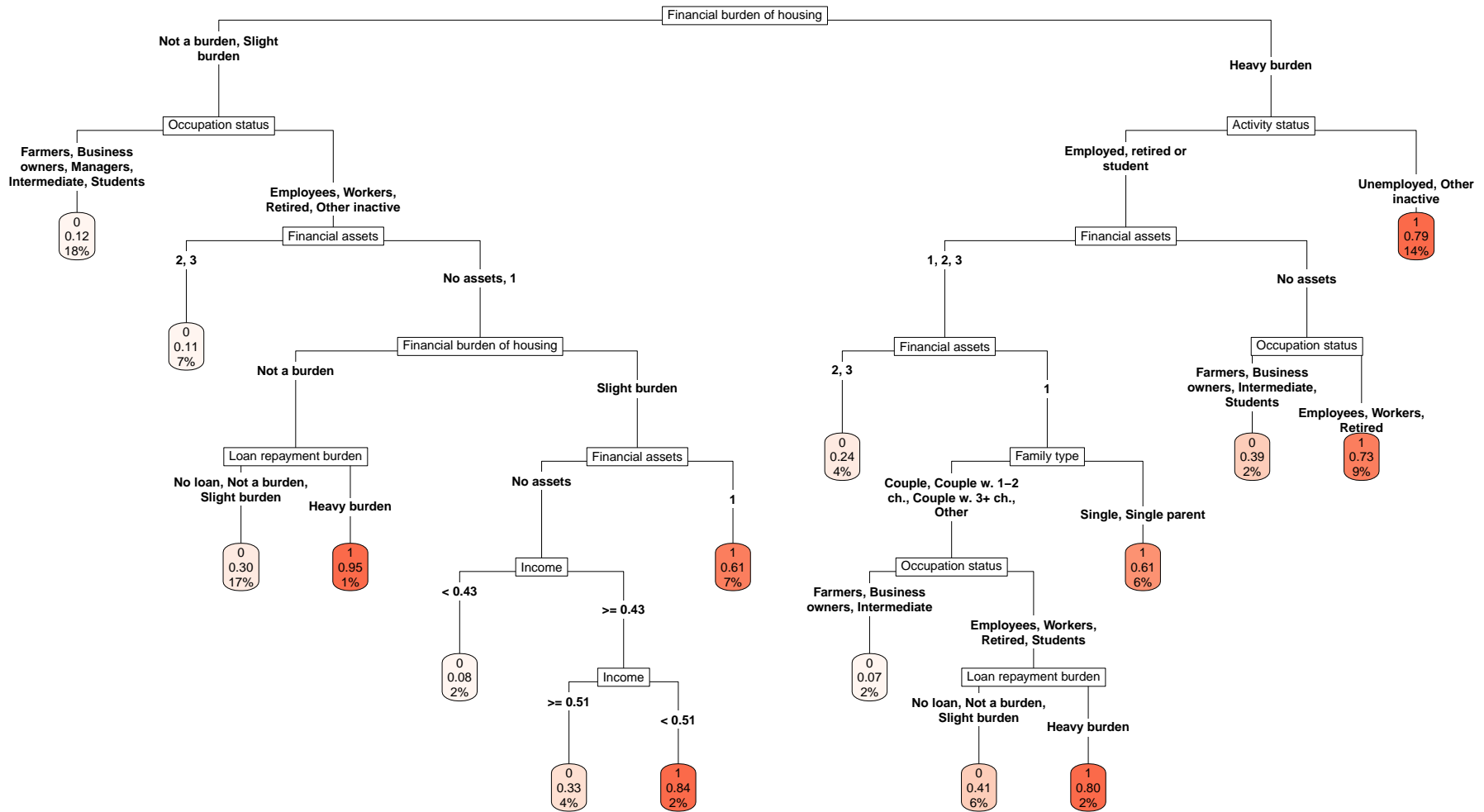


Figure C.1: Classification using a regression tree

## D Deep poverty in non-ordinary households

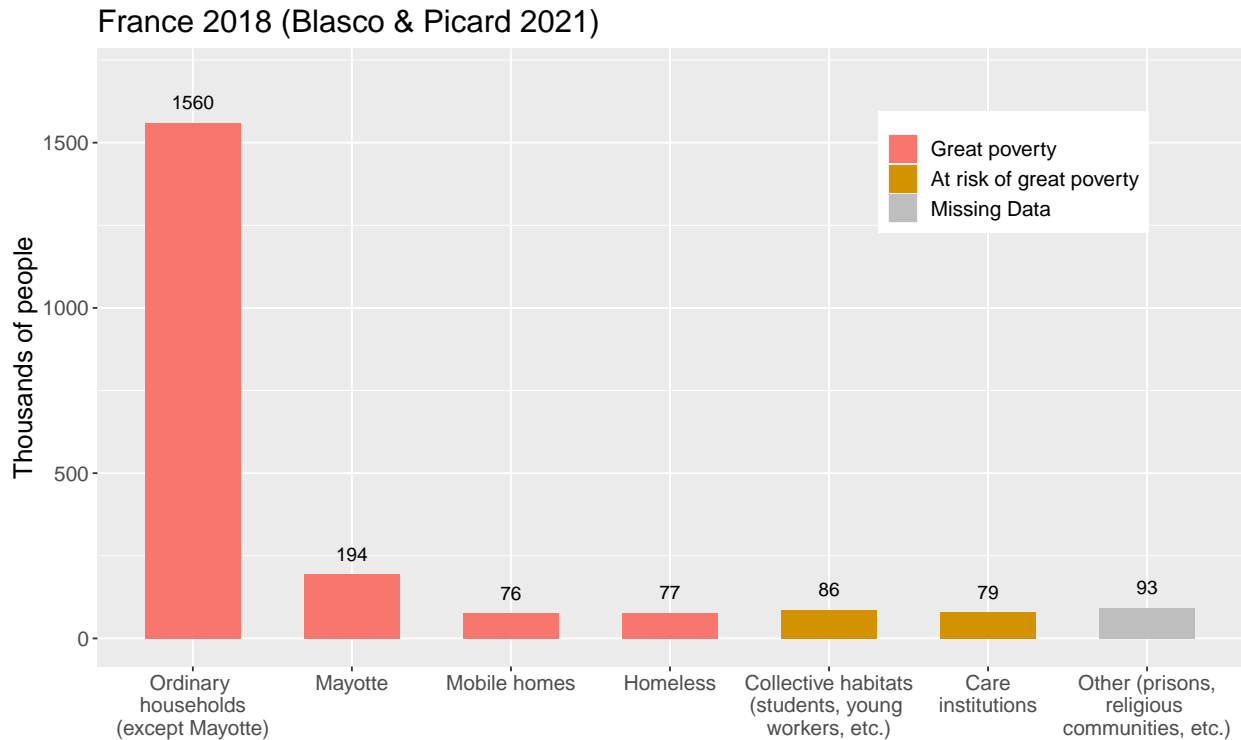


Figure D.1: Headcount of deep poverty including people not living in ordinary households (France 2018)

To supplement the information obtained from ordinary households, other statistical sources can be mobilized (population census, surveys in collective establishments, surveys of recipients of minimum social benefits, etc.). In France in 2018, ordinary households represent at least 80% of people in deep poverty, outside of Mayotte<sup>9</sup> (Blasco and Picard, 2021). Half of the remaining 20% are homeless or living in confirmed economic hardship in mobile homes, and half are living in collective housing and in severe income poverty, but whose living conditions cannot be observed in surveys (young workers' hostels, ehpad, etc.).

These proportions may vary between countries depending on the prevalence of non-ordinary housing situations, in particular the proportion of the population living without shelter. However, the order of magnitude confirms that measuring deep poverty with household surveys allows us to capture the largest share of deep poverty in the sense described above.

## E The impact of the monetary poverty line in France

A significant proportion of people in situations of material and social deprivation (severe or ordinary) have an equivalized income above the poverty thresholds of 50% and 60% of the median. In France, among the

<sup>9</sup>Here Mayotte is counted separately, as income and living conditions in this territory differ greatly from that of the rest of France.

people in a situation of ordinary material and social deprivation, 12% even have a equivalized income above the median.

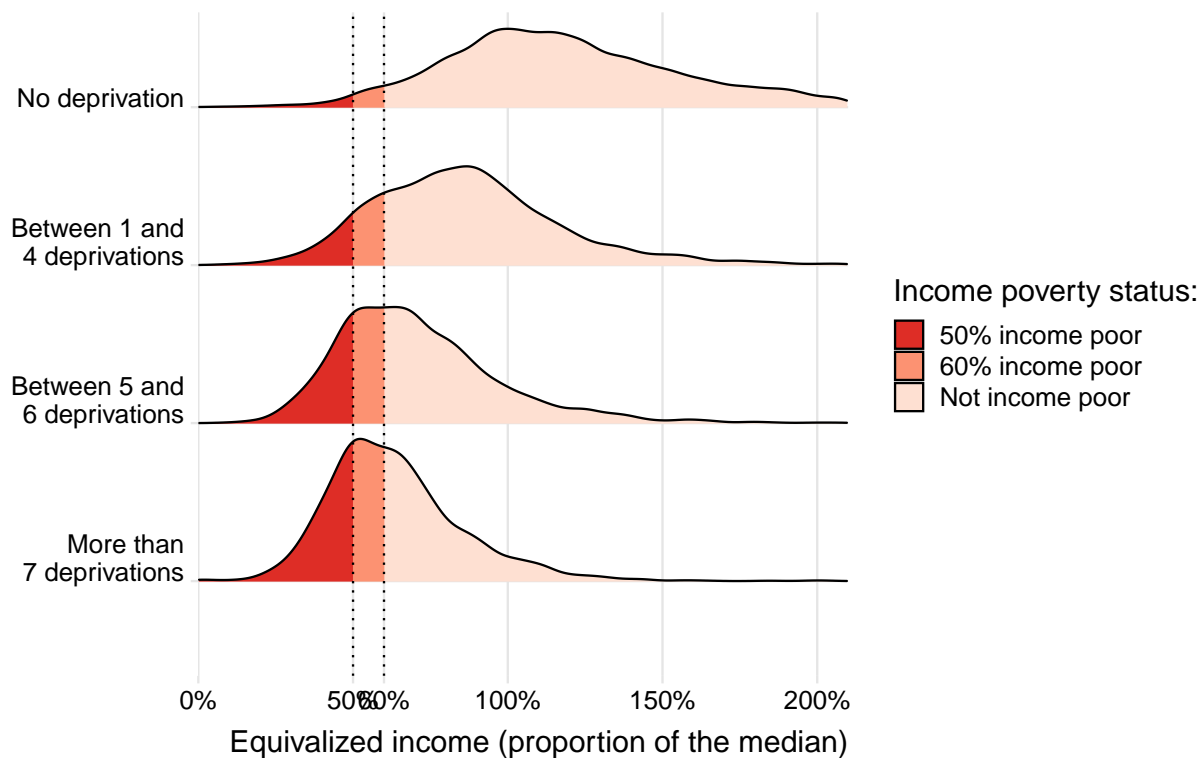


Figure E.1: Income distribution by deprivation level (France 2019)

It is these profiles whose presence in the target population will be affected by the choice of monetary threshold. In particular, the choice of the monetary poverty line has an important implication on the proportion of seniors and retirees who will be identified by the indicator. Indeed, in France, these people have a narrower distribution of income, especially at the lower end of the income scale: the proportion of retirees whose equivalized income is below 60 percent of the median is much lower than in the rest of the population, and even lower below the threshold of 50 percent of the median.

It is all the more important to keep this in mind that retirees have a material and social deprivation rate that is significantly higher than their income poverty rate: while their income poverty rates are much lower than those of the rest of the population, their material and social deprivation rates are close to the rest of the population. As a result, in the case of France, imposing an income threshold results in a significant proportion of retirees whose equivalized income is above the poverty line, but who may still suffer significant material and social deprivation, being removed from the indicator's target.





Figure E.2: Density of equivalized income for retired and non-retired



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