

# Evaluating the Impact of Energy Poverty in a Multidimensional Setting

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Even in wealthy countries, there may be a portion of the population that is unable to purchase a basic set of goods and services based on energy use. According to the Building Performance Institute Europe, in 2012, about 10.8% of the European population was unable to maintain adequate warmth in their homes or were living in energy poverty. People exposed to energy poverty not only usually spend a high share of their income on electricity, oil, and gas; they also live in inefficient and unhealthy dwellings; and are exposed to severe consequences concerning health, social exclusion, and overall household welfare.

Energy poverty has been initially seen as an aspect of income poverty. Gradually, a consensus has emerged about the importance of considering it as a distinct phenomenon that should be separately analyzed. Recent advances in the economic analysis include the use of multidimensional energy poverty indicators, the consideration of subjective welfare measures, and the use of both ‘objective’ and ‘subjective’ measures of energy deprivation.

Building on the extant literature, we propose an analysis of individuals’ life satisfaction where objective and subjective measures of energy poverty deprivation are jointly considered within a multidimensional approach. To assess the impact of energy poverty on subjective well-being (SWB), we first subsume a set of available indicators in a single multidimensional energy poverty index (MEPI) providing information at the individual level. This is achieved by adapting to energy poverty analysis (and the data at hand) the methodology used for multidimensional poverty index by the UNDP. While the aggregate multidimensional indicators are used for descriptive analysis, the individual-level MEPI is used in econometric analysis. Considering subjective indicators of energy poverty makes this kind of index trivially endogenous in its relationship with SWB. We suggest estimating the individual-level relationship between SWB and the MEPI using a bivariate ordered probit model (given the ordinal nature of our MEPI and the life satisfaction variable) with exclusion restrictions. Provided that an opportune set of instruments is available, this solution is adequate to face a general set of endogeneity problems related to unobservable factors even in a cross-sectional environment.

We build the multidimensional indicator and carry out our empirical analyses by using the Italian version of the European Union Survey on Income and Living Conditions. We first provide an explorative analysis that shows the potential from using the multidimensional index to identify energy poverty, while pointing at the same time to differences with respect to traditional monetary indicators of fuel poverty. Subsequently, we econometrically assess the relationship between subjective well-being and the individual level MEPI by identifying the causal relationship between energy poverty and life satisfaction by means of exclusion restrictions referred to the year of construction of the dwellings. The results not only confirm theoretical predictions, by detecting a significant negative relationship between subjective well-being and the intensity of energy poverty, but also point to the capability of multidimensional indicators in explaining the impact of energy poverty on subjective well-being *vis-à-vis* classical affordability measures (which, in our exercise, do not

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detect any significant effect). These effects are detected even when considering a MEPI restricted to the subset of objective indicators, but the predicted negative impact is substantially smaller. Thus, accounting for subjective perception is relevant not only for the identification of a larger group of deprived individuals, but also for assessing the intensity of the phenomenon. Concerning the planning of policies identifying and supporting energy poor people, our findings point to the importance of complementing the available data on energy expenditures with information on the dwelling's inefficiency and perceived thermal discomfort.