



The policy implications of energy poverty indicators

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ABSTRACT

The methodologies and indicators that have been proposed in the literature to measure energy poverty are quite diverse. Some are subjective approaches based on personal or third parties' perceptions of affordable warmth at home; whereas others calculate objective indicators. Although these different proposals have already been theoretically compared, an empirical comparative analysis that measures in a real case study the practical impact of the theoretical limitations detected for the different indicators was still pending. The goal of this paper is thus to contribute to this debate by comparing critically the different approaches used to measure energy poverty in a real case (Spain in 2015), and to propose a new methodology that might be able to overcome some of the major problems that affect current methods.

1. Introduction

25 years after the publication of Brenda Boardman's book about Fuel Poverty¹ (Boardman, 1991), the debate in Europe regarding this important issue is probably more alive than ever. In 2012, a special issue of Energy Policy introduced by Liddell's editorial (Liddell, 2012), helped summarize some of the most relevant achievements to date, together with the pending issues. Five years later, some of them are still open, in particular those regarding the proper definition of energy poverty and the right methodology to obtain a comprehensive indicator. Although the most relevant contributions come from the UK (Boardman, 2012; Hills, 2011; Moore, 2012a; Guertler, 2012; Healy and Clinch, 2004; Hutchinson et al., 2006; Day et al., 2016) some other assessments can be found in the literature coming from other European countries as well (Bouzarovski et al., 2012; European Commission, 2015; Brunner et al., 2012; Fabbri, 2015; González-Eguino, 2015; Lacroix and Chaton, 2015; Santamouris et al., 2013; Scarpellini et al., 2015; Thomson and Snell, 2013; Tirado Herrero and Ürge Vorsatz, 2012). In addition, projects like EPEE, INSIGHT-E, or the EU Fuel Poverty Network and the recent report by Trinomics (Rademaekers, 2016) have also contributed significantly to the understanding of this complex issue.

Energy poverty and the concept of vulnerable consumers have also been recently recognized explicitly in European legislation. The so-called Clean Energy Package (European Commission, 2016a) sets out a new approach to protect vulnerable consumers, including provisions such as (1) the requirement that a share of energy efficiency measures

are applied primarily to households living in energy poverty, (2) the obligation on Member States to monitor and report the situation of energy poverty, or (3) the creation of an energy poverty observatory to obtain better data about the problem and its solutions, and to assist Member States in combating it. In addition, the proposal for the revision of the Directive on the internal market for electricity (European Commission, 2016b) makes a distinction between vulnerable consumers and energy poverty, requiring Member States to define both concepts.

The methodologies proposed in the literature to identify energy poverty and vulnerable consumers are quite diverse (see Table 1). Some are subjective approaches based on personal or third parties' perceptions of affordable warmth at home; whereas others calculate objective indicators. Although these different proposals have already been theoretically criticized (Fahmy, 2011; Heindl, 2015; Schuessler, 2014), an empirical comparative analysis that measures in a real case study the practical impact of these theoretical limitations, and their policy implications, is still pending.

Thus the goal of this paper is to contribute to this debate by comparing critically, in a real setting, the different approaches used to measure energy poverty on an objective basis, and to propose a new methodology that might be able to overcome some of the major problems that affect current proposals, i.e. (1) excessive sensitivity to energy prices and housing costs, (2) arbitrariness in the choice of the thresholds and (3) relative approaches that measure inequality rather than poverty. This third drawback will be further elaborated in Section 2.

However, defining a more accurate indicator that is able to show

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¹ In this survey, the term Energy Poverty instead of Fuel Poverty has been used. A discussion about the difference between them can be found in (Li et al., 2014).

Nomenclature

AFCP	After Fuel Cost Poverty
ECV	Spanish Survey on Living Conditions
EHCS	English Housing Condition Survey
EHS	English Housing Survey
EPF	Spanish Household Budget Survey
LIHC	Low Income High Cost
MIS	Minimum Income Standard
RMI	Minimum Income Allowance provided by Spanish regions

Table 1
Energy Poverty Indicators in Europe.

Indicator	Country	Year	Sample size	Value	Reference
10%	Germany	2011	10,193	27.6–29.5%	(Heindl, 2015)
	France	2013	43,000	16.6%	(Legendre and Ricci, 2015)
	UK	1997–2008	61,355	18–18.2%	(Roberts et al., 2015)
	England	2014	11,851	11.6%	(DECC, 2016)
	France	2006	50,000	11–13%	(Imbert et al., 2016)
	Greece	2015	400	58%	(Papada and Kaliampakos, 2016)
	Spain	2013	22,057	18.24%	(Economics for Energy, 2015)
LIHC	England	2009	16,000	9%	(Hills, 2011)
	Austria	2013	931	2.5%	(Boltz and Pichler, 2014)
	Germany	2011	10,193	11.1–15.6%	(Heindl, 2015)
	France	2013	43,000	9.2%	(Legendre and Ricci, 2015)
	England	2014	11,851	10.6%	(DECC, 2016)
	France	2006	50,000	10%	(Imbert et al., 2016)
	Spain	2013	22,057	8.71%	(Economics for Energy, 2015)
MIS	England	2008	15,523	25.5%	(Moore, 2012b)
	Italy	2011	19,000	8.4%	(Valbonesi et al., 2014)
	Germany	2011	10,193	9.9–10.6%	(Heindl, 2015)
	Spain	2013	22,057	9.88%	(Economics for Energy, 2015)
AFCP	France	2013	43,000	20.9%	(Legendre and Ricci, 2015)
2 M	Hungary	2005–2008	10,000	4–8%	(Tirado Herrero and Ürge Vorsatz, 2012)

better the extent of the incidence of energy poverty in a country in aggregate terms is not enough. If energy poverty is to be solved, we must be able to identify the characteristics of those households most affected by it, so that they can be targeted correctly by the policies devised. Again, although some proposals have been made regarding the identification of vulnerable households (Middlemiss and Gillard, 2015; Legendre and Ricci, 2015), there is still room for improvement. In the present study, we analyze the major factors that determine the vulnerability of households to energy poverty, and we present the main policy implications of these results.

We apply our methods to Spain, a country that, although features a rather benign climate (and would therefore be assumed to suffer less from this problem), has also been severely affected by the economic crisis, and in which energy prices have also increased very much recently (placing it among the most expensive countries for energy in households). As a result, Spain presents energy poverty rates comparable to other European countries and is therefore a good reference to test the different indicators.

The structure of the paper is as follows: Section 2 presents a brief state of the art of energy poverty indicators. Section 3 applies the methodology proposed to the case study and calculates the indicators, focusing on the search for their limitations and strengths. Additionally, Section 4 describes our study of vulnerable households based on the energy poverty indicator chosen. Finally, Section 5 presents the

conclusions and some policy recommendations in the light of the empirical results.

2. Measuring energy poverty

The first studies about energy poverty were carried out in the early 80s in the UK. They were conducted by Bradshaw and Hutton (Bradshaw and Hutton, 1983), and were the prelude to Boardman's study (Boardman, 1991), also in the UK, where the first formal definition of energy poverty was presented: a home would be energy poor if its expenditure in energy services exceeded 10% of its total income.

In 1991, the English Housing Condition Survey (EHCS), that became

in 2008 the English Housing Survey (EHS), used this threshold proposed by Boardman to measure the “affordable warmth”, i.e. the ability of households to ensure a comfortable temperature in winter. Since then some other definitions of energy poverty have been proposed (Fahmy, 2011; Price et al., 2012). Among them, Heindl's (Heindl, 2015) classification of energy poverty indicators is particularly interesting:

1. Subjective and qualitative, developed by the individuals themselves.
2. Subjective and qualitative, developed by third parties.
3. Objective and quantitative indicators, not income-expenditure based (eg, humidity, incidence of mold in the household or epidemiological data).
4. Objective, quantitative and income-based indicators.

Ideally, as Heindl points out, all these indicators should be taken into account when addressing the study of energy poverty in a country. However, we acknowledge that in essence, the fourth group somehow incorporates, at least partly, the others, therefore being more informative about all aspects of energy poverty. Therefore, while recognizing the need to consider all approaches, and indeed using a subjective measure to test the robustness of our results, the present study mainly focuses on objective, income-based measures.

There are basically three types of objective, income-based energy poverty indicators: those based on the share of income required to pay

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