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Abstract

In this paper, following the literature on well-being, we propose an aggregate measure of employment deprivation among households that is increasing in the incidence of household unemployment (how many households are touched by the lack of employment of any of its members), its intensity (how far are households on average from being employment non-deprived), and inequality of employment exclusion across households (how concentrated is unemployment in a few of them). Based on this measurement framework, we analyze employment deprivation across the European Union using Labor Force Surveys during the current Great Recession. Our results provide evidence for the relevance of incorporating the household dimension in identifying unemployment profiles with different implications in terms of household well-being and vulnerability.

Keywords: employment deprivation, unemployment measurement, vulnerability, European Union.
JEL Classification: D30; D63; I31, J64.

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Introduction

The current great economic depression that hit the developed world in recent years has brought massive unemployment back to the US and several countries in Europe, with an even higher incidence for certain subpopulations such as young people, migrants or the low skilled, as well as for specific regions within these countries. Following EUROSTAT figures, the unemployment rate in the EU-27 raised from 7.2 to 9.7% between 2007 and 2010, and the youth unemployment rate increased from 15.7 to 21.1%, being both phenomena particularly large in Spain, Ireland, Greece and the Baltic countries (Estonia, Latvia and Lithuania).[1]

One of the issues that have raised most attention during this process has been the severity of the hit of unemployment on households so as to completely exclude many of them from the labor market. For example, in Spain, the country with the highest unemployment rates in Europe (20 per cent in 2010, second quarter), the publication of an estimate of the number of workless households has become a better proxy of the severity of unemployment on the population than the individual unemployment rate itself. In the same line, the *Europe 2020 strategy* has made official the use of two indicators of exclusion from the labor market: the share of persons (children aged 0-17 years and persons aged 18-59 years) who are living in jobless households, and the share of population (aged below 60 years) living in households with very low work intensity (i.e., households where the working age members work less than 20% of their total work potential).

Within a welfare framework, the relevance of integrating the household dimension when it comes to the measurement of unemployment should not come as a surprise, as there is a wide consensus in income distribution analysis that society's well-being cannot be assessed on an individual basis without a reference to the global situation of the household. The employment of households' members is the main source of regular income and social inclusion for the majority of the population. Thus, exclusion of an individual from the labor market not only affects her directly, but also the rest of

[1] Similarly, the European Commission (2010a) underlined that the unemployment rate for non-EU nationals is more than 11 percentage points higher than for nationals and that the low skilled have experienced a much more severe increase in unemployment in recent years: twice of that experienced by the high skilled.

individuals cohabiting in her household, as they will suffer the lack of resources and any additional behavioral problem that potentially comes along with experiencing a long spell of unemployment. Clearly, households with higher rates of unemployed adults become significantly more vulnerable to future shocks and to their consequences, such as illness, evictions, foreclosures, more expensive credits, family breaks, unsocial behavior, fewer opportunities for their children, etc. For this reason, a household member's unemployment increases economic insecurity for the whole household.[2]

Thus, it should not be surprising that, in an international comparison, OECD (2001) does not find a significant correlation between aggregate unemployment and poverty rates and still, there is a largely significant effect of the number of working individuals in the household as an explanatory variable of any individual poverty outcome. This strengthens the idea that the solid association identified at the micro-level between higher household employment and a lower risk of poverty is weaker at the macro-level.

In this line, the OECD Employment Outlook 2009 says: "In virtually all countries, the poverty rate among jobless households is more than double the rate observed among working households. […] This is especially the case in countries such Australia, Canada, Ireland, Korea and the United States, where more than half of individuals living in jobless households are poor (against 37% on average in the OECD area)." Besides, "for most of the working poor, underemployment is the major problem" (OCDE, 2009: 167). Consequently, the higher the unemployment rate of a household, the more dependent all household members become from any employed members keeping their jobs or receiving social benefits. This is a crucial point in countries within the Mediterranean welfare system, in which the family net usually covers the lack of State mechanisms that could provide the necessary protection against economic shocks.

In this paper we propose to measure the level of households' employment deprivation making use of the methodological framework developed in the literature focused on the measurement of well-being. Therefore, for any given population we propose to

[2] The literature about the penalties of unemployment is profuse (see, for example, Sen, 1997). The relation between workless household status and poverty, mental health in the family, or children's well-being is also discussed, for example, in Nickell (2004), Dew (1991), Pedersen *et al.* (2005) and Lindo (2011). Clearly, "The implications of risky events, and the insecurity they produce, are also partly determined by the social obligations of individuals. The economic insecurity felt by parents is, for example, only partly due to the anxiety about their personal futures, as compared to their worries about the fate of their dependent children. Hence, adding it all together, the impact of changes in a given dimension of security can be very different, for individuals in different contexts" (Osberg, 1998: 34).

construct an aggregate measure of employment deprivation among households that takes into account the incidence of household unemployment (how many households are touched by the lack of employment of any of its members), its intensity (how far are households on average from being employment non-deprived), and inequality of employment exclusion across households (how concentrated is unemployment in a few of them). We believe that an aggregate measure of employment deprivation should be increasing, *ceteris paribus*, in each of these three elements.

For this purpose, we propose to quantify households' employment deprivation based on the way other indicators aiming to measure the lack of well-being are constructed. In particular, our proposal follows a similar path to that of Foster-Greer-Thorbecke's family of indicators in measuring poverty analysis in a cross-section of individuals (Foster *et al*., 1984), recently extended further to a panel by Gradín *et al.* (2012). In this same line Shorrocks (2009b) broadens the measurement of unemployment accounting for duration.

Our empirical analysis will consist in using this setting to analyze employment deprivation across the European Union making the most of the information contained in the European Labor Force Surveys for different years (2007-2009) and countries. Our aim here will be to ascertain to what extent incorporating the household dimension of unemployment changes the unemployment profiles and trends, particularly in those countries most strongly affected by the recession. Also, it would be of great interest to analyze to what extent the three dimensions in which the aggregate index is decomposable are also relevant, from an empirical point of view, in explaining the extent to which employment deprivation is more or less concentrated in certain households.

The structure of the paper is as follows. The first section presents the literature that has focused on measuring employment deprivation at both individual and household levels. The second section details the relevant properties an employment deprivation index should satisfy. The third section introduces a new aggregate employment deprivation index that is consistent with these relevant properties. In the fourth section we apply the new measure in an empirical exercise undertaken for a large number of EU member countries for illustrative purposes. The last section summarizes the main contribution of the paper.

1. Measuring employment deprivation: the individual and household level

Official unemployment rates are usually a matter of political and academic discussion due to the set of value judgments involved in their estimation. First, it is necessary to define the whole set of conditions that a person must verify to be considered "unemployed". Following Sen (1976) terminology on poverty measurement, Shorrocks (2009b) denotes this first step as the "identification problem". Given that many public unemployment benefits are directly associated to the results of this stage, it is easy to understand its importance. Thus, for example, the change in the definition of unemployment introduced by the European Commission in 2000 reactivated the discussion in the EU about the convenience of dropping passive job seekers from unemployment registers (see Garrido and Toharia, 2004).

Once the labor force status of individuals has been determined, the second step, the "aggregation problem", must solve how to aggregate individual information into an overall unemployment measure. The usual way to do it is to sum up all those individuals classified as unemployed and calculate the unemployment rate as the percentage of individuals who are unemployed out of all classified as active (thus employed or unemployed). However, this is not the only way to proceed and this measure may not necessarily be the best unemployment index possible. A number of studies have tried to enlarge the temporal bandwidth of this measurement by incorporating the history of individuals' unemployment experiences into it. Indeed, Paul (1992), Riese and Brunner (1998), Borooah (2002), Sengupta (2009), and Shorrocks (2009a,b) added a longitudinal dimension to the static view captured by the unemployment rate in a similar way to what is commonly done in other social welfare measurements: individuals' lifetime unemployment is aggregated using a function that reflects society's preferences for equality in individuals' employment deprivations. With this purpose, they not only considered the relevance of average unemployment duration on the individual unemployment experience but also took into account the dispersion in the distribution of spell lengths in time, punishing spells of longer duration.

Surprisingly, there is a very limited amount of research on searching for the appropriate measurement of unemployment at the household level. The above approaches are based on explicit welfare frameworks where unemployment is viewed as a "bad" (in a similar

way to how monetary poverty and material deprivation are viewed), but all of them use individual-based unemployment measures.[3] However, the use of unemployment measures that do not take into account the "household dimension" is probably one of the reasons that explain why its correlation with poverty rates has strongly decreased since the mid-eighties.[4] Indeed, the individual unemployment rate appears to suffer from serious limitations as an indicator of the most relevant employment conditions for low income households. In contrast, the proportion of workless households or the intra-household distribution of unemployment can be key factors in order to explain the evolution of the poverty rate or household vulnerability.

Further, Gregg, Scutella, and Wadsworth (2010) have aimed to reconcile observed differences between workless measures at the individual and household level identifying the sources of these divergences. Understanding this requires delving deeper into both the household formation and dissolution processes and analyzing the evolution of the employment distribution across households. In particular, they showed that the increasing trend in polarization of employment across households, mainly observable in two-adult households, is the most important reason in order to explain the divergences between individual and household worklessness in five large countries up to mid-2000.

In this paper, we are not interested in identifying these differences but in proposing a scheme that allows us to build aggregate unemployment measures based on household deprivation in the access to employment. This will allow us to establish a more direct relation between unemployment and social exclusion since individuals that are vulnerable to social exclusion because they cohabit in households with very low work intensity can then be included in the unemployment measure. In any case, our family of indexes is flexible enough to incorporate the standard unemployment rate and several workless household rates as particular cases, depending on the values chosen for the index's parameters.

In a first step, we propose to calculate, for each household, an employment deprivation indicator. This indicator could be, for example, the proportion of economically active

[3] Among the few exceptions of unemployment measures that take into account the household dimension, Berloffa and Modena (2011), in the context of constructing aggregate indices of economic well-being, have proposed a new measure of household economic insecurity (the inactive-unemployed dependency rate), which is defined as the average number of inactive individuals in the household that depend on the unemployed ones.

[4] See Blank (1993, 2000), Haveman and Schwabish (2000) and Meyer and Sullivan (2011) among others.

households' members who are unemployed. This is equivalent to calculating the household unemployment rate. Alternatively, a more accurate measure could also account for the actual number of hours worked by household members relative to the number of hours they are willing to work, thus taking into consideration that part-time workers who are seeking a full-time job (and full-timers working below their desired hours) are also part-time unemployed. In this case, the identification problem can be solved including as unemployed not only the officially unemployed individuals but also those workers who are underemployed given their willingness to increase their number of hours of work. In constructing this indicator we can also set a threshold below which a household would be considered as employment deprived (for example, working 20% of potential hours) and above which it would be considered as employment non-deprived. Choosing different thresholds would allow us to measure a variety of employment exclusion concepts depending on the degree of unemployment severity.

In a second step we propose to aggregate these household indicators for the whole target population (households with at least one economically active person), in a way that is consistent with other measures of well-being. Thus, the aggregate measure should be increasing in incidence, intensity and inequality of households' unemployment experience. This means that the aggregation problem is solved within a welfare framework that includes a social preference for equality. We propose to construct this aggregate deprivation index based on the Foster-Greer-Thorbecke's family of poverty measures that satisfy all desirable properties, and also additionally satisfy decomposability into all three components of employment deprivation, and among different population subgroups, which is obviously very appealing for any empirical analysis. In this vein, we borrow the strategy followed by Shorrocks (2009b) and Gradín *et al.* (2012).

2. Relevant properties in the measurement of employment deprivation among households

2.1 Preliminary notation

Consider a society consisting of N households where at least one member is an economically active individual (i.e., she is a working-age individual available to work). Each active household i is composed by H_i individuals. Let $\boldsymbol{g}_i^{\gamma} = \left(g_{i1}^{\gamma}, g_{i2}^{\gamma}, ..., g_{ij}^{\gamma}, ..., g_{iH_i}^{\gamma} \right)$

be the raw vector of individual employment gaps for household *i*, whose elements are given by:

$$g_{ij}^{\gamma} = \begin{cases} \left(\dfrac{\bar{h}_{ij} - h_{ij}}{\bar{h}_{ij}} \right)^{\gamma} & \text{if } \; h_{ij} < \bar{h}_{ij} \;\text{ and }\; j \in \Theta_i \\ 0 & \text{otherwise,} \end{cases} \tag{1}$$

where parameter $\gamma \geq 0$; $h_{ij} \geq 0$ is the number of working hours of individual *j*; $\bar{h}_{ij} > 0$ is the individual working hours threshold (that is, the number of working hours she wishes to work, the usual number of hours or the potential number of hours)[5]; and Θ_i is the set of employment deprived individuals (who are either unemployed or underemployed[6]) in household *i*.[7] If we define Θ_i as the set of officially unemployed workers in household *i*, $\Theta_i \equiv \Theta_i^u$, then $g_{ij}^{\gamma} = 1$ for each one of them (assuming that $h_{ij} = 0$), and $g_{ij}^{\gamma} = 0$ for the remaining household members. However, if Θ_i also includes employed individuals that wish to increase their number of usual working hours (underemployed workers), $\Theta_i \equiv \Theta_i^{u,e}$, g_{ij}^{γ} quantifies the relative working hours gap (to the power of γ) for each unemployed or underemployed individual in the household. This means that for unemployed workers $g_{ij}^{\gamma} = 1$, but for underemployed ones, $0 < g_{ij}^{\gamma} < 1$ (since $g_{ij}^{\gamma} = \left(\dfrac{\bar{h}_{ij} - h_{ij}}{\bar{h}_{ij}} \right)^{\gamma}$, with $h_{ij} < \bar{h}_{ij}$).

A household employment deprivation index is a function, $u_i\left(\boldsymbol{g}_i^{\gamma}; \tau\right)$, that maps each employment gap profile $\boldsymbol{g}_i^{\gamma}$ into $\Re_+$ (where $\Re_+$ is the nonnegative real number set) for

[5] In the empirical exercise this threshold will be determined directly by the information on desired hours of work reported by the individual. However, in the case that one wants to incorporate any specific household labor supply model in which the household total number of working hours is jointly determined, the individually reported number of hours could be corrected accordingly in order to take into account the joint decision on hours and the degree of substitutability of individual labor supply between different household members.

[6] Underemployment is understood here as including those individuals who work less than the usual full-time hours while willing to work more and being available to do so.

[7] The normalization of individual employment gaps is not essential in our framework. Non normalized employment gaps could also be used.

a given household employment deprivation threshold, $0 \leq \tau \leq 1$.[8] Let $\boldsymbol{u} = (u_1, u_2, ..., u_i, ..., u_N)$ denote the vector of household employment deprivation indicators for the society, and $\tilde{\boldsymbol{u}} = (\tilde{u}_1, \tilde{u}_2, ..., \tilde{u}_i, ..., \tilde{u}_N)$ the ordered vector, where $\tilde{u}_1 \geq \tilde{u}_2 \geq ... \geq \tilde{u}_N$, being $q \equiv q(\boldsymbol{u})$ the number of employment deprived households ($u_i > 0$).

An aggregate household employment deprivation index is a function $U(\boldsymbol{u})$ which maps each vector of household employment deprivation indicators, $\boldsymbol{u}$, into $\Re_+$. The value of $U(\boldsymbol{u})$ represents the aggregate employment deprivation level of a particular society, considering each household employment gap.

Given that $U(\boldsymbol{u})$ is constructed in two steps, in order to discuss the desirable properties of the aggregate household employment deprivation index, we need, in a first stage, to discuss the desirable properties of the household employment deprivation index $u_i(\boldsymbol{g}_i^\gamma; \tau)$.

2.2 Desirable properties of a household employment deprivation indicator

Since household employment deprivation is a "bad" just like poverty is, it is reasonable to assume that $u_i(\boldsymbol{g}_i^\gamma; \tau)$ should satisfy the equivalent *continuity*, *focus*, *monotonicity*, *scale invariance*, *anonymity*, *regressive transfer*, and *replication invariance* axioms that are usual in the standard poverty measurement case.

In our employment deprivation framework, the *continuity axiom* requires that $u_i(\boldsymbol{g}_i^\gamma; \tau)$ is a continuous function of $\boldsymbol{g}_i^\gamma$ for any given τ. The *focus axiom* requires that any increase in working hours of non-deprived individuals should not affect the household employment deprivation. Accepting this property implies assuming that it is not possible to compensate hourly gaps of an employment deprived individual with an

[8] This threshold allows the researcher to set a minimum degree of employment deprivation that a household should have to be considered deprived. In particular, if the value of the threshold is 0.5 a household will be counted within the deprived if, for instance, half of all active household members are unemployed or if all active members are employed but work half the number of working hours wished. This threshold allows to easily focus the analysis on severe deprivation.

excess of hours of a non-deprived individual within the same household. Unlike the case of income, in which it is generally reasonable to assume households pooling their members' earnings, we agree with Jahoda, (1979: 423) in that there are several reasons to believe that employment is much more than earning a living[9]. Note, however, that we are only measuring here involuntary unemployment, so when a person is out of the labor market as the consequence of any within-family agreement, as an inactive person, she will not be considered employment deprived. Thus, the *focus axiom* situates the individual as the subject of the unemployment phenomenon, while a forthcoming axiom on transfers between household members will allow us to take into account the unemployment circumstances of other members of her household when measuring the household employment deprivation.

The *monotonicity axiom* requires that a decrease in the hours of any employment deprived individual should lead to an increase in the measured level of household employment deprivation. Assuming the *regressive transfer axiom* implies that a transfer of working time from a deprived individual towards another household member who is less deprived (with a lower g_{ij}^{γ}) would always increase the household employment deprivation indicator. This axiom is another consequence of the individual nature of employment deprivation but within the household framework discussed above. It is not only the dimension of the total household working hours gap that has to be considered when measuring employment deprivation, also its distribution among deprived household members is important.

The *scale invariance axiom* requires that if for each individual in the household both the individual working hours' threshold and her working hours are scaled up or down by the same factor the household employment deprivation level should remain unchanged. Accepting the *anonymity axiom* implies that permutations of employment gaps, g_{ij}^{γ}, between individuals within the same household would not affect the household

[9] "First among them is the fact that employment imposes a time structure on the waking day. Secondly, employment implies regularly shared experiences and contacts with people outside the family. Thirdly, employment links an individual to goals and purposes which transcend his own. Fourthly, employment defines aspects of status and identity. Finally, employment enforces activity. It is these objective consequences of work in complex industrialised societies which help us to understand the motivation to work beyond earning a living; to understand why work is psychologically supportive, even when conditions are bad, and, by the same token, to understand why unemployment is psychologically destructive." Quotation borrowed from Osberg (1998).

employment deprivation indicator. Finally, the *replication invariance axiom* implies that the household employment deprivation indicator remains unchanged under *r* replications of the original members of the household.

In the particular case in which the individual employment gap, g_{ij}^{γ}, is a dichotomous variable that can only take values 0 (non-deprived) or 1 (deprived), as in the case of the standard official definition of unemployment, all previous axioms are reduced to three: *anonymity*, *replication invariance* and an additional axiom related to the particular characteristics of the unemployment framework, *increasing proportion of employment deprived individuals axiom* that implies that if there is an increase in the number of deprived individuals within the household, the household employment deprivation indicator will increase.[10]

2.3 Desirable properties of an aggregate household employment deprivation index

In the second stage an aggregate household employment deprivation index $U(\boldsymbol{u})$ is defined to be a function of household employment deprivation indicators, u_i, reflecting society's preference about the distribution of household employment deprivations. Again, it seems reasonable to require *U* to be consistent with the following properties of poverty measures.

The *continuity axiom* requires that the *U* index is a continuous function of u_i. *Monotonicity axiom* imposes that *U* increases whenever there is an increase in u_i. The *anonymity axiom* implies that the *U* index remains unchanged after whichever permutation of u_i for a given population of households. The *replication invariance axiom* requires that the *U* index remains unchanged under *r* replications of the original population of households, thus allowing for the comparison of the level of employment deprivation in populations of different sizes.

Finally, the *preference for unemployment equality among deprived households axiom* requires that *U* decreases whenever there is an equalization of u_is. This is the equivalent to the Pigou-Dalton principle of transfers used in the inequality and welfare analysis, and commonly required in the measurement of poverty in line with Sen

[10] Note, here, that when the individual employment gap is a dichotomous variable, employment deprivation will always be equally distributed among deprived household members.

(1976). This property in our case can be formalized as follows. Let $\boldsymbol{u}$ and $\boldsymbol{u'}$ be two vectors of household employment deprivation indicators. If $\boldsymbol{u'}$ is obtained from $\boldsymbol{u}$ such that there are two households i and l so that:

$$u_i > u'_i > u'_l > u_l; \quad u'_i + u'_l = u_i + u_l; \quad u'_s = u_s \quad \text{for all } s \neq i,l;$$

where, at least, household i is employment deprived, $u_i > 0$, then $U(\boldsymbol{u'}) < U(\boldsymbol{u})$.

We consider this set of axioms as the minimum requirement for an aggregate household employment deprivation index. Obviously, satisfying other properties could be of interest. For instance, we could require the index to be normalized, to range between zero and one, or to be additively decomposable by population subgroups.

2.4 Properties of the official unemployment rate

The official unemployment rate can be understood as an index that aggregates unemployment first within the household and then among the population. In both cases, this is done by calculating the mean. Following the previous notation, firstly it quantifies the household unemployment rate:

$$u_i(\boldsymbol{g_i}) = \frac{1}{H_i^A} \sum_{j=1}^{H_i^A} g_{ij} \quad \text{if } j \in \Theta_i^u \ ,$$

and secondly, it aggregates these indexes across households:

$$U(\boldsymbol{u}) = \sum_{i=1}^{N} u_i \ \frac{H_i^A}{\sum_{i=1}^{N} H_i^A} \ ,$$

where H_i^A is the number of economically active individuals in household *i*. In the first case, the sum within the household is not a problem according to our desired properties. Indeed, the official unemployment rate satisfies the three axioms we require for the household employment deprivation index in the case of considering that the individual employment gap, g_{ij}^{γ}, is a dichotomous variable 0/1 constructed using the information on the labor status of active individuals, 1 if unemployed and 0 if employed. However, when aggregating among the population this measure does not allow taking into account the degree of concentration of unemployment in some households. Indeed, the

unemployment rate satisfies all the axioms that are desirable for the aggregate index, except that related to the preference for employment deprivation equality among deprived households.

In the next section, we propose a family of indexes that allows considering the preference for equality in employment deprivation among households in the population and also generalizes the measurement of unemployment to the case of a continuous variable of individual employment gap. In our case, we will consider satisfying all axioms mentioned above in the construction of household employment deprivation indicator.

3. Measuring employment deprivation among households

3.1 The aggregate household employment deprivation measure

Our main aim in this paper is to propose an unemployment index, U, that places the information about household employment deprivation in the core of the measurement. In order to do this, in a first stage we define the household employment deprivation indicator, u_i, as being a modified *FGT* index. Thus:

$$u_i(\boldsymbol{g}_i^{\gamma};\tau)=\begin{cases}\dfrac{1}{H_i^A}\sum_{j=1}^{H_i^A} g_{ij}^{\gamma} & \text{if} \quad \hat{u}_i \geq \tau \\ 0 & \text{if} \quad \hat{u}_i < \tau\end{cases} \qquad (2)$$

where $0 \leq \tau \leq 1$ is a given household employment deprivation threshold, g_{ij}^{γ} is defined as in expression (1), H_i^A is the number of economically active individuals in the household *i*, and $\hat{u}_i$ is defined as:

$$\hat{u}_i = \frac{1}{H_i^A}\sum_{j=1}^{H_i^A} g_{ij}^{1} \quad .$$

If $\Theta_i \equiv \Theta_i^u$ in expression (1), $\hat{u}_i$ represents the share of officially unemployed individuals in household *i* (in relation with its total economically active individuals). If $\Theta_i \equiv \Theta_i^{u,e}$, $\hat{u}_i$ represents the share of the total working hours gap in the household (in relation with the maximum number of hours). Thus, $u_i\left(\boldsymbol{g}_i^{\gamma};\tau\right)$ is a function whose value

indicates the degree of employment deprivation of household i based on the household employment deprivation profile, $\boldsymbol{g}_i^{\gamma}$, given τ. A household with average employment deprivation below the threshold ($\hat{u}_i \leq \tau$) will not be identified as deprived, although some members could be unemployed or underemployed.

In a second stage, we construct the aggregate household employment indicator defined by:

$$U(\boldsymbol{u}) = \begin{cases} \sum_{i=1}^{N} u_i^{\alpha} \omega_i = \sum_{i=1}^{N} \left[\frac{1}{H_i^A} \sum_{j=1}^{H_i^A} g_{ij}^{\gamma} \right]^{\alpha} \omega_i & \text{if} \quad \alpha > 0 \\ \sum_{i=1}^{N} I(u_i)\omega_i & \text{if} \quad \alpha = 0 \ , \end{cases}$$

where parameter $\alpha \geq 0$, and $I(u_i)$ is an indicator function defined as,

$$I(u_i) = \begin{cases} 1 & \text{if } u_i > 0 \\ 0 & \text{if } u_i = 0 \ , \end{cases}$$

and ω_i is the weight associated to household *i*. If we are interested in giving all households the same weight, then: $\omega_i = \frac{1}{N}$. If we want to weight each household by its size, then we have at least two possibilities: $\omega_i = \frac{H_i}{\sum_{i=1}^{N} H_i}$ or $\omega_i = \frac{H_i^A}{\sum_{i=1}^{N} H_i^A}$. In the first case, ω_i includes all individuals belonging to households where there are active individuals with employment deprivation, and as a consequence, $U(\boldsymbol{u})$ attaches to each of these individuals the employment deprivation level of her household. This way of weighting in the calculation of aggregate household employment deprivation is the most consistent with a well-being approach, because it allows us to incorporate in the measurement of deprivation the experience of people who, even if out of labor market (i.e. children or other inactive individuals), their level of well-being is most likely to depend on the labor status of other household members they live with. In the second case, however, only active individuals in deprived households are involved in the measurement, providing us with the same framework in which unemployment is generally measured.

3.2 Interpreting the parameters γ, α and τ

$U(\boldsymbol{u})$ is actually a family of indexes which verify different properties depending on the values of two parameters: γ and α, provided $\tau < 1$.[11] In fact, different combinations of these parameters' values reflect different possible views of the unemployment phenomenon. Therefore, it is important to examine this issue in some detail.

If gamma takes a value equal to zero, $\gamma = 0$, all individuals affected by employment deprivation in the household contribute equally to the household employment deprivation indicator, regardless of their gap. Consequently, in this case the household employment deprivation indicator, u_i, measures employment deprivation incidence within the household (household-level head-count ratio). If gamma takes a value equal to one, $\gamma = 1$, the indicator is the mean household gap reflecting employment deprivation intensity in the household but avoiding taking into account how deprivation is distributed between household members. Finally, if gamma takes values over one, $\gamma > 1$, the indicator reflects the loss of household welfare when employment deprivation is concentrated in fewer household individuals. For example, if we have a household with two deprived adult members wishing to work 39 hours each, the indicator will be higher if one of them is deprived by only 1 hour a week and the other one is fully unemployed, than if both of them are deprived 20 hours (even if in both cases the household employment deprivation gap is 40 working hours)[12]. This parameter gamma captures the sensitivity of the household employment deprivation indicator to the variability in the employment gap of those household members that are employment deprived. Obviously, in the case that the gap is a dichotomous variable, 0/1, by definition there will be no variability in the deprivation measure among the deprived and the particular value of gamma becomes irrelevant.

Once u_i has been calculated, the index $U(\boldsymbol{u})$ aggregates each household employment deprivation indicator to the power of alpha. An alpha value equal to zero, $\alpha = 0$, measures the incidence of household employment deprivation across the population

[11] Note that if $\tau = 1$ the index is invariant to different values of γ or α because in this case, by construction, employment deprivation is equally distributed among the deprived both within and across households ($g_{ij}^{\gamma} = 1,\ u_i = 1$).

[12] Ignoring this fact could have strong welfare implications in countries in which one specific group, such as women or young people, are systematically more employment deprived than others.

(aggregate head-count ratio). In particular if the population over which we aggregate is households ($\omega_i = \frac{1}{N}$) then the measure is the proportion of households in the population with at least one employment deprived individual. Alternatively, in the case we aggregate across all individuals in the population ($\omega_i = \frac{H_i}{\sum_{i=1}^{N} H_i}$) then the measure is the proportion of individuals living in households with at least one employment deprived individual. Similarly, if we use $\omega_i = \frac{H_i^A}{\sum_{i=1}^{N} H_i^A}$, the proportion refers to all economically active individuals. A value of alpha equal to one, $\alpha = 1$, not only considers incidence but also the intensity of employment deprivation in the households. For example, in the case we aggregate across economically active individuals ($\omega_i = \frac{H_i^A}{\sum_{i=1}^{N} H_i^A}$) and g_{ij}^{γ} is defined as a dichotomous variable following the official classification of unemployment then when alpha is equal to one the measure is the conventional unemployment rate. Alpha values over one, $\alpha > 1$, reflect a social preference for equality in employment deprivation between deprived households. Let us consider, for example, a society with two households, each consisting of four economically active adults, with a total of four individuals fully unemployed. Aggregate employment deprivation will be higher if one of the households has three unemployed and the other one has only one, compared with the case in which each household has two unemployed. This is so because employment deprivation is unevenly distributed across households in the former case but equally distributed in the latter.

The index, as presented so far, takes into account all employment deprived households in the population. However, in welfare analyses there is a large concern for intensely deprived households. Indeed, the literature on economic inequalities devotes special attention to extreme poverty or material deprivation. There is no reason why this should not apply to the analysis of unemployment. In fact, in trying to evaluate the social impact of unemployment, statistical offices offer a variety of indicators of workless households. In our framework, $U(\boldsymbol{u})$ incorporates the sensitivity to extreme employment household deprivation when α takes a high value. However, if we aim to calculate a measure of more severe deprivation we can define an employment

deprivation threshold over cero, $\tau > 0$, such that only those households that are most deprived (those with $\hat{u}_i > \tau$) are included in the measurement.[13]

3.3 The relationship between our proposal and other measures which are sensitive to household employment deprivation

One of the advantages of our framework is that it encompasses some of the previous measures used in several official reports that are interested in identifying those households who remain outside or are at the margin of the labor market. Indeed, the Europe 2020 Strategy includes two measures directly related to our family of indexes among the Social Cohesion Indicators: "Population in jobless households" and "People living in households with very low work intensity".

The first indicator is defined by Eurostat as "the number of persons (children aged 0-17 years or persons aged 18-59 years) who are living in eligible households[14] where none of the members are working, expressed as a percentage of the total population (aged 0-17 or respectively aged 18-59) who are living in eligible households." This measure can be obtained as an extreme case of our family of indices when $\Theta_i \equiv \Theta_i^u$, $\tau = 1$, and $\omega_i = \frac{H_i}{\sum_{i=1}^{N} H_i}$ (where H_i is the number of persons aged 0-17 or aged 18-59, respectively).

Note that all non negative values of γ and α are possible since, in this case, they do not affect the value of the index.[15]

The second indicator is defined by Eurostat as "the share of population aged 0-59 living in households where the working age members worked less than 20% of their total work potential[16] during the past year." This measure can be again obtained as an extreme case

[13] Recall that results do not vary with γ or α if $\tau = 1$.

[14] "Eligible households" means that households composed solely of students are excluded.

[15] If we were interested in calculating the share of households where none of the members are working, we could calculate our index using $\omega_i = \frac{1}{N}$, N being the number of eligible households. Using several values of τ allows us to change the household unemployment level chosen when selecting the employment deprived population.

[16] The household work intensity is defined as the ratio between the number of months that all working age household members have been working during the reference year and the total number of months that they could theoretically have worked. When the respondent declares himself as a part-time worker, the number of worked hours per week is adapted to those of part-time work during the relevant months (this is done on the basis of the number of hours worked at the time of interview). A working age person is a

of our family of indices when, $\Theta_i \equiv \Theta_i^{u,e}$, $\gamma = 1$, $\tau = 0.8$, $\alpha = 0$ and $\omega_i = \frac{H_i}{\sum_{i=1}^{N} H_i}$ (where H_i is the number of persons aged 0-59 years). In this case, the number of individuals with a potential employment gap would be the number of working age individuals in household *i* (and not the number of active individuals) and, again, only households with some characteristics would be considered.

Finally, it is easy to see that the official unemployment rate can be also obtained within our framework choosing: $\Theta_i \equiv \Theta_i^{u}$, $\gamma = 1$, $\tau = 0$, $\alpha = 1$, and $\omega_i = \frac{H_i^A}{\sum_{i=1}^{N} H_i^A}$.

3.4 Additional features of the aggregate household employment deprivation index

It is easy to check that the household employment deprivation measure, $u_i\left(\boldsymbol{g}_i^{\gamma};\tau\right)$, defined in (2) satisfies all desirable properties discussed in Section 2.2 as far as $\gamma > 1$. This is so because since it is a modified version of the FGT it inherits its properties. In particular, the fulfillment of the focus and monotonicity axioms comes straightforward from the definition of the individual employment gaps, g_{ij}^{γ}. The scale invariance axiom is satisfied as a consequence of the normalization of these gaps, and the anonymity axiom is verified as a result of their aggregation into the household. Besides, it is easy to check the replication invariance axiom, since u_i remains unchanged under replications of the original members of the household. Similarly, $\gamma > 1$ guarantees the fulfillment of the regressive transfer axiom. Thus, for values of γ higher than one, the parameter γ reflects the aversion to inequality of individual employment deprivation gaps when measuring total household employment deprivation. Additionally, u_i is normalized to take values between 0 and 1, taking the lowest value when the household is not employment deprived, and the largest when all of its active members are unemployed.

Our aggregate measure, $U(\boldsymbol{u})$, is also a modified version of the FGT, now defined over household employment deprivation measures. Thus, it inherits its well-known properties

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person aged 18-59 except if students aged 18-24. Households only including children, students aged less than 25 and/or people aged 60 or more are totally excluded from the computation.

as well. In particular, it is also normalized to take values between 0 and 1, taking the lowest value when there are no employment deprived households in the population, and taking the largest value when all active individuals in all households are unemployed. Further, it fulfills all the axioms that were discussed in Section 2.3 as far as $\gamma > 1$ and $\alpha > 1$, including the preference for employment deprivation equality among deprived households which is generally not satisfied by other indices that have been proposed in the literature so far. This property is the consequence of the parameter α being greater than one. Then α can be understood as a parameter reflecting the extent of aversion to inequality of employment deprivation across deprived households.

Moreover, the $U(\boldsymbol{u})$ index also satisfies the additive decomposability of employment deprivation by subpopulations, which is of particular interest for empirical analysis. Let $\boldsymbol{u} = \left(\boldsymbol{u}^1, \boldsymbol{u}^2, ..., \boldsymbol{u}^K\right)$ be an exhaustive partition of the population of households into *K* mutually exclusive groups, where $\boldsymbol{u}^k$ is the vector of employment deprivation indicators associated to households belong to group *k*, and $\boldsymbol{\pi} = \left(\pi^1, \pi^2, ..., \pi^K\right)$ their respective population weights, then:

$$U\left(\boldsymbol{u}\right) = \sum_{k=1}^{K} U\left(\boldsymbol{u}^k\right) \pi^k .$$

Further, in a parallel way to the traditional decomposition of the *FGT* index into incidence, intensity and inequality components (Foster *et al.* 1984), when $\alpha = 2$ then *U* can also be decomposed as:

$$U(\boldsymbol{u}) = H\left[I^2 + \left(1 - I\right)^2 C_{1-u}^2 \right] = H\left[I^2 + V_u \right],$$

where if $\omega_i = \dfrac{H_i^A}{\sum_{i=1}^{N} H_i^A}$, H indicates de proportion of active individuals who are living in households affected by employment deprivation;[17] and $I = \overline{u} = \sum_{i=1}^{q} u_i \omega_i$ and V_u respectively indicate the weighted average and variance of household employment deprivation indicators across deprived households. Further,

[17] If $\omega_i = \dfrac{1}{N}$, *H* indicates the proportion of employment deprived households ($H = q/N$).

$V_u = \sum_{i=1}^{q} (u_i - \bar{u})^2 \omega_i = (1-I)^2 C_{1-u}^2$, with C_{1-u}^2 being the squared coefficient of variation of $1-u_i$. More generally, for any $\alpha \geq 0$ (see Shorrocks, 2009b):

$$U(\boldsymbol{u}) = HI^{\alpha}\left[1 + E_u^{\alpha}\right] \ , \qquad \textbf{(3)}$$

where $E_u^{\alpha} = \sum_{i=1}^{q}\left[\left(\frac{u_i}{\bar{u}}\right)^{\alpha} - 1\right] w_i$ is related to the well-known family of Generalized Entropy inequality indices.[18]

Finally, our aggregate indicator *U* is consistent with a partial ordering that comes from dominance criteria based on modified TIP (*Three I's of Poverty*) curves defined over the vector of ordered household employment deprivation experiences $\tilde{\boldsymbol{u}} = (\tilde{u}_1,\ \tilde{u}_2,\ ...,\ \tilde{u}_i,...,\ \tilde{u}_N)$ where $\tilde{u}_1 \geq \tilde{u}_2 \geq ... \geq \tilde{u}_N$, instead of over that of ordered individual poverty gaps as in Jenkins and Lambert (1997). Thus, our *Employment Deprivation curve*, $ED(\tilde{\boldsymbol{u}})$, for each value of $\pi = \sum_{i=1}^{m} \omega_i$, can be expressed as:

$$ED_{\pi}(\tilde{\boldsymbol{u}}) = \sum_{i=1}^{m} \tilde{u}_i \omega_i \ ,$$

where *m* is any integer number such that $m \leq N$. $ED(\tilde{\boldsymbol{u}})$ accumulates household employment deprivation levels, from higher to lower employment deprivation. Similar to conventional TIP curves, $ED(\tilde{\boldsymbol{u}})$ shows i) the *incidence* of households' employment deprivation (the proportion of deprived households or individuals living in deprived households), ii) the *intensity* of employment deprivation experiences (that for each household depends on the level and distribution over individuals of normalized employment gaps), and iii) the *inequality* of employment deprivation across the population of deprived households. The dominance in these curves (i.e., when the curve of a distribution is always equal or below that of another one) allows for the identification of partial orderings in aggregate employment deprivation which are robust to the choice of a particular aggregate employment deprivation indicator satisfying our set of axioms defined over the u_i s.

[18] More specifically, for any $\alpha > 1$ the Generalized Entropy index is: $GE_u^{\alpha} = \alpha(\alpha - 1)E_u^{\alpha}$.

4. Employment deprivation in the European Union

Our data are a sample of individuals living in households with, at least, one economically active member (from now onwards "active households") obtained from the EU Labour Force Survey database for the period between 2007 and 2009. We analyze 23 countries after excluding the Nordic countries and Malta for lack of information.[19]

In what follows, the first subsection will show the relevance of considering the household dimension even within the confines of classical unemployment measures, that is, when only the active population and ILO unemployment definition are used, and thus the conventional unemployment rate is just the extreme case of the index we have proposed in the previous section, when no preference for equality across deprived households is assumed. The other two subsections will expand the analysis in two directions. First, we will show the implications of considering a broader definition of employment deprivation including underemployment. Secondly, we will further expand the measure in order to consider the whole population that is affected by (severe) employment deprivation, that is, those people, whether active or not, who are living in active households where employment deprivation is high. This is, in our view, the measure that brings in the analysis the most complete picture of the well-being implications of employment deprivation.

4.1 Going beyond the ILO unemployment rate

In a first approach to measurement, we consider the information on individual employment status reported at the second quarter of each year of the survey according to the conventional ILO definition for individuals aged between 15 and 74.[20] As previously explained, in this simple case, the individual employment gap takes the value 1 if the individual is unemployed and 0 otherwise and therefore, assuming $\tau = 0$, the

[19] The Nordic countries (Denmark, Sweden and Finland) lack complete information on households while Malta microdata are currently missing in the European Labor Force Survey data provided by EUROSTAT. Note also that we drop any individuals in the sample who are living in institutional households and are not linked to a private household in countries in which they are sampled (e.g. Germany).

[20] For this we use the information provided in a quarterly periodicity in the Labour Force Survey data sets. An individual is considered to be unemployed if even if actively seeking employment she did not do any work for pay during the reference week and did not have a job or business from which she was absent for some reason during that week. If the individual has found employment to begin in three months but is available for work in the following two weeks she is also classified as unemployed.

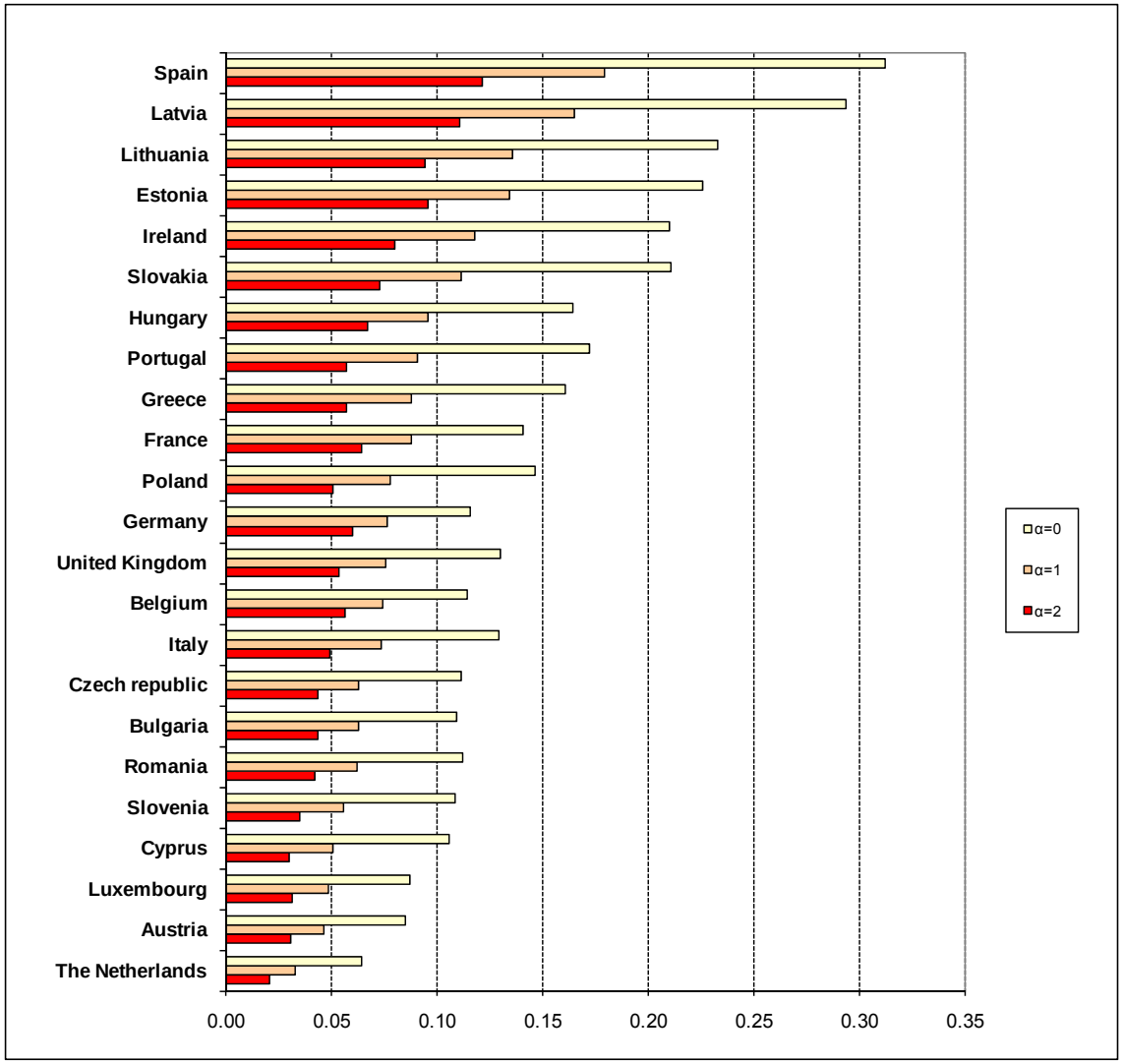
household employment deprivation index reflects the household unemployment rate. The aggregate household employment deprivation index for 2009 for different values of α is reported in Figure 1, where $\omega_i = \frac{H_i^A}{\sum_{i=1}^{N} H_i^A}$ (i.e. household's weight is the share of economically active individuals in the household).

After the large increases in unemployment in some countries due to the Great Recession, in 2009 we find a large variety of unemployment rates in the European Union. For instance, countries like The Netherlands, Austria, Luxemburg, Cyprus or Slovenia register unemployment rates below 6% while other countries' rates, Latvia and Spain, are over a 16%.[21] This unemployment rate is obtained as a particular case of our index when $\alpha = 1$.[22] For $\alpha = 0$, our index reflects the incidence of household employment deprivation on the economically active population i.e. the percentage of economically active individuals who are currently living in households that are touched by the unemployment phenomenon. Further, for $\alpha = 2$ our index aggregates the household unemployment rates taking into account a social preference for equality.

[21] For a detailed analysis of how the recession had an uneven impact on European countries see OECD (2010) or European Commission (2010b).

[22] There are small discrepancies between our results and the unemployment rates reported by Eurostat due to a small number of missing values on household identifications in some countries.

Figure 1. Aggregate household employment deprivation (unemployment) index for EU countries in 2009, with households weighted by their number of active members



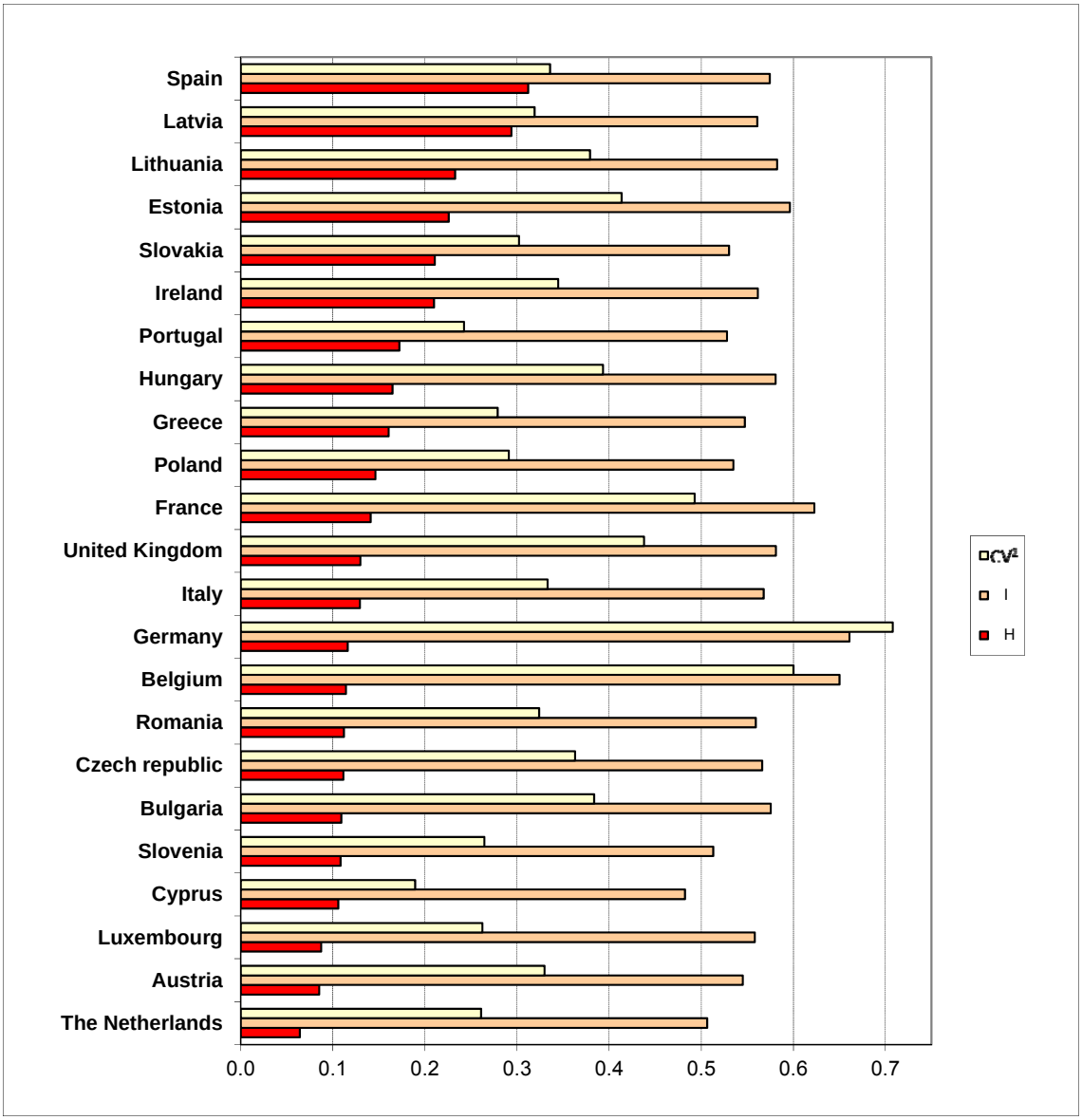
Note: Own construction using the quarterly information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

The analysis of unemployment using our index allows for the identification of diverse profiles of household unemployment experiences across countries that are masked using only a conventional measure of unemployment. Indeed, there are countries that while having similar unemployment rates, such as Germany, Belgium, United Kingdom and Italy (7.4-7.6%), household employment deprivation is of a different nature (see Figure 2). The first two countries have a lower percentage of economically active individuals living in households affected by unemployment (11.4-11.5%) compared to the last two countries (12.9-13%); which is reflected in the value of the incidence component (*H*). Nevertheless, their unemployment rates are similar because household unemployment rates are notably higher in the first two countries (65-66%) compared to the last two

(56.8-58.1%). This is measured by the intensity component, *I*. Further, the distribution of employment in Germany among deprived households is quite uneven, employment deprivation inequality among deprived households captured by the coefficient of variation, *CV*, is the largest of all countries. Figure 3 displays the distribution of household-level employment deprivation indices before aggregation takes place, and it shows that indeed Germany, and to a lower extent Belgium, is the country with the largest proportion of economically active people living in deprived households with all their active members unemployed, 39%[23] (35% in Belgium), compared with only 22% in Italy or 26% in The UK.

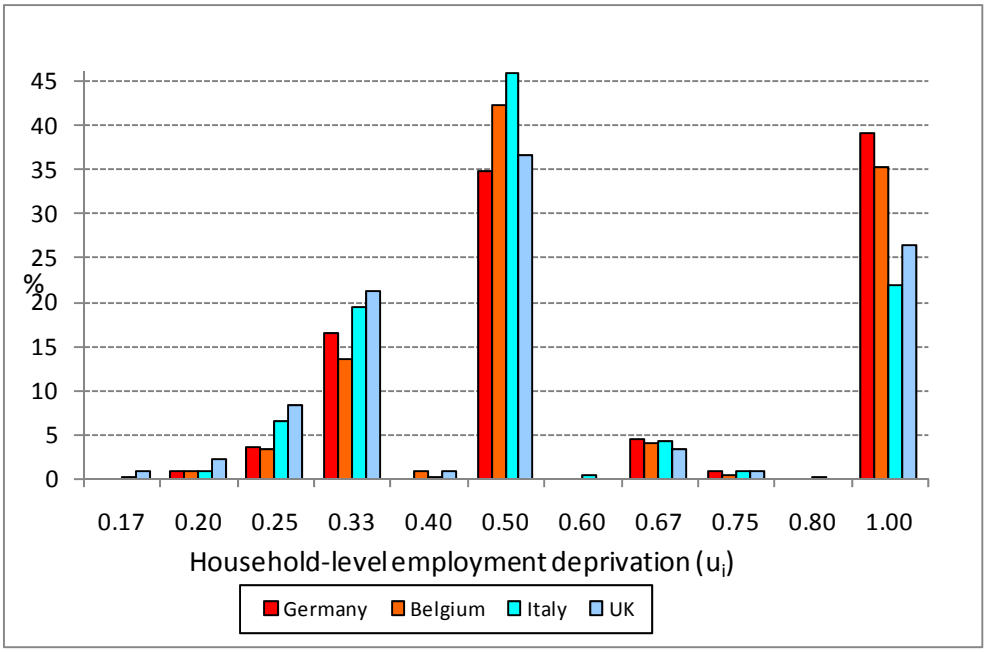
[23] In fact, Germany registers the largest proportion of economically active people living in deprived households with all their members unemployed among all the countries analyzed. It is clearly the case that differences across countries (time periods) in the distribution of household employment deprivation indicators could be the consequence of the household formation process. Indeed, household size is endogenous. It is sensitive to the business cycle, or to the prevailing welfare regime, as individuals affected by unemployment can stay longer in (or return to) their original family as a response to the bad labor market conditions, thus affecting the distribution of unemployment across households. The importance of this phenomenon could be easily addressed, for example, by constructing counterfactual distributions in which employment deprivation is analyzed across countries (periods) using the same distribution of household sizes.

Figure 2. Decomposing the aggregate household employment (unemployment) deprivation index for EU countries in 2009, $\alpha = 2$, with households weighted by their number of active members



Note: Own construction using the quarterly information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

Figure 3. Distribution of household-level employment deprivation (unemployment) among economically active population in selected EU countries in 2009



Note: Own construction using the quarterly information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

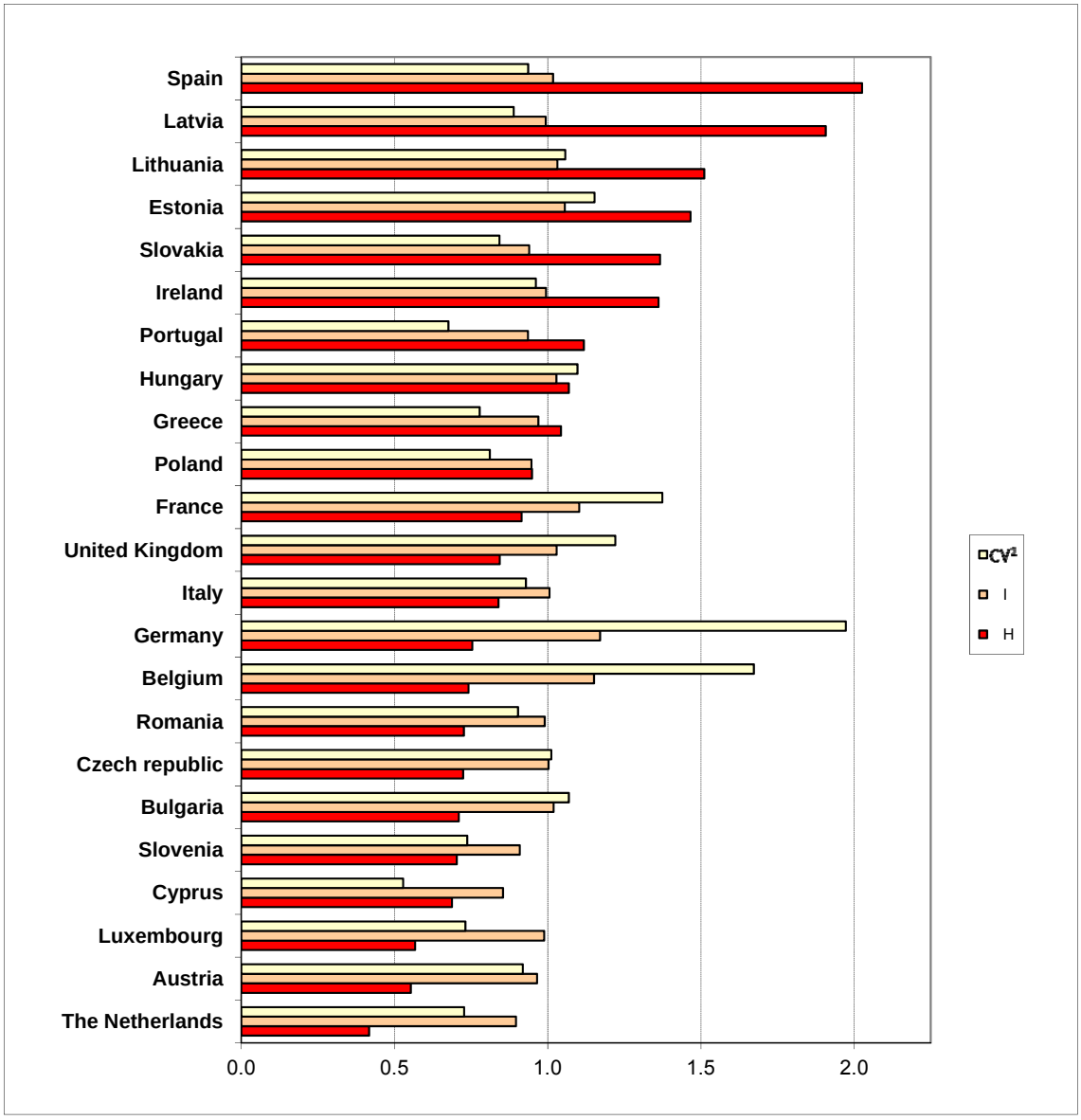
In general, we observe that the percentage of economically active individuals living in households touched by unemployment is large (small) in countries where the unemployment rate is also large (small). For instance, countries like Spain or Latvia have an incidence of about a 30% in contrast with the 6.4% in The Netherlands or the 8.5% in Austria.[24] In contrast, there is larger employment deprivation intensity in countries with middle-range levels of unemployment such as Germany, Belgium or France; while countries that have a relatively high unemployment rate, such as Portugal or Slovakia, show sensibly lower levels of intensity and employment deprivation inequality. Some countries perform well in all three components: The Netherlands, Slovenia and Cyprus, while others, Spain and the Baltic countries, perform badly in all of them (see Figure 4).

As a consequence of the results on these three components, the value of our aggregate household employment deprivation index, relative to the unweighted mean for all countries, varies with alpha for several countries (see Figure 5). Those countries with a

[24] This represents approximately a 15.8% of the total population in Spain, a 15.6 in Latvia and, in contrast, a 3.7% of the total population in The Netherlands and a 4.4% in Austria. A measure that is nearer to the idea of loss of population welfare in terms of employment deprivation.

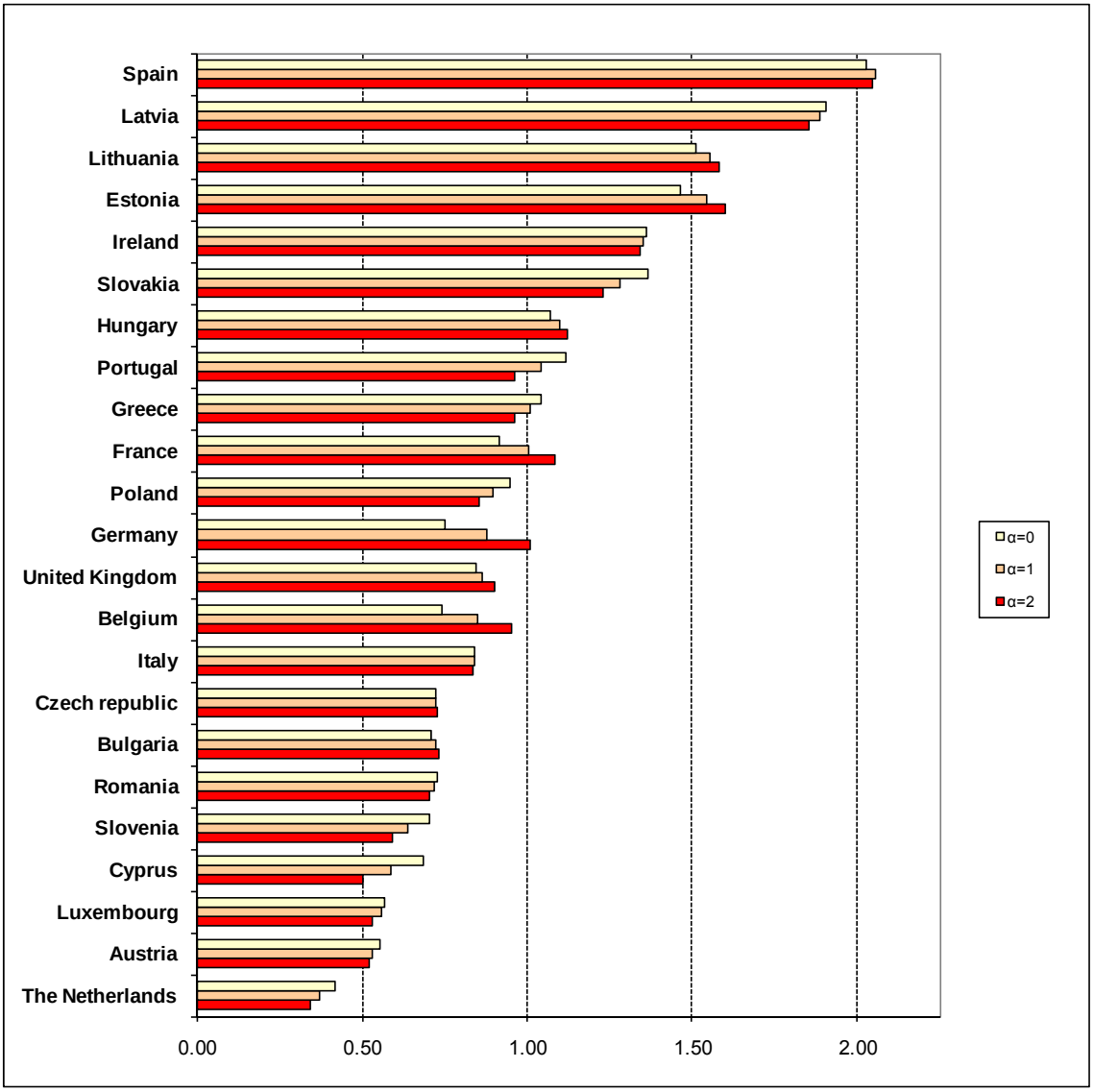
low unemployment rate improve their relative position as alpha increases, given that they register low levels of all three components. Other countries such as Slovakia, Portugal and Greece, with relatively high unemployment rates, also improve when alpha increases, that is because even if they depart from a situation of a higher incidence of unemployment among households, their intensity is similar to the mean and their employment inequality is low. In contrast, some countries clearly worsen their level of employment deprivation index in relative terms when alpha increases. This is the case of high unemployment countries such as Lithuania and Estonia, but also of countries with middle-range unemployment rates such as France, Germany, United Kingdom or Belgium, where incidence is low relative to the mean, intensity is higher than the mean and inequality even higher (in fact, they register the highest levels of employment deprivation inequality among deprived households).

Figure 4. Decomposing the aggregate household employment deprivation (unemployment) index for EU countries in 2009 relative to the unweighted average, $\alpha = 2$, with households weighted by their number of active members



Note: Own construction using the quarterly information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

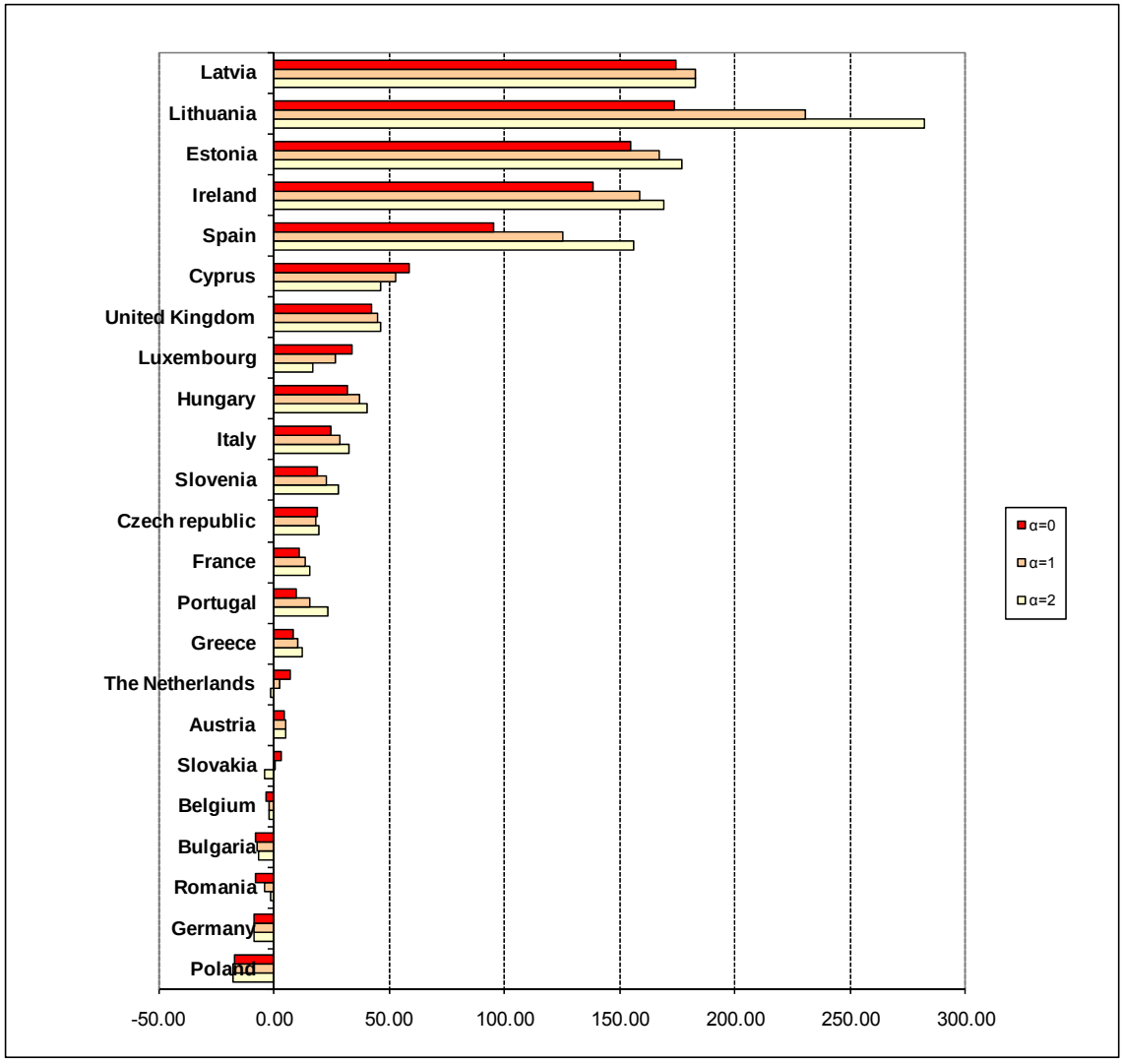
Figure 5. Aggregate household employment deprivation (unemployment) index for EU countries in 2009 relative to the unweighted mean, with households weighted by their number of active members



Note: Own construction using the quarterly information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

During the period of economic crisis in recent years, unemployment rates have boosted in some European countries, increasing in a range of 7 to 11 percentage points in Ireland, Spain and the Baltic countries. This is clearly reflected in all our indices, whatever the value of alpha. However, this increase has followed different patterns by country (see Figure 6).

Figure 6. Percentage of variation of the aggregate household employment deprivation (unemployment) index for EU countries: 2007-2009, with households weighted by their number of active members

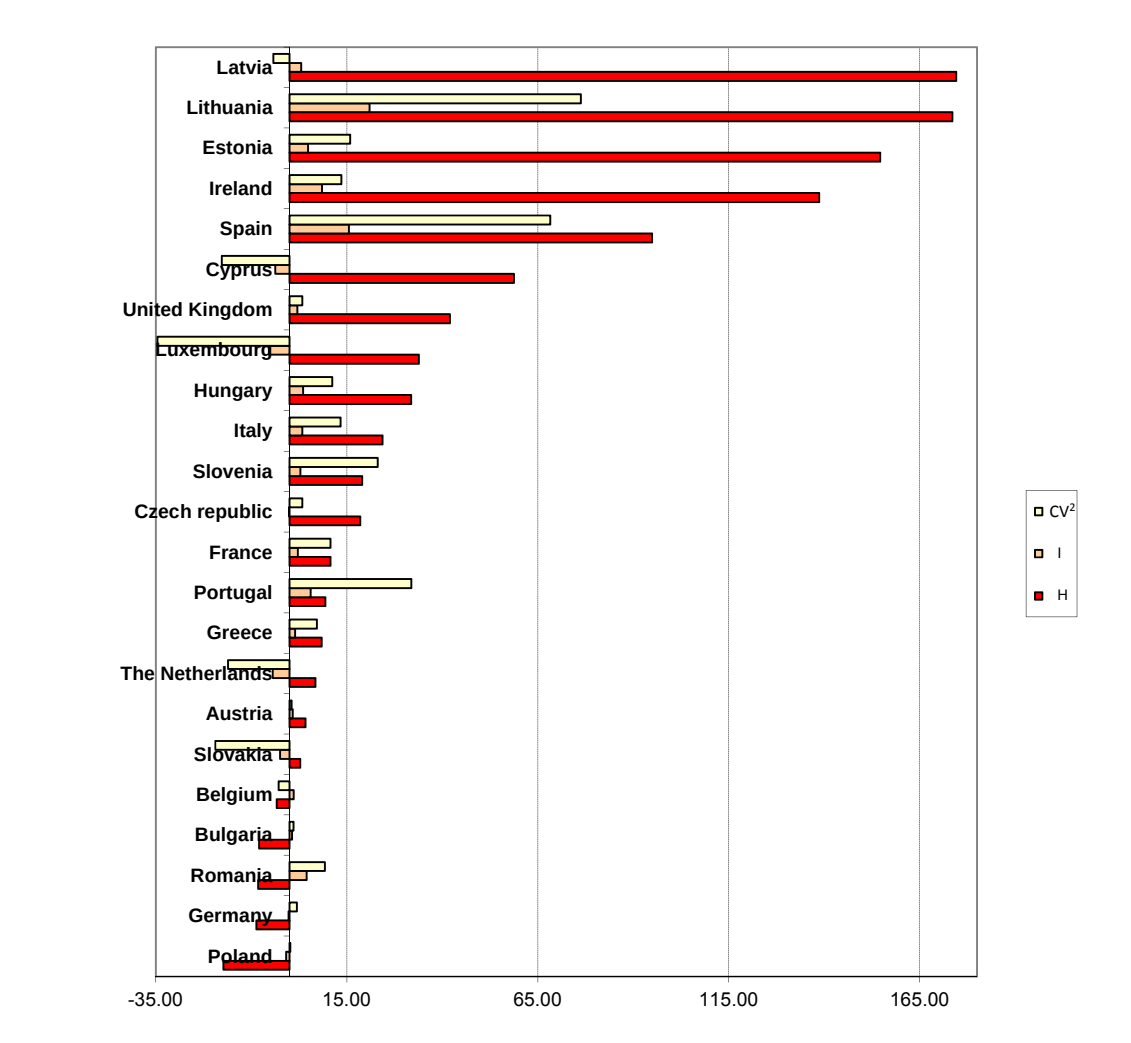


Note: Own construction using the quarterly information from the European Labour Force Survey database for the 2nd quarter of 2007, 2008 and 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

Results show that for Lithuania, Estonia, Ireland and Spain the index increases strongly as alpha grows, while in Latvia deprivation increases in the same proportion regardless the value of alpha (Figure 7). In all these countries, except in Latvia, all three components grow, even if in different proportions. In Spain, incidence grows but in a smaller dimension than in the rest. In contrast, in this country inequality grows proportionally more, in a similar way to what happens in Lithuania. In Latvia, all change is driven by the increase in the incidence of unemployment given that intensity is most stable and inequality decreases. Among the rest of the countries we can see countries with increases in the incidence of employment deprivation together with

decreases in intensity and inequality (see the cases of Cyprus, Luxembourg, The Netherlands and Slovakia). The opposite happens in Romania.

Figure 7. Percentage of variation in incidence, intensity and inequality of employment deprivation (unemployment) index for EU countries: 2007-2009, with households weighted by their number of active members



Note: Own construction using the quarterly information from the European Labour Force Survey database for the 2nd quarter of 2007, 2008 and 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

4.2 Household employment deprivation including underemployment

There is an important part of employment deprivation that is not captured by the usual unemployment rate measure and is commonly referred to as underemployment. Using yearly data within the Labour Force Survey, we define as employment deprived those individuals who are either unemployed or underemployed. The phenomenon of underemployed workers, even if always relevant, becomes particularly important during

the current period of economic crisis where a strategy in some countries in order to avoid a deeper reduction of employment has been to reduce the number of hours of work of the employed population. This was particularly relevant in the case of Germany (OECD 2010 and Brenke *et al*., 2011). Further, an increase in the number of hours available for work could be a rational strategy for part-timers (mostly women) in response to a negative employment shock in their household. Indeed, when the labor market is extremely weak, this could lead, as it is effectively observed in Spain, to a disproportionally large increase in the proportion of involuntary part-timers (from about one third of part-time employed right before the crisis to about a half in 2010)[25].

Using the sub-sample for the second-quarter of the annual LFS[26], for the underemployed we construct an *individual employment gap* indicator which is the difference between the hours the individual wishes to work[27] and those she usually worked in the main job[28] as a proportion of the former.

Figure 8 reports the change in aggregate household employment deprivation that comes with underemployment.[29] Focusing on the case where $\gamma = 1$ allows for a more direct comparison with our previous results because the deprivation indicator for each household is just the average gap of their economically active members. Results for the aggregate indicator reveal that the average household employment gap ($\alpha = 1$, the equivalent to the unemployment rate but now with the continuous gaps) increases employment deprivation in Spain by 2.4 percentage points, up to 20.5 % and, thus, it increases, even further, its distance to the other EU countries. The increase is also about

[25] In contrast, in The Netherlands, the country with the largest proportion of part-timers among the employed population -49% in 2010-, only 4% is involuntary. See OECD Statistical data on line, OECDStatExtracts.

[26] For these calculations we use the second quarter information from the annual data files of the Eurostat Labour Force Survey dataset instead of that in the quarterly data files. We do so to have information on the reasons why an individual is in part-time work in order to classify involuntary part-time workers as deprived. Note that this implies using nationally representative sub-samples for Spain, France, The Netherlands and Germany.

[27] The number of hours the individuals may wish to work is capped at the country's full-timers' usual working hours' mode. This prevents having problems with unreasonable large numbers coming either from outliers or from measurement error. In the case of part-timers the gap is only positive if they wish to work more hours but they could not find a full-time job.

[28] In those cases in which the individual reported missing in her usual hours of work, this value was estimated using the number of hours actually worked during the reference week in the main job.

[29] The percentage of the employed population that is underemployed, according to our estimates, varies between less than 2% in Bulgaria, Slovakia, Slovenia, Czech Republic, and Estonia, to about 6% in Germany, Spain, and Cyprus.

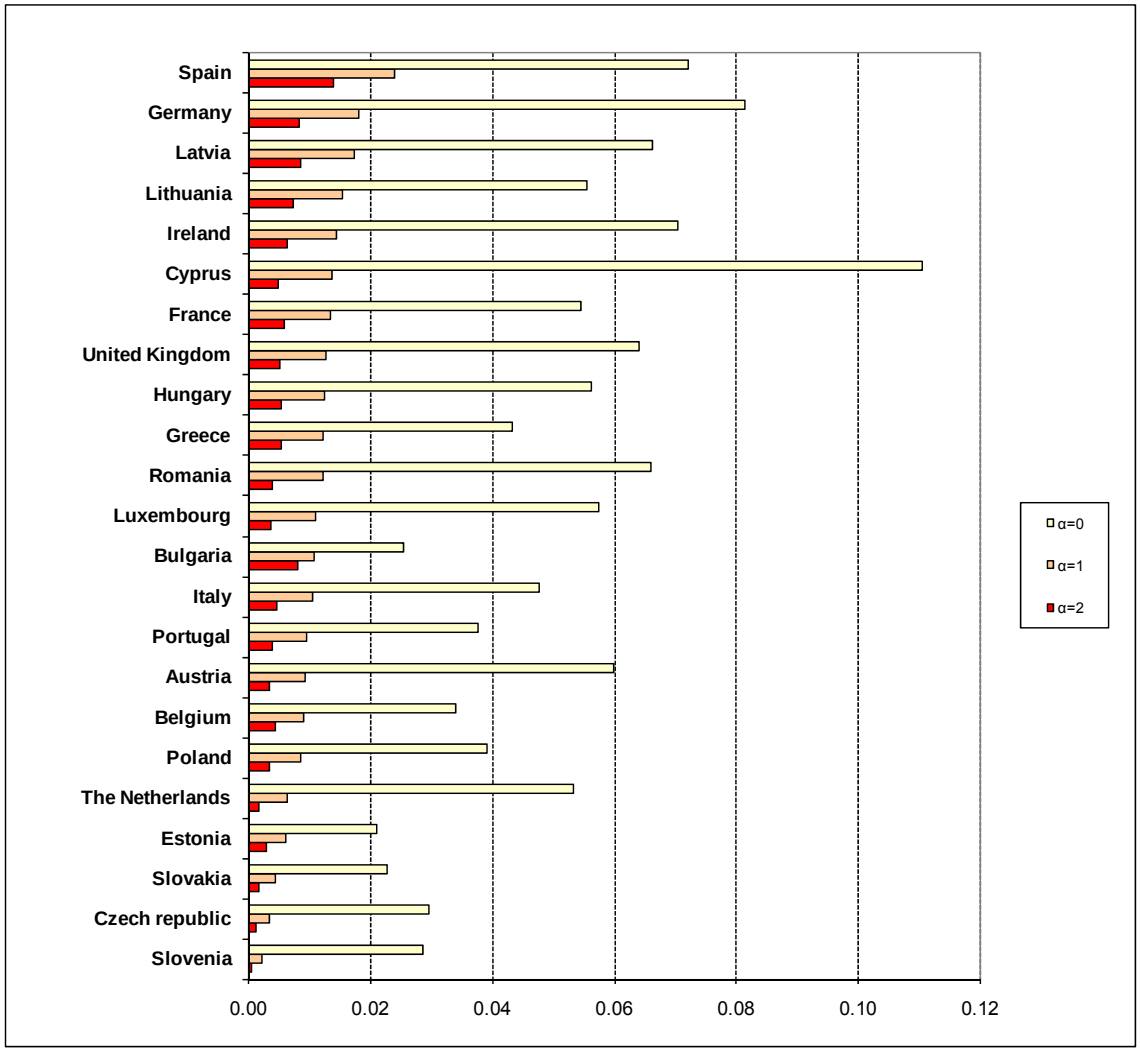
1.5 percentage points or higher in other countries with large unemployment rates such as Latvia, Lithuania, or Ireland. But, as expected from our discussion above, household employment deprivation also increases by near 2 percentage points (up to 9.4%) in Germany, a country with intermediate unemployment rates. To a lesser extent this also applies to France and The UK, and to Cyprus, with even lower unemployment rates. Thus, in times of recession in the EU, it seems most important to look at changes in the number of hours worked, given that just counting the unemployed underestimates the real effect of recession on employment deprivation.

In the case of $\alpha = 1$ considering the household structure is irrelevant, but this is no longer true for other values of this parameter. Results using $\alpha = 0$ show that considering underemployment, the share of the active population touched by employment deprivation in their households also increases by 11 percentage points in Cyprus, 8 in Germany, or 7.2 in Spain. That is, the consequences of the recession are spread out across the population more deeply than if only unemployment was considered. In the case in which the distribution of deprivation across households is also considered ($\alpha = 2$) we see that the increase in aggregate household deprivation is similar to the case of $\alpha = 1$ except in Bulgaria or Italy where the increase is larger than in other countries with similar levels of the former. What is most interesting in this case is the index's decomposition. In Figure 9 it is shown that, in general, the increase in deprivation induced by workers' underemployment is mainly driven by the dominant effect of the increase in incidence across the active population, which is only partially compensated by a reduction in the intensity and, to a lower extent, in the inequality among the deprived households. There are a few outstanding cases, however. In Spain, workers' underemployment reduces very little the intensity of employment deprivation, compared with the largest reductions in Germany, Cyprus, or The Netherlands. Additionally, in Spain there is an increase in the degree of inequality that also contrasts with the large reductions in other countries, but especially in Germany. Clearly, it results that workers' underemployment is playing a different role in these two countries. It seems to be attenuating the consequences of unemployment in Germany (even if by increasing its incidence), but accentuating them in Spain (making the phenomenon more unevenly distributed across households).[30]

[30] In fact, underemployed workers are more concentrated in households with already high unemployment rates in Spain than in Germany.

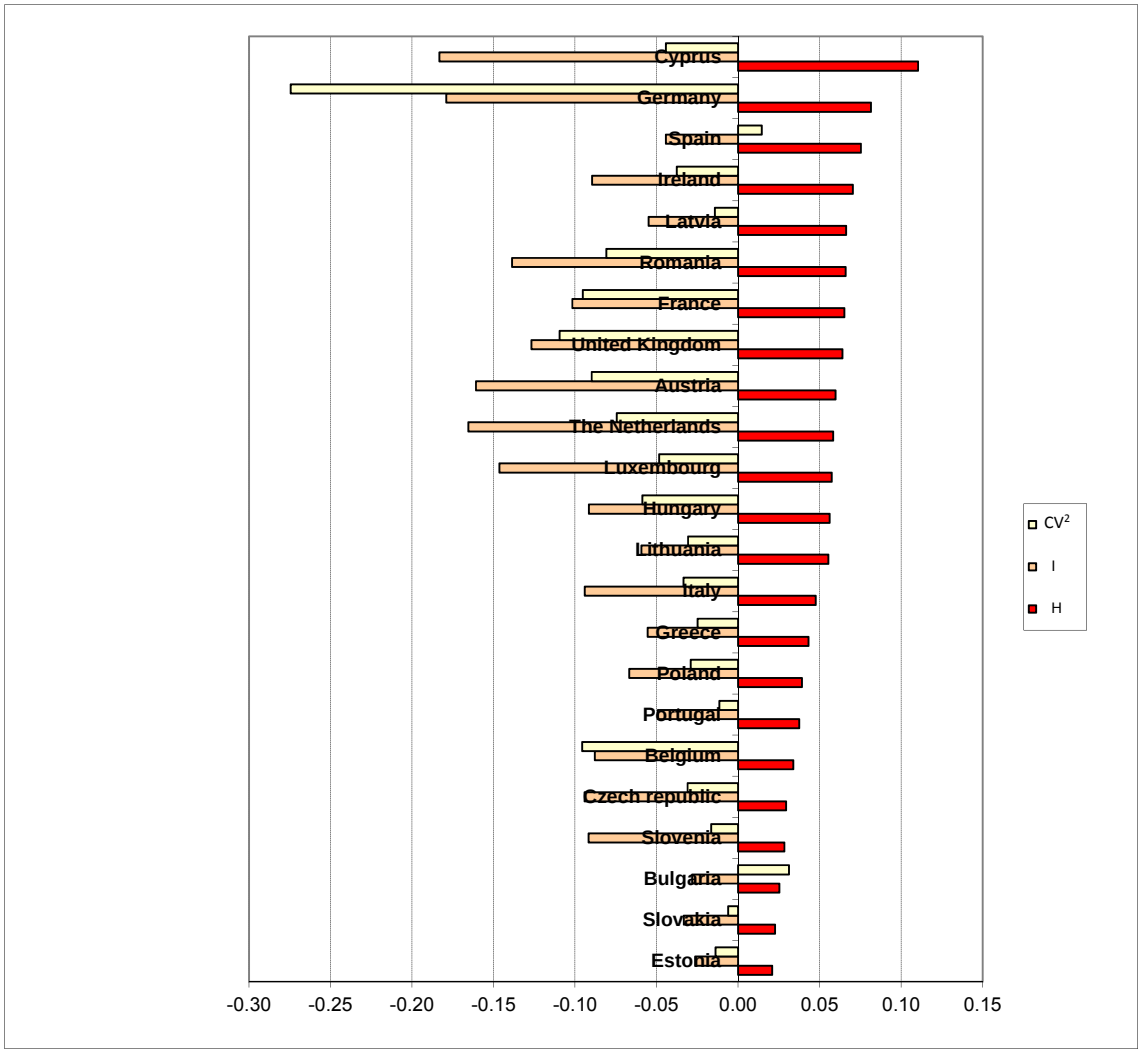
Finally, Figure 10 shows the level of aggregate household employment deprivation resulting of incorporating workers' underemployment and taking into account a preference for equality in the distribution of employment gaps within households ($\gamma = 2$) for different values of α.

Figure 8. Change in aggregate household employment deprivation including underemployment, $\gamma = 1$, for EU countries in 2009, with households weighted by their number of active members



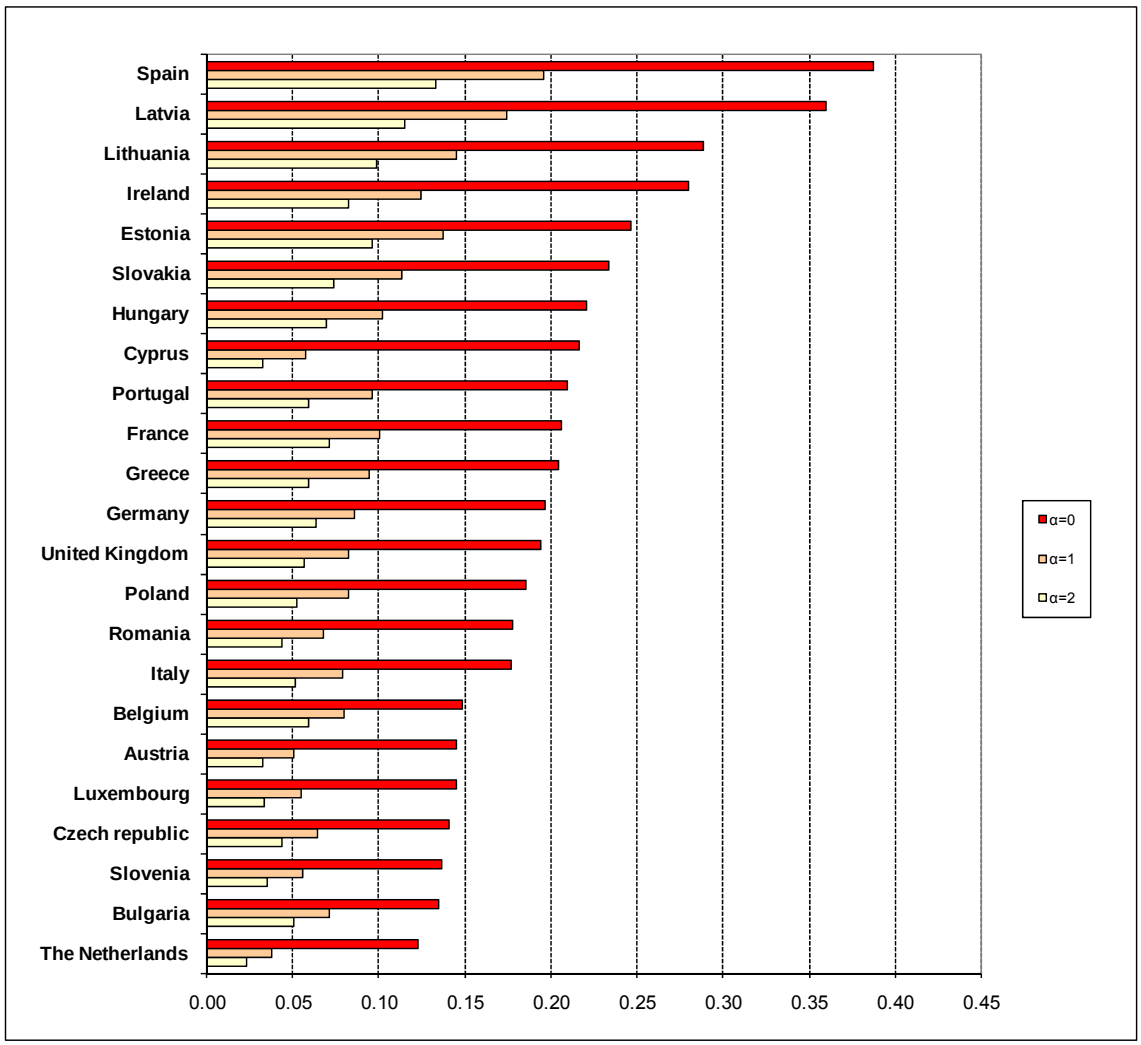
Note: Own construction using the annual information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

Figure 9. Change in the incidence, intensity and inequality components of aggregate household employment deprivation including underemployment, $\gamma = 1$, $\alpha = 2$, for EU countries in 2009, with households weighted by their number of active members



Note: Own construction using the annual information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

Figure 10. Aggregate household employment deprivation including underemployment, $\gamma = 2$, for EU countries 2009, with households weighted by their number of active members



Note: Own construction using the annual information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

4.3 Household employment deprivation for the population living in active households

There are two directions in which the analysis of household employment deprivation can be expanded in order to consider its entire well-being implications. First, deprivation measures should incorporate inactive members, mainly children and elderly, who cohabit in active households because their well-being is also indirectly affected by employment deprivation, not only by the lack of income but also by any induced social or behavioral side-effect. Secondly, households with a high level of employment deprivation deserve to be paid more attention. Therefore, in line with the existing

indicators related to worklessness, we can use our family of indices to focus on this particular group by increasing the threshold that determines the minimum unemployment deprivation for a household to be considered deprived (τ).

Thus, we now calculate our index using weights of household size relative to the population living in active households, i.e. $\omega_i = \frac{H_i}{\sum_{i=1}^{N} H_i}$ and alternative values of τ (only 0 and 1 for simplicity).

Let us consider first the case in which $\alpha = 0$. In the case of the ILO definition of unemployment, the index calculates the percentage of individuals (regardless of their age and labor status) in active households that cohabit with the employment deprived. This proportion is 17% on average, but varies considerably across countries.[31] The incidence of this phenomenon is 5 percentage points higher on average (22.6%) in the case of using the broader concept of employment deprivation, going from 13.3% in The Netherlands and 14.1% in Slovenia, to 39.6% in Latvia and 41.6% in Spain. In the case of concentrating on the most severe deprivation ($\tau = 1$), the index provides the same percentage now referred to people living in active households with all their active members fully unemployed, those households totally excluded from the labor market. The average is 3%, but with values that reach 6.2% in Spain, and about 4-5% in other six countries (Hungary, Slovakia, Ireland, and the Baltics).

Further the case in which $\tau = 0$, if $\alpha = 1$ the index incorporates in each case the intensity of household deprivation, with the possibility of penalizing the unequal distribution of employment deprivation within households in the case of including underemployment ($\gamma = 2$). This index is just the corresponding household unemployment (underemployment) rate faced on average by any individual living in active households. Finally, for $\alpha = 2$ the index incorporates sensitivity to their distribution of employment deprivation across the deprived households. Results are shown in Table A1 in the Appendix.

[31] It is extremely high in Spain (34.4%) and in the Baltics (32.1% in Latvia; 25.5% in Lithuania, 25.4% in Estonia), being around 20% in a bunch of other countries (Slovakia, Ireland, Portugal, Hungary, or Greece), about 15% in France, Poland, The UK, or Italy, and between 10-12% in the rest of countries, except The Netherlands, which shows the lowest rate: 7.2%. See Table A1 in the Appendix.

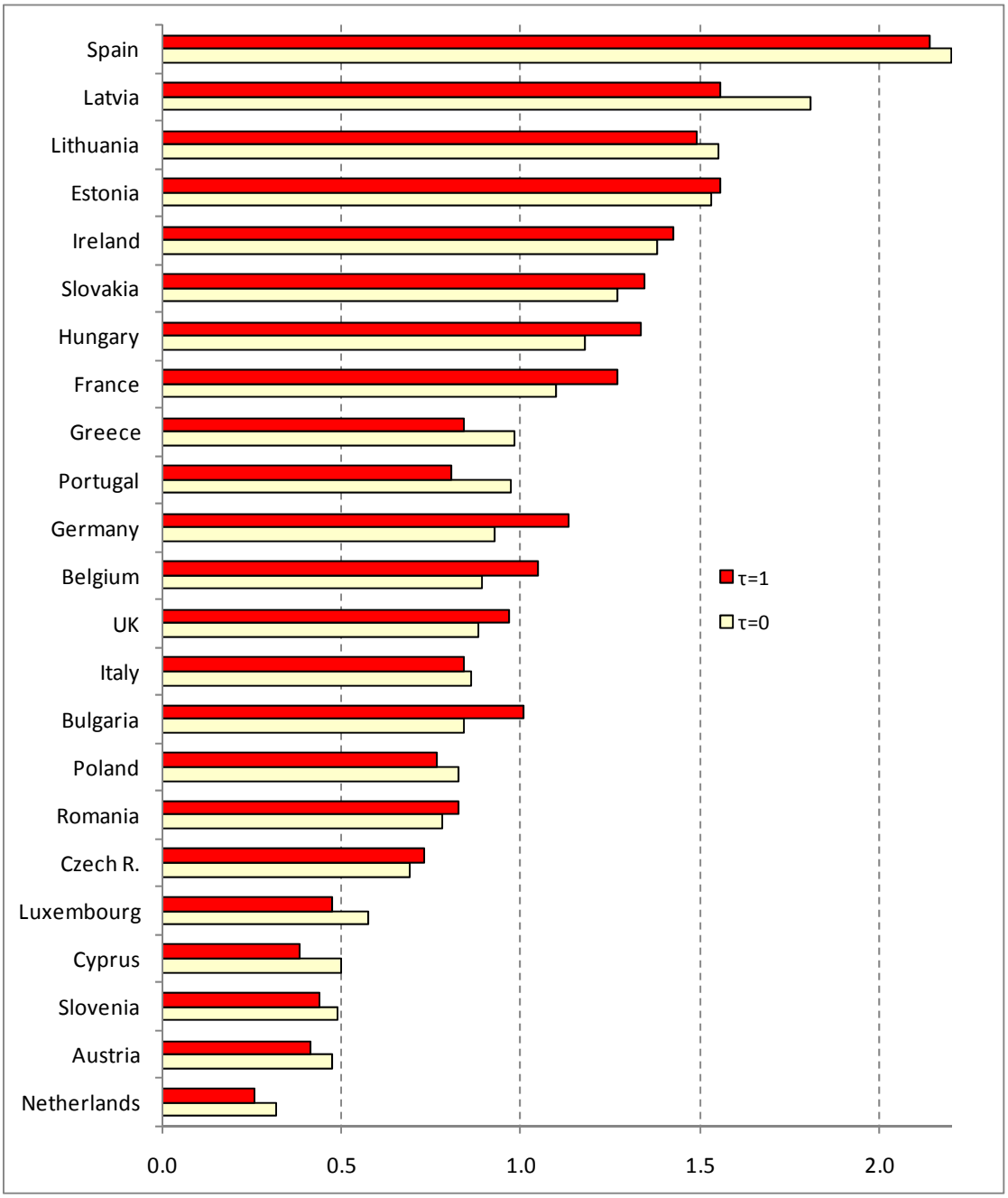
According to values in Table A1, the countries with the largest relative penalization (increase in deprivation relative to the unweighted average) by considering inequality across households ($\alpha = 2$ compared with $\alpha = 1$) are Spain, Germany, and Belgium, followed by Bulgaria and France.[32] Those with the largest relative reduction are, however, Cyprus, Portugal, and The Netherlands. The degree of severity of deprivation varies substantially across countries, too, as can be observed in Figure 11, that displays the final ranking of household employment deprivation in the EU in 2009 using the most complete version of the index including underemployment ($\gamma = 2$) for both extreme values of τ. The most severe deprivation is about a half (49%) of total deprivation on average, but it is proportionally higher in Germany (61%), Bulgaria (60%), or Belgium (58%), and smaller in Cyprus (38%), The Netherlands (40%), Portugal (41%) or Latvia (43%).[33] As a consequence, the level of deprivation relative to the unweighted average increases in the former countries for $\tau = 1$, and decreases in the latter.[34]

[32] In Figure A1 we have depicted the distribution of the population that lives in deprived households (some active member is unemployed) across the household unemployment rate for a selection of countries. Germany and Belgium continue to outstand as countries with a large proportion of individuals in deprived households with all active household members unemployed.

[33] Obviously, the contribution of severe deprivation to the total is lower in the case of $\alpha = 1$, when inequality across households is not accounted for, about 30% on average, varying between 20% in Cyprus and 40% in Germany.

[34] It is worth noting that some countries like Spain or France have experienced a large aggravation of their employment deprivation between 2007 and 2009. The relative ratio of severe deprivation increased from 35% to 48% in Spain and from 45% to 57% in France.

Figure 11. Aggregate household employment deprivation (relative to the unweighted mean) including underemployment, with households weighted by household size, $\gamma = 2, \alpha = 2$, for EU countries in 2009



Note: Own construction using the annual information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

Conclusions

In this paper we have proposed a framework for measuring deprivation of households from employment that, embracing as particular cases the conventional unemployment rate and the most usual indicators of jobless households, allows for a more general

analysis of the household dimension of this phenomenon. For that purpose, we have proposed a family of measures rooted in the measurement of well-being so that the level of household deprivation from employment is obtained by first accounting for the incidence of unemployment (or, more generally, underemployment) within households, and then aggregating household's deprivation into a global measure. Both household-level and aggregate measures verify several properties which are consistent with how well-being is measured in other dimensions such as poverty or discrimination. More specifically, they take into account the incidence, intensity and inequality of employment deprivation.

Based on this framework we have analyzed employment deprivation in several EU countries using the European Labor Force Survey. Our results showed that, as it is well known, massive unemployment is affecting several EU countries as a consequence of the current Great Recession. Our contribution, however, lies in having analyzed the households' dimension of individual employment deprivation while keeping individual as the focus of analysis. We expect individual unemployment or underemployment to have implications in terms of well-being not only on those directly affected but also on other members of their households. In this respect, a measure of the degree to which household members are excluded from the labor market will be directly related to the living conditions of the household and its vulnerability regarding future economic shocks.

Our starting point was to show the relevance of the household dimension even within the same framework in which unemployment is conventionally analyzed, assuming that employment deprivation is measured by the proportion of unemployed members, and households are weighted by the number of active members. In this case, we have shown that, in general, those countries with the largest (lowest) levels of unemployment rate are also those with the highest (lowest) household employment deprivation. For example, Spain or Latvia showed the highest incidence of unemployment across households (about 30% of the economically active population lived in households touched by unemployment), while also showing high levels of intensity of deprivation and inequality among the deprived. At intermediate levels, however, there are countries with similar unemployment rates that differ in their patterns of employment deprivation once the structure of employment across households is incorporated. For example, Germany outstands as a country with low incidence of household employment

deprivation, but with high levels of both intensity and inequality of deprivation among the deprived households. However, we have also shown that this is the result of not considering workers' underemployment, which in this country has been playing a relevant role during the recession. Indeed, expanding the conventional measurement of unemployment introducing underemployment of both full-timers and part-timers in the measure of household employment deprivation substantially reduces the intensity and inequality of the phenomenon in this country, while having a much smaller effect in Spain or Latvia, despite the fact that all three countries have relatively high levels of underemployment among workers in the European context. We have also identified different patterns across EU countries of increasing unemployment from the household perspective.

Finally, we have shown that in order to have a complete picture of household deprivation from employment one can also incorporate into the analysis all the population living in households touched by unemployment (underemployment) regardless of its age or labor status. In this way, the measure will better capture the implications of household employment deprivation on individual well-being. We have also shown that the picture can change substantially if only the most severe deprivation is studied, thus considering as employment deprived only people living in households completely excluded from the labor market.

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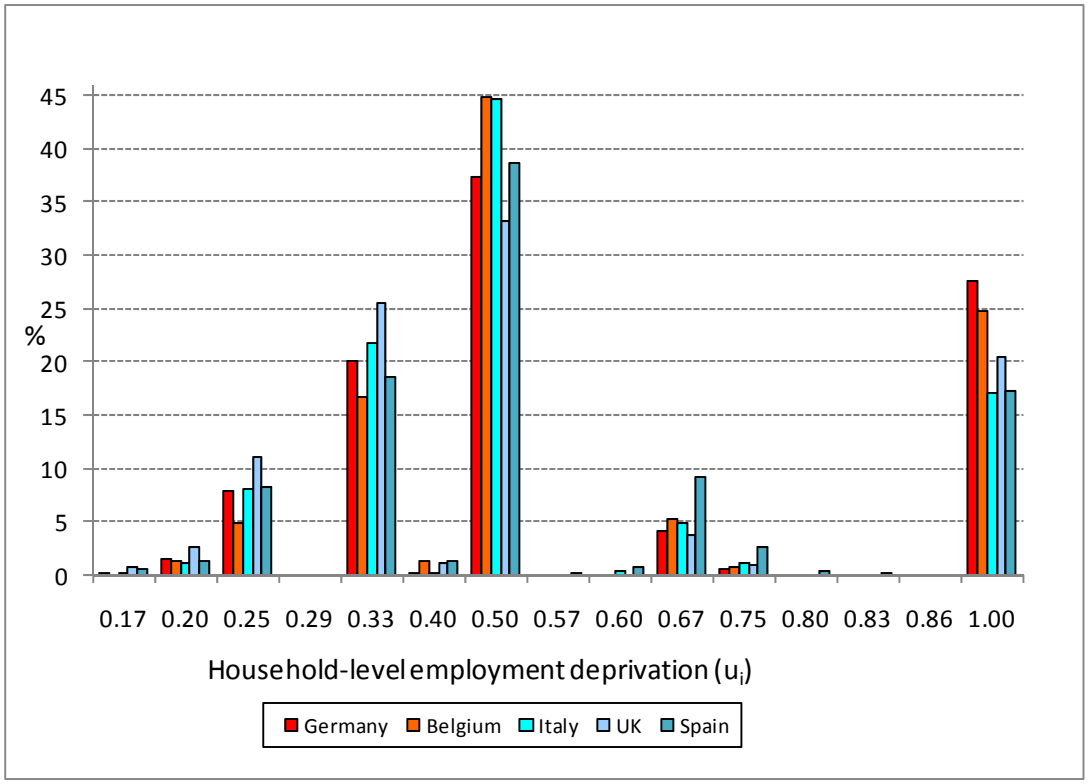
Table A1. Household employment deprivation index in the EU (weighted by household size) in 2009

Country	Unemployment (ILO)				Unemployment (ILO) and Underemployment		
	$\tau = 0$			$\tau = 1$	$\tau = 0; \gamma = 2$		
	$\alpha = 0$	$\alpha = 1$	$\alpha = 2$		$\alpha = 0$	$\alpha = 1$	$\alpha = 2$
Austria	0.095	0.046	0.027	0.012	0.161	0.050	0.029
Belgium	0.125	0.074	0.052	0.032	0.161	0.079	0.054
Bulgaria	0.122	0.066	0.044	0.031	0.148	0.075	0.051
Cyprus	0.112	0.051	0.028	0.011	0.226	0.057	0.030
Czech R.	0.123	0.065	0.041	0.022	0.155	0.066	0.042
Germany	0.123	0.072	0.052	0.034	0.203	0.083	0.057
Estonia	0.254	0.139	0.091	0.047	0.272	0.142	0.092
Spain	0.344	0.190	0.125	0.062	0.416	0.203	0.133
France	0.153	0.088	0.060	0.029	0.219	0.100	0.066
Greece	0.179	0.093	0.057	0.025	0.225	0.099	0.059
Hungary	0.183	0.102	0.069	0.040	0.241	0.108	0.071
Ireland	0.233	0.124	0.081	0.043	0.304	0.131	0.083
Italy	0.146	0.078	0.050	0.025	0.195	0.083	0.052
Lithuania	0.255	0.136	0.087	0.045	0.314	0.148	0.094
Luxembourg	0.100	0.054	0.034	0.017	0.166	0.060	0.035
Latvia	0.321	0.168	0.105	0.047	0.396	0.396	0.177
Netherlands	0.072	0.031	0.017	0.007	0.133	0.036	0.019
Poland	0.161	0.080	0.049	0.023	0.203	0.084	0.050
Portugal	0.192	0.095	0.057	0.024	0.229	0.101	0.059
Romania	0.127	0.069	0.046	0.025	0.209	0.075	0.047
Slovenia	0.111	0.052	0.029	0.013	0.141	0.052	0.029
Slovakia	0.237	0.120	0.076	0.040	0.260	0.122	0.077
UK	0.149	0.079	0.052	0.031	0.220	0.085	0.053
Unweighted average	0.170	0.090	0.058	0.030	0.226	0.106	0.063

Note: Own construction using the quarterly information from the European Labour Force Survey database for the 2nd quarter of 2009 for unemployment and annual information from the European Labour Force Survey database for the 2nd quarter of 2009 when including underemployment. Individuals are weighted by their quarterly weighting factor in order to make results meaningful at the population level.

Figure A1. Distribution of household-level employment deprivation (unemployment) among all the population in selected EU countries in 2009



Note: Own construction using the quarterly information from the European Labour Force Survey database for the 2nd quarter of 2009. Individuals are weighted by household size and by their quarterly weighting factor in order to make results meaningful at the population level.