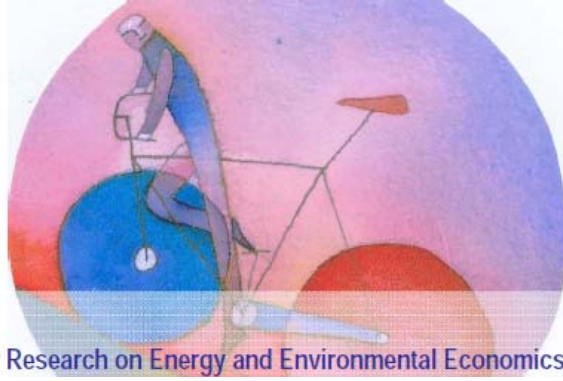


Bocconi

IEFE

Centre for Research on Energy and Environmental Economics and Policy



Working Paper Series - ISSN 1973-0381

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The Italian case**

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Working Paper n. 66

April 2014

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Fuel poverty and the energy benefits system: The Italian case*

April 2014

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ABSTRACT

In this paper we discuss a number of ways to define and measure the affordability of energy consumption, and we examine the emergence of fuel poverty in Italy in the period from 1998 to 2011. The paper examines the eligibility criteria for claiming the benefits available to support energy consumption for vulnerable families and it identifies the potential beneficiaries. The study assesses the appropriateness of the eligibility criteria by comparing the population targeted by the policy with the population actually living in fuel poverty. A simulation exercise, using the hypothetical scenario most likely to result in energy benefits being made available, shows that, regardless of the affordability index adopted, the provision of state energy benefits has little impact on fuel poverty.

Keywords: fuel poverty; affordability; energy benefits; vulnerable consumers

JEL Codes: D12, I32, I38, Q4

* We thank participants at the Vulnerable Consumer Working Group Meeting, European Commission, Brussels, 1 February 2013; at the Società Italiana degli Economisti annual meeting, Bologna, 24-26 October 2013; and at the IEFSE seminar on 4 March 2014, for their comments. All remaining errors are our own. We are indebted to Roberto Malaman (AEEG) and Gabriella Utili (AEEG) for useful discussions on the details of the electricity and gas benefits scheme.

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1 Introduction

It is well-known that escalating energy prices have led to real and growing affordability problems for many utility customers even in advanced countries. These problems are likely to have been exacerbated by the recent financial crisis. There is also growing anxiety about the potential effect of policies aimed at countering climate change on the price consumers pay for energy and thus for most essential products.

As highlighted in the recent report by the Vulnerable Consumer Working Group of the EU Citizens' Energy Forum (November 2013, p.26), many EU governments have implemented a range of different measures – ranging from specific government support to pay energy bills (i.e. social tariffs, benefits, discounts, delayed payments) to broader social security measures (i.e. general income and housing support) – in order to help low income households and other socially vulnerable groups. Consequently, the beneficiaries targeted by these measures and the results of these measures may vary considerably from country to country.¹ However, the relevant information needed to assess these interventions is rarely made available, making it difficult to investigate their effectiveness.

This study aims to provide some evidence about the Italian experience: using a number of different datasets and indices, it investigates the dynamics of electricity and gas affordability in the period between 1998 and 2011. The study then looks at the electricity and gas benefits scheme introduced in 2008 and designed to support low income households in Italy. We assess how accurately it targets the households in actual need and we evaluate the scheme's effectiveness.

The study begins by looking at the debate about the concepts of affordability and the statistical indices which are most typically used to assess fuel poverty. It is a lively debate; different approaches can produce quite different pictures of the situation² as documented in the Hills Report (2012). The key point to make is that affordability criteria should ideally accommodate numerous elements, appropriately weighted. On the one hand, they should be sensitive to changes in supply side variables (i.e. changes

¹ In Belgium 8.5% of all residential customers have benefited from social tariffs in gas and electricity in 2012; in Italy, beneficiaries included about 600,000 households; in France 1,083,000 and 313,000 consumers benefited from social tariffs for electricity and gas, respectively (see the Vulnerable Consumers Working Group Report, 2013).

² On this point and as applied to the Italian experience, see e.g. Miniaci, Scarpa and Valbonesi (2008). On the UK, see Waddams Price (2005) and Hancock, Waddams Price (1998), Gomez-Lobo, A. (1996).

to energy prices, technology, conditions of service) and, on the other, they must take into consideration consumer needs and preferences. This seems to be particularly complex, given the heterogeneity of household living conditions (e.g. climate and type of housing), and composition (e.g. number of family members, presence or absence of children and/or the elderly and disabled).

On the basis of our discussion on the *pros* and *cons* of the different affordability criteria, we then look at the dynamics of the affordability issue in Italian electricity and gas markets for the period 1998 to 2011 using the annual Surveys on Family Budgets (SFB). As expected, the results depend to a large extent on which measures are used; in particular, on the way in which we define the threshold used to identify vulnerable customers. However, by any measure, fuel poverty in Italy seems to be on the increase since 2007, accompanied by a remarkable reduction in household spending capacity.

Finally we evaluate the potential effectiveness of the electricity and gas benefits scheme introduced in 2008 to support low income households. We first investigate the extent to which the existing rules accurately identify the households with the greatest energy affordability problems, and we assess whether the policy would have been effective in reducing fuel poverty if all eligible households had received the benefit.

Our analysis, based on data from the 2011 EU Survey on Income and Living Conditions (SILC), highlights that the eligibility rules have several limitations: about 12.5% of the households in absolute poverty do not meet the criteria. Only 43% of the households at risk of poverty and no more than 59% of those with affordability problems qualify for the benefits. The value of the benefits in 2011 was on average €68 for electricity and €92 for gas, corresponding respectively to 0.9% and 1.6% of the net income of the eligible households. If all those entitled had taken up the benefit, the total cost of the scheme would have been €409.9 million, equivalent to 0.026% of the GDP. The amount of benefit available from the scheme and its failure to target households in need accurately means that even in the most favourable scenario the scheme has no significant impact on the incidence of fuel poverty, no matter what type of indicator is used to depict the phenomenon. The high number of potentially eligible households that do not apply for the benefit is a further limitation.

The rest of paper is organised as follows. In Section 2, we present different measures of affordability. In Section 3 the study investigates energy affordability in Italy for the

period 1998 to 2011. In Section 4 we describe the Italian state electricity and gas benefits scheme; we consider the potential beneficiaries and we estimate the scheme's ability to tackle income and fuel poverty successfully. Policy implications and suggestions for future research are discussed in the Conclusions (Section 5).

2 Energy affordability indicators

The measures of affordability which are typically adopted are based on the incidence of energy spending as a share of total expenditure or income. Although we consider these indicators first, we prefer the use of indicators based on the notion of residual income.

2.1 Affordability indices based on energy spending as a budget share

The notion of sustainable or affordable energy consumption is based on the idea that it is undesirable for expenditure on these basic goods to exceed a critical threshold: beyond this limit, households presumably struggle in covering the costs and consequently *ad hoc* policies would be recommended.³ The general idea is that energy consumption is part of an essential basket of goods which every household should be able to afford in order to have a “normal” standard of living, characterised by normal heating conditions and normal use of household appliances. In practice, once policy makers have determined the level of the critical threshold, a household is considered to have an affordability issue for the consumption of electricity and gas if it exceeds that limit and such a household can then be said exhibit what the UK has labelled “fuel poverty” (see DEFRA (2001 and 2007)). Accordingly such households should be considered as part of the target population for which the benefits scheme was designed.⁴

In this context, a headcount index (HI) is the percentage of consumers whose energy expenditure exceeds more than a given fraction of their income or total expenditure (i.e. the critical threshold). In most studies, this critical threshold has been fixed at between 5% and 10%, depending on the utility considered.⁵ This way of measuring affordability does not incorporate any information about a desirable minimum amount of household

³ Some studies in economic literature have highlighted the idea that policy makers should consider essential levels of energy consumption – and more generally of public utility services – as a merit good and consequently address policies to support lower consumption (Hancock, 1993; Sadmo, 1983; Besley 1998).

⁴ Important contributions to the measurement of poverty are provided by Atkinson, (1987); Callan and Nolan (1991); Foster, Greer and Thorbecke (1984); Sen (1976).

⁵ See also Fankhauser and Tepic (2007), Chaplin and Freeman (1999), Hancock, K. E. (1993), Healy (2001), Sefton, (2001), Sefton and Chesshire, (2005), Waddams Price et al. (2012).

consumption, either for utilities or other goods. For example, a policy based on such a critical threshold does not discriminate between a household with €100 expenditure on energy per month out of a total monthly expenditure of €1000, and another household with a monthly expenditure of €500 on utilities out of a monthly total expenditure of €5000. It follows that such a policy does not address, and may potentially exclude from the set of eligible households, impoverished consumers (i.e. those who do not have access to the service either because of limited supply or because of high fixed costs).

The way this critical threshold is derived is described as follows. Formally define (x_h), the total observed expenditure for household (h), corresponding to the sum of the observed expenditure in utilities (x_h^u) and the actual expenditure in total (x_h^c). In the aforementioned approach, a household has problems of sustainability in its energy consumption if the ratio ($r_h = x_h^u / x_h$) is larger than a given threshold (r^u). Considering any population, the extent of the sustainability problem is measured by the fraction of households for whom ($r_h \geq r^u$), i.e. HI:

$$[1] \quad HI \equiv \frac{\sum_h \mathbf{1}(r_h \geq r^u)}{N}$$

where N is the total number of households and $\mathbf{1}(r_h \geq r^u)$ is an indicator function which equals 1 whenever the condition in parentheses holds, and 0 otherwise. The index HI in [1] tells us the fraction of the households which spend more than a given "reasonable amount" (in proportion to available resources) for utilities. Notice that [1] does not incorporate any qualitative information relating to a minimum or desirable level of consumption, neither for the utilities nor for other goods and services.

In our view, such a concept of affordability cannot provide useful information on either the extent of the problem, or its depth. As for the former issue, it excludes from its definition of fuel poverty those households in absolute poverty that decide because of economic constraints to spend very little for these services. Moreover, this approach can label as "fuel poor" some relatively well-off households that are characterised by high energy consumption.

2.2 Affordability indices based on residual income

A different way of measuring affordability stems from the basic observation that energy is not the only item essential for a decent life, and that spending on energy can become problematic where it leaves a household insufficient income to consume other goods or services. As highlighted in Miniaci, Scarpa and Valbonesi (2008a) and (2008b), the indices presented in 2.1 above completely neglect this point. The notion of “residual income” was first used to study problems of affordability in the field of housing economics where the problem is described as follows: *“housing is not affordable for a household if it excessively crowds out other expenditure. Obviously housing expenditure always crowds out non-housing expenditure versus housing expenditure. The term ‘excessively’ is key”* (Thalmann, 2003, p.294). Adapting this definition for use in relation to energy consumption, we can say that there is a problem with energy affordability if the household does not have sufficient financial resources to fund a minimum level of consumption of other goods after paying bills for gas and electricity.

Note that this approach focuses on financial difficulties incurred as a result of the consumption of public utilities (Stone, 1993). Another useful element of this approach is that it allows one to identify at least three types of households with affordability issues for which different types of interventions are suitable:

- (i) Households unable to access the minimum amount of essential commodities and utilities: in this case, the problem of energy affordability can be alleviated by income support mechanisms which are not conditional on the actual level of consumption;
- (ii) Households with limited income that over-consume: in this case, an appropriately targeted action should address the reason why this happens (preferences, technological constraints, inefficient equipment, etc.);
- (iii) Households whose consumption is below the minimum standard due to monetary or non-monetary constraints (e.g. lack of access to gas or electricity networks): in this case, interventions should first be aimed at removing these constraints.

Formally, consider (q^{cp}) the minimum bundle, common to all households, of non-energy goods and services which are considered necessary for a decent standard of living, whose market price is (p_c). Household (h) with an actual level of energy consumption (q_h^u) faces an affordability problem if its residual income (RI_h), defined as the difference between the total observed expenditure and energy expenditure ($RI_h = x_h - p_u q_h^u$), is not sufficient to purchase such a minimum bundle of other goods, that is, if:

$$[2] \quad x_h - p_u q_h^u < p_c q^{cp}$$

The indicator function $I_h^u = \mathbf{1}(x_h - p_u q_h^u < p_c q^{cp})$ is equal to 1 for those households with insufficient residual income (and 0 otherwise), while $I_h^c = \mathbf{1}(x_h - p_c q_h^c < p_u q^{up})$ equals 1 whenever the expenditure of energy is lower than the market value of the minimum standard for energy (q^{up}). We call households with $I_h^u = 1$ “residual income poor”, while we classify those households with $I_h^c = 1$ as “under-consumers”. The numbers of residual income poor and of under-consumers are $N_u^{RI} = \sum_h I_h^u$ and $N_c^{RI} = \sum_h I_h^c$ respectively, and the headcount index consistent with this approach is defined as:

$$[3] \quad H_u^{RI} = N_u^{RI}/N, \quad H_c^{RI} = N_c^{RI}/N,$$

and by combining the two deprivation conditions:

$$[4] \quad HI^{RI} = \frac{\sum_h (I_h^u + I_h^c - I_h^c I_h^u)}{N}$$

The above indices do not take into account how much below the minimum consumption level a household has slipped and therefore these indices give no guidance on the level of subsidy needed to overcome the problem. This information is instead conveyed by the Poverty Gap Indexes (PGI). We define the average gap between the minimum standards and those for the residual income poor and the under-consumers as:

$$[5] \quad GI_u^{RI} = \frac{1}{N_u^{RI}} \sum_h I_h^u (p_c q^{cp} - p_c q_h^c), \quad GI_c^{RI} = \frac{1}{N_c^{RI}} \sum_h I_h^c (p_u q^{up} - p_u q_h^u),$$

The Poverty Gap Indices are defined as:

$$[6] \quad PGI_u^{RI} = H_u^{RI} \times GI_u^{RI}, \quad PGI_c^{RI} = H_c^{RI} \times GI_c^{RI}$$

which combines indicators of the extensive and intensive margins relevance of the affordability problem.

With respect to the budget share approach, the residual income framework has the advantage of distinguishing between the different causes of fuel poverty (income poverty, over-consumption or under-consumption) and of being able to assess (through the poverty gap indices) the appropriate monetary transfer needed to support the households in need. Both aspects are crucial in the design of effective policies aimed at alleviating the problem of fuel poverty.

2.3 The affordability of electricity and gas expenditure in Italy, 1998-2011

In this section we apply the affordability measures outlined in the previous section to the consumption of electricity and gas in Italy; to this end, we need to follow two preliminary steps:

- (i) Define the threshold (r^u) above which the budget share indicates the presence of an affordability problem.
- (ii) Set the level of the minimum standard expenditures for electricity and gas ($x^{up} = p_u q^{up}$) and the other goods ($x^{cp} = p_c q^{cp}$).

We set the values for the minimum quantity of gas and electricity as equal to those included in the definition of the official Italian poverty line,⁶ and the corresponding component is used for the sum of the other goods; these amounts are estimated for each household sampled by the ISTAT Survey of Household Budgets from 1998 to 2011. For the purposes of this paper, we consider the minimum expenditure for gas to coincide with the heating and cooking component of the poverty line, which can be seen as an average of the minimum of such costs regardless of the fuel type.

⁶ See ISTAT, La misura della povertà assoluta, Metodi e norme n. 39, 2009, and details in Appendix A.

TABLE 1 – about here

Table 1 shows the average monetary value of the minimum standards x^{up} for electricity, gas and other goods in Italy in 2011. For electricity, the value of the reference consumption does not depend on the area of residence and it amounts to about half of the actual median expenditure for electricity. For gas we consider as reference expenditure the expenditure for heating and cooking included in the definition of the poverty line. Such a component is region-specific (for climatic reasons) and its value is about 80% of the actual median spending except for small households living in warm areas, where it is considerably smaller than the median expenditure. As not all Italian households use natural gas for heating and/or cooking, the minimum standard for other goods (x^{cp}) must be differentiated between users and non-users of natural gas. In the latter case the value of (x^{cp}) includes the minimum expenditure for heating and cooking. See Appendix A for further details.

For the definition of the threshold values (r^u), necessary to identify the households in need on the basis of the share of their budgets spent on gas and electricity, we can adopt several alternative approaches:⁷

- (i) A “normative” approach internalises the implicit value judgements adopted in the construction of the absolute poverty line. In this case the maximum sustainable threshold (r^u) is defined as the ratio between the value of the amount of subsistence for the utility (x^{up}) and the value of overall subsistence spending ($x^p = x^{up} + x^{cp}$). This ratio varies with household size, area of residence and relative price, thus acknowledging the role played by economies of scale, climate conditions and prices.
- (ii) A “positive” approach, that looks at the balance sheets of households with low purchasing power and defines the maximum sustainable threshold (r^u) as the median value of the share of energy expenditure for the households in a state of relative poverty (that is, for a two person household, households whose expenditure is less than the average per capita expenditure). This threshold is

⁷ Notice that all these approaches necessarily entail some degree of arbitrariness, so that the number of possible alternatives is potentially infinite.

computed conditional on household size and geographical area and varies over time due to changes in relative prices and household consumption decisions.

(iii) The standard approach that sets a threshold equal for all types of households which at least apparently yields more interpretable results. Much of the literature sets the threshold at 10 % for gas (including heating) and 5% for electricity (e.g. Fankhauser and Tepic, 2007).

TABLE 2 - about here

Table 2 allows us to appreciate the difference between the alternative approaches described above. The table shows the thresholds computed according to the above criterion (1) on the left and (2) on the right, for the year 2011. For electricity, the thresholds set by criterion (1) are about half of those set according to the second approach, while the differences are narrower in the case of gas. In all cases, the standard thresholds of 10% for gas and 5% for electricity are much higher than those identified by the criteria (1) and (2), and therefore their use classifies fewer household as “fuel poor”.

TABLE 3 - about here

Table 3 provides an initial insight into the relevance of electricity and gas affordability in Italy, where the concept of sustainability refers to the incidence of actual expenditure for these utilities in household budgets. For each year, the table shows the average thresholds and the estimates of the headcount index for electricity and gas (referring only to those households actually connected to the natural gas network). The left-hand panel refers to the normative approach (where threshold values are implicit in the poverty line); the central panel shows the results for the positive approach (where threshold values are set with reference to the observed budget share of the household with reduced spending capacity); while the right-hand panel considers the threshold of 5% for expenditure on electricity and 10% for gas. Adopting the normative criterion, the percentage of households spending an excessive share of their budget on electricity varies from 33.7% in 1998 to 51.4% in 2010. Using the positive criterion the percentage of households with electricity affordability problems is halved and estimates range between 14.8% in 2007 and 20.1% in 1999. Finally, setting the limit constant at 5%, the

percentage remains between 5% (in 2000) and 8.1% (in 2009). Different criteria deliver remarkably different pictures of the affordability of electricity consumption, both in terms of overall levels and dynamics. Nevertheless, all three methods agree in indicating a worsening of the sustainability of electricity bills coinciding with the start of the Great Recession. With regard to gas consumption, the indices computed with the normative and the positive approaches have a similar size, but their time variations differ significantly: the normative headcount index varies from 20.4% in 2001 to 28.9% in 2009, while with the positive criterion it ranges between 24.7% in 2003 and 33.4% in 2000. Moreover, the three indicators do not show consistent evidence in favour of the claim that the affordability of gas consumption has worsened in recent years.

TABLE 4 - about here

Consider now the measures related to the residual income approach shown in Table 4. In this case we account for the sum of the costs of electricity and gas accurately, taking into consideration whether or not the household uses natural gas. The first column shows the fraction of households classified as being in absolute poverty, that is, those whose expenditure falls below the absolute poverty line. Due to data accessibility, our figures do not coincide with the official absolute poverty rate provided by the Italian Central Statistical Institute (ISTAT). In particular, we estimate the percentage of poor households by almost two percentage points above the ISTAT figure. However, what is more important here is that we are fully consistent in terms of time dynamics.⁸ In the last few years, from 2007 to 2011, the percentage of households in absolute poverty has increased by almost 50%, rising from 5.2% to 7.7%. Column (A) shows the fraction of households defined as residual income poor, i.e. those households whose expenditure, net of electricity and gas bills, is lower than the value of the minimum bundle of other goods necessary to guarantee a decent standard of living. We can observe that this fraction fluctuated around 5.5% until 2007, reaching 8.4% in 2011. The fraction of under-users, namely the households whose expenditure on electricity and/or gas is less than the subsistence level as identified by the poverty line, varies over time. In particular, the proportion of under-users has decreased from approximately 30% to

⁸ See Appendix A for further details.

20.6% between 1998 and 2005 and then increased to 24.9% in 2011 (see column (B)). The high percentage of under-users is a consequence of the relative “generosity” of the minimum reference expenditure for gas, defined as the heating expenditure component of the poverty line and nearly equal to the observed median expenditure for heating. The combination of residual income poor and under-users, column (C), leads to an estimate of about 30% of households with affordability problems. As expected, the majority of these households are not poor in the absolute sense. The last two columns of Table 4 present the percentage of residual income poor and under-users who are not absolutely poor. The first group of households varies between 0.5% and 0.7% until 2007, with a recent increase to more than 0.9%. Overall, at least 85% of the residual income poor households are actually absolutely poor, that is unable to afford the minimum standards of consumption either of energy or of other goods. On the other hand, less than 10% of the under-consumers are also poor in absolute terms. In conclusion, the worsening of the affordability indicators during the last few years is mainly driven by the general deterioration of the absolute poverty indicator over time.

So far, we have only looked at headcount indices, which simply count the number of households “with affordability problems”. In the case of the residual income approach it is particularly informative to study the depth of the phenomenon among these households. Indeed, in this framework the average deviation from minimum standard expenditure is an exact measure of the average money transfer required to ensure that residual income poor households can continue to consume the current amounts of electricity and gas and at the same time be able to afford the subsistence basket of other goods; for the under-consumers, it is the index that identifies the transfer that would allow them to consume the minimum amount of electricity and gas, leaving their current spending on other goods unchanged.

TABLE 5 - about here

The average deviations for the residual income poor and the under-consumers (GI_u^{RI} and GI_c^{RI} respectively) are reported in Table 5. Our estimates show that not only is energy less affordable for more Italian households today than in the past (see Table 4), but also that households are affected by this issue in an increasingly serious way. In

fact, for the residual income poor households, the amount which they would need to finance the sufficient consumption of other items has increased from €128 per month in 1998 to €200 per month in 2011 (+56%) - compared to an inflation of 36.6% in the same period. For the under-users, however, the distance from the threshold has remained unchanged in real terms.

3 Electricity and gas-related benefits in Italy

The state policy regarding benefits payable for electricity and gas consumption in Italy was set forth by Law 205 of 23 December 2005, and then implemented through the Ministerial Decree of 28 December 2007 (electricity bonus) and the Law Decree 185/2008 (gas bonus). The declared aim of the policy has been to provide a support to:

- i) households living in poverty - or on its margins;
- ii) large households; and in case of electricity;
- iii) households which include a disabled, or a critically ill person.

The program is funded through specific components in transmission or distribution,⁹ paid by all consumers.

The income eligibility criteria for electricity and gas benefits are the same;¹⁰ and in both cases the spending ability of the family is tested by using a synthetic indicator called ISEE (the acronym for “Indicatore di Situazione Economica Equivalente”, that is, the Equivalent Economic Conditions Indicator). The indicator combines information about three elements: income, real and financial assets, and the composition of the household. To be eligible, the household's equivalent income indicator must not exceed €7,500 unless the family includes more than three dependents, in which case the threshold is increased to €20,000.

Given that the benefits are paid in the form of discounts on electricity and gas bills, a necessary eligibility condition is that the household must be a domestic customer in its primary residence. In the case of electricity, some limits to the installed power must be met (3 kW for up to four household members, 4.5 kW if more), unless the household includes a person who needs essential electro-medical appliances. In the case of gas, the

⁹ These components are the so called “AS” in the transmission and distribution tariff (TIT), and “AG” component in the gas distribution tariff (RTDG).

¹⁰ For detailed information about the benefit design, see http://www.autorita.energia.it/it/bonus_sociale.htm

benefit is given to eligible households in the form of discounts in bills for domestic customers having an individual contract, and with a bank transfer for customers having a condominium contract (usually due to the presence of centralised heating).

All domestic customers meeting the above criteria can apply for the benefits by filing a form with the municipality where they reside. Given that the eligibility criteria are independent of the actual consumption levels, the ubiquity of the power grid guarantees that all the Italian households meeting the above income requisites are potential beneficiaries of the electricity bonus. The availability of the gas benefit is instead limited by the fact that natural gas is not available everywhere. In particular, many mountainous areas and the entire Sardinia region are not served by the gas distribution grid. In practice this makes the pool of eligible households for the gas benefit a subset of the households eligible for the electricity bonus.

The electricity bonus depends on a number of components and it is independent of actual consumption, with the exception of the presence of electro-medical appliances, where it is calculated on the ground of the electricity usage intensity. For gas, the discount is proportional to the family size and depends on the classification of the municipality according to its typical winter temperature and the declared use (hot water and cooking and/or heating, see Appendix B).

3.1 Assessing the appropriateness of the eligibility criteria

All the affordability indicators discussed in previous sections refer to actual and/or standard expenditure in order to identify households in need. The eligibility criteria used to determine electricity and gas benefits in Italy are instead independent of actual household consumption. The fundamental criteria are to be a domestic customer and to have an equivalent income indicator below a given threshold. In order to assess to what extent the eligibility criteria for the electricity and gas benefits are able to identify those households facing affordability problems, we have made use of data from the Eurostat - ISTAT “Survey on Income and Living Conditions” (EU-SILC) to classify the households according to different energy poverty criteria which we then compare with their eligibility status.

We ran this exercise using data from the 2011 EU-SILC survey because this is the first year for which it is possible to compute taxable household income, crucial information when computing the equivalent income indicator (ISEE) for every family

participating in the survey. Unfortunately, the data do not reliably identify the households which might be beneficiaries of the electricity benefits for health reasons; therefore, we focused exclusively on the households eligible for electricity benefits for economic hardship. These constitute the vast majority of benefit recipients (see Appendix C for details). Some approximation is also necessary for gas. In fact with the EU-SILC data we can determine whether the household uses gas for cooking and/or heating, but the EU-SILC questionnaire does not distinguish between natural gas and other kinds of gas, thereby leading to an overestimate of the pool of eligible customers. Moreover, we cannot observe the cost of gas included in general condominium expenses (see Appendix C for details).

We first use the survey data to provide a brief description of the distribution of income, the incidence of poverty income, and the eligibility status for the electricity and gas benefits. We compare these figures with those of the indicators for the electricity and gas. Although we maintain the alternative definitions of affordability illustrated in the previous sections, their implementation is slightly different with the new data, the main difference being that we apply the affordability measures to disposable income rather than to total expenditure.

TABLE 6 - about here

The adult equivalent income is estimated at an average of €33,567 in 2011, its distribution is such that 5.3% of the households are in the state of absolute income poverty and 19.5% are at risk of poverty¹¹ (see Table 6). In this scenario, the electricity benefits provide support to potentially 11.5% of households (about 2.9 million families); 9.2% of the households (2.3 million) qualify for the gas benefit. Depending on which strategy is adopted to set the critical threshold for the budget shares, the percentage of households in difficulty ranges from between 6.1% to 38.3% for electricity and from between 2.6% to 17.6% for gas. Resorting to the residual income approach, 5.6% of households do not have sufficient resources left after having paid

¹¹ The adult equivalent income is defined as household income net of taxes and contribution to the social security system, including imputed rents and social transfers, divided by the Carbonaro's equivalence scale that is used for the definition of the absolute poverty line. The households at risk of poverty are defined by Eurostat as those households whose adult equivalent income is less than 60% of median adult equivalent income.

electricity and gas bills, while 26.73% families have energy expenditure below the minimum standards. The statistics vary considerably between different types of families. The incidence of income and fuel poverty is higher among households with children, dramatically higher in the case of single parents. The percentage of households covered by the benefits (which are means-tested) tends to be higher among households with higher poverty rates. It is not therefore surprising that the coverage rate for the southern regions is more than three times the coverage rate for the richer northern regions, and that the percentage of eligible families in rural regions is higher than the corresponding percentage in more densely populated areas.

Table 6 provides some information about the relationship between household housing conditions, their incomes, eligibility status and relative fuel poverty. In fact, quality of accommodation may play a crucial role in determining the financial costs of energy, and therefore its affordability. It turns out that householders who own their homes are less likely to face an affordability problem, to be income poor or to be eligible for the benefits. This is partly due to the fact that home-owners are richer than tenants, but it is also the case that rented houses are typically of lower quality in comparison with owner-occupied houses. Table 6 shows that where accommodation is poorly maintained (e.g. leaking roofs, broken windows, dampness or poor insulation) the likelihood of falling into fuel poverty is higher.

Finally, we investigate whether households that declare difficulties in coping with regular mortgage payments, rent and utility bills are classified as poor and are supported by the electricity and gas benefits. The percentage of the absolutely poor among the households with arrears (for economic reasons) on mortgage or rent payments is above 25% and affordability problems are widespread. To a lesser extent, the incidence of income and fuel poverty is also higher among households with arrears (for economic reasons) on utility bills.

We might expect that households with arrears would be covered by the electricity and gas benefits system, but this is not so. Within this group, the percentage of eligible households is three times the average, but nevertheless more than 70% of families declaring difficulties in paying bills are not eligible for the system. Even taking into account the households who see themselves in financial difficulty, either because they consider their housing costs to be almost unbearable, or because their savings are

insufficient to face unexpected expenses of about €800 or because they struggle to make ends meet, there is a wide gap between the number of households who see themselves in need and the number of households potentially eligible for support.

Although perceived financial difficulties may be relevant *per se*, we prefer to rely on objective indicators. We therefore studied the percentage of eligible households among the income poor families, and also among the families facing difficulties according to the alternative approaches such as measures based on residual income.

TABLE 7 - about here

The stated aim of the electricity and gas benefits scheme is to support low income households, but the eligibility criteria do not ensure that all the targeted families qualify for the benefits. In particular, Table 7 shows that:

- about 12.5% of the households are absolutely poor, i.e. 170,000 families are not eligible for these benefits;
- only 43% of the households at risk of poverty qualify for the benefits, that is, 2.8 million households at risk of poverty are not supported by the policy.

Our estimates also make it clear that the eligibility criteria are particularly inadequate in addressing households that are poor but have no children, and also poor households outside the South.

More than 40% of the households facing difficulties because their electricity and/or gas bills amount to more than 5% (10%) of their net income are not entitled to the benefits; the coverage rate is higher (75%) if we refer to households with gas affordability problems according to the positive budget share approach. The percentage of potential beneficiaries of the scheme among residual income poor households is about 87%, while on average only about 10% of under-users are eligible. The fraction of households in difficulty that are supported by the scheme varies greatly between types of families and geographical areas, with families with children and families living in the South being most likely to be eligible.

The fact that the eligibility criteria exclude a significant portion of households in need is due to a combination of factors:

- (i) the Equivalent Economic Conditions Indicator (ISEE) used to assess the financial resources of the households refers to a definition of income that differs from that considered by the standard poverty indicators. In fact, the ISEE considers gross household income together with an estimate of the income produced by real estate properties and financial wealth, while the poverty statistics refer to net household income including imputed rents due to primary residence ownership and social transfers;
- (ii) the ISEE indicator is based on an equivalence scale that is slightly different from that used for poverty definition. In particular, the equivalence scale used in the ISEE indicator overweighs the presence of disabled individuals, single parents and couples with children where both partners are employed (see Appendix C), while the equivalence scale used for the poverty indicators considers only the size of the household and the age of its members;
- (iii) in order to be eligible, the household's ISEE value is compared to €7,500 euro (or €20,000 euro if there are more than three dependent children), regardless of its region of residence; the components of the absolute poverty line are instead region-specific, which allows it to consider regional variations in prices, housing markets and heating needs.
- (iv) the eligibility criteria do not depend on the household's actual energy consumption; the scheme, by its design, is not well suited to deliver benefits to those consumers facing difficulties despite the fact that their spending ability is above the subsistence level.

3.2 Assessing the potential effectiveness of the electricity and gas benefits scheme in combating fuel poverty

We now investigate the extent to which the electricity and gas benefits scheme actually alleviates the affordability problems related to energy consumption in low income households. Unfortunately there are no publicly available data on the recipients of the benefits so that we cannot rely on standard econometric procedures to assess the effectiveness of the scheme. We circumvented this lack of *ad hoc* data by assuming that all eligible households actually receive the benefits and compare this outcome with a situation in which no such scheme existed. More specifically, we first made use of the EU-SILC 2011 data to identify eligible households (as in the previous subsection). We

then used the eligibility rules to determine the appropriate level of benefits for each family (see Appendix B). Finally we compared the income and fuel poverty indicators with and without the benefits. By doing so we were able to estimate the maximum potential effect that the policy has in terms of combating fuel poverty, given the actual features of the households and the distribution of income and energy expenditure.

The value of the benefits depends on household size and, in the case of gas, on the climatic conditions of the area of residence. In 2011, the benefits for electricity ranged from €56 euro for a single or two-person household to €124 euro per year for a family with at least five members. The gas benefit varied between €70 for a household in the warmest areas of the country with at most four members to €264 for larger households in the coldest regions. According to our estimates, the average amount of the discount and its related tax advantage was €75.4 for electricity and €135.2 for gas. The impact of these benefits on household budgets is limited: for the low income households who are the potential beneficiaries of the policy, the electricity benefit is on average equivalent to 0.9% of their net income, while the gas benefit amount is equivalent to 1.6% of net income. The resources required to combat residual income poverty, for example, are much larger: in Table 5 we estimate the average deviation from the minimum standard for the residual income poor to be equal to €200 euro per month in 2011. To include cross-national comparisons, we note that the Winter Fuel Payment scheme in the UK paid £400 to pensioners over 80 in 2011; we note that this subsidy could be added to advantages coming from the Warm Home discount scheme and from other measures used in UK fuel poverty policy (Hills, 2012).

TABLE 8 - about here

Table 8 summarises what would happen if all entitled households took advantage of the scheme. In the first column we present the fraction of households not eligible for the benefits who are in income or fuel poverty according to the different criteria adopted. In this exercise we took advantage of the fact that the eligibility rules are constant across all sectors. Therefore if gas users qualify, we consider the sum of the two benefits, and we report a unique set of affordability indicators for gas and electricity. The second column similarly shows the same values for the eligible households where they did not take up the benefits.

All our statistics confirm that these families are more vulnerable than households that are not eligible. After the payment of benefits, the situation improves only marginally with respect to income poverty (the third and fourth columns). Among the recipients, absolute poverty decreases by 0.9 percentage points, from 40.7% to 39.8%; this means that only 2.2% of the recipients who are absolutely poor are enabled to exit from poverty status thanks to the electricity and gas benefits scheme. A similar exit rate is estimated from the "at risk of poverty" status, and the same rate is even lower if we focus on the residual income poor. Adding the small effect that benefits have on recipient welfare to the fact that the eligibility criteria leave many poor households without support (see Table 7), the result is that the overall potential effect of the policy on the poverty indicators is negligible (see last column of Table 8).

Even though the targeting of the scheme does not take into account actual expenditure for electricity and gas, the somewhat paradoxical result is that the main effect of the benefits scheme is to improve the affordability indicators based on the budget share approach. In fact comparing the affordability indices for the eligible households before and after the payment of the bonuses (columns 2 and 3 of Table 8) we can compute that about 16% of the recipients may solve their difficulties by taking advantage of the fuel discounts. The reduction of the headcount indices for the entire population is much smaller due to the limited coverage provided by the eligibility criteria: considering the combined threshold of 5% for electricity and 10% for gas, the payment of the benefits reduces the headcount index from 4.2% to 3.7%.

4 Conclusions

There is a lively debate about which measures are better able to describe the affordability of energy consumption. In this paper we have presented the *pros* and *cons* of some of these measures and, by making use of available statistical datasets, we show that alternative indices may represent the situation in very different ways, both in terms of the number of the households in need and in terms of time dynamics. Despite this variability, the different measures agree in indicating that energy consumption has become less affordable since the start of the financial crisis in 2007.

In 2008, the Italian government introduced a scheme aimed at supporting the energy consumption of vulnerable households. The Italian scheme unlike schemes for general

income support as adopted in the UK's fuel poverty strategy (Hills, 2012) and unlike direct subsidies for investments to increase home efficiency as widely-used in Sweden (Mahapatra et al. 2011), consists of a lump-sum contribution for vulnerable consumers, similar to schemes already adopted in France (Dubois, 2012).

Given the eligibility criteria, which are related to indicators of consumer purchasing power, we estimate that in 2011 the percentage of Italian households which qualified for the benefits was about 11.5% for the electricity benefit and 9.2% for the gas benefit. The coverage of the benefits varied significantly across different types of households and different regions. We estimate that in 2011 the average benefits received were €68 for electricity and €92 for gas.

The policy therefore provides a limited benefit to a potentially large number of beneficiaries. The eligibility of a household is determined by its taxable income, financial and real wealth, labour force participation and demographic composition. It is independent of the actual spending on energy, housing conditions and the cost of living experienced by the family. This undermines the ability of the benefits scheme to effectively target households in need. At the same time some of the funds are disbursed to families that can hardly be considered vulnerable. Our simulation shows that even in the most favourable scenario, the implementation of the policy leaves the poverty and affordability indices basically unaltered.

Our analysis suggests that the effectiveness of the Italian energy benefits scheme could be improved by heavily revising the eligibility criteria. In particular, it is necessary to recognise that the cost of living differs widely across the country, and that therefore the material conditions of households falling below the national €7.500 threshold of equivalent income but living in different areas of the country can be remarkably different. Price heterogeneity is duly taken into account by the poverty and affordability indices, but not by the administrative rule applied to grant access to the benefits. In our opinion, household spending ability should instead be compared to an area-specific threshold whose level should depend on the local cost of living.

The discounts are enjoyed by all low income households who have an electricity and/or natural gas supply, regardless of the quantities consumed. The decision to use a discount instead of a cash transfer excludes from the pool of eligible households those families who have been disconnected because of arrears as well as vulnerable

consumers who live in areas with no access to the natural gas grid. This result is somewhat paradoxical if the goal of the scheme is to finance the consumption of energy as a “merit good”. In this respect, means-tested cash transfers can be a more effective way to support households in need, ensuring a wider coverage rate of the target population, without necessarily increasing current (substantial) administrative costs.

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Tables

Table 1: Average monetary value of the minimum reference monthly expenditure for utilities and other goods.

Values for 2011, by climatic classification of the area of residence.

# Household members	Gas				
	Electricity	Warm	Mild	Temperate	Cold
1	12.01	5.33	36.49	36.51	53.36
2	16.34	20.27	47.76	52.12	68.27
3	22.33	27.17	53.79	59.17	75.12
4	25.13	40.94	61.98	68.05	87.79
5 +	27.29	55.90	73.82	82.38	102.72

# Household members	Other goods (Food, housing, etc.)							
	Warm		Mild		Temperate		Cold	
	No gas	With gas	No gas	With gas	No gas	With gas	No gas	With gas
1	563.96	556.05	614.81	634.19	647.80	624.12	739.93	682.33
2	801.03	779.45	870.63	868.71	889.19	858.70	1025.34	953.41
3	1035.76	1006.74	1106.69	1106.82	1139.85	1091.55	1301.22	1220.38
4	1260.45	1222.44	1349.52	1311.79	1331.91	1302.77	1566.30	1471.95
5 +	1456.33	1430.94	1531.08	1501.59	1506.09	1468.43	1774.63	1718.28

Table 2: Critical thresholds r^u for the budget share approach.

Values for 2011

# Household members	Thresholds based on components of the absolute poverty line (1) Electricity					Thresholds based on budget shares of households in relative poverty (2) Electricity				
	Warm	Mild	Temperate	Cold	Total	Warm	Mild	Temperate	Cold	Total
1	0.0209	0.0182	0.0181	0.0161	0.0176	0.0526	0.0412	0.0525	0.0325	0.0403
2	0.0201	0.0179	0.0179	0.0158	0.0173	0.0453	0.0384	0.0365	0.0274	0.0341
3	0.0211	0.0192	0.0193	0.0170	0.0186	0.0424	0.0355	0.0275	0.0291	0.0329
4	0.0196	0.0182	0.0184	0.0159	0.0176	0.0362	0.0344	0.0290	0.0258	0.0307
5+	0.0185	0.0177	0.0185	0.0151	0.0171	0.0390	0.0301	0.0298	0.0232	0.0300
Total	0.0203	0.0183	0.0184	0.0161	0.0177	0.0442	0.0374	0.0379	0.0290	0.0350
# Household members	Gas					Gas				
	Warm	Mild	Temperate	Cold	Total	Warm	Mild	Temperate	Cold	Total
1	0.0094	0.0511	0.0523	0.0715	0.0594	0.0398	0.0511	0.0718	0.0745	0.0663
2	0.0250	0.0497	0.0552	0.0660	0.0566	0.0278	0.0404	0.0550	0.0610	0.0524
3	0.0258	0.0444	0.0497	0.0571	0.0490	0.0242	0.0475	0.0409	0.0502	0.0448
4	0.0318	0.0435	0.0481	0.0555	0.0473	0.0268	0.0400	0.0388	0.0437	0.0390
5+	0.0370	0.0458	0.0523	0.0560	0.0492	0.0187	0.0297	0.0505	0.0289	0.0305
Total	0.0247	0.0476	0.0519	0.0642	0.0539	0.0285	0.0445	0.0540	0.0596	0.0517

Table 3: Affordability measures based on the budget share approach.

Average threshold ratios for normative and positive approaches and headcount indices (HI) for electricity and gas. Threshold and HI for gas refer to gas users only.

	Normative approach				Positive approach				Standard approach	
	Electricity		Gas		Electricity		Gas		Electricity	Gas
	Average threshold	HI	Average threshold	HI	Average threshold	HI	Average threshold	HI	5% threshold HI	10% threshold HI
1998	0.0200	0.3372	0.0523	0.2287	0.0283	0.1987	0.0382	0.3236	0.0588	0.0575
1999	0.0191	0.3726	0.0523	0.2317	0.0286	0.2012	0.0451	0.2824	0.0647	0.0568
2000	0.0198	0.3352	0.0543	0.2186	0.0279	0.1868	0.0363	0.3340	0.0497	0.0578
2001	0.0196	0.3698	0.0542	0.2039	0.0296	0.1894	0.0387	0.3241	0.0526	0.0508
2002	0.0189	0.4066	0.0508	0.2536	0.0306	0.1768	0.0466	0.2714	0.0565	0.0589
2003	0.0187	0.4122	0.0510	0.2503	0.0315	0.1685	0.0493	0.2471	0.0578	0.0515
2004	0.0177	0.4331	0.0502	0.2637	0.0308	0.1668	0.0476	0.2653	0.0548	0.0532
2005	0.0179	0.4458	0.0528	0.2621	0.0319	0.1616	0.0529	0.2498	0.0582	0.0589
2006	0.0194	0.4220	0.0555	0.2607	0.0340	0.1566	0.0515	0.2692	0.0600	0.0688
2007	0.0197	0.4262	0.0543	0.2167	0.0344	0.1481	0.0412	0.3001	0.0542	0.0483
2008	0.0202	0.4706	0.0561	0.2505	0.0370	0.1556	0.0495	0.2639	0.0710	0.0605
2009	0.0196	0.4920	0.0534	0.2894	0.0366	0.1648	0.0520	0.2744	0.0806	0.0735
2010	0.0181	0.5138	0.0519	0.2852	0.0362	0.1559	0.0536	0.2519	0.0716	0.0649
2011	0.0177	0.5042	0.0539	0.2708	0.0350	0.1614	0.0517	0.2645	0.0690	0.0645

Table 4: Affordability measures based on the residual income approach.

Gas and electricity together. Headcount indices for absolute poverty, overall energy poverty (C) and by cause of deprivation (A and B).

	Below the absolute poverty line	(A) Residual income poor	(B) Under-users	(C) A and/or B	Above the absolute poverty line	
					Residual income poor	Under-users
1998	0.0537	0.0572	0.2897	0.3256	0.0051	0.2668
1999	0.0545	0.0596	0.2745	0.3136	0.0065	0.2527
2000	0.0517	0.0557	0.3003	0.3328	0.0057	0.2754
2001	0.0562	0.0595	0.2929	0.3292	0.0054	0.2677
2002	0.0551	0.0607	0.2540	0.2955	0.0073	0.2331
2003	0.0504	0.0551	0.2337	0.2717	0.0064	0.2150
2004	0.0492	0.0544	0.2157	0.2573	0.0059	0.2021
2005	0.0470	0.0523	0.2057	0.2461	0.0066	0.1925
2006	0.0487	0.0547	0.2365	0.2760	0.0069	0.2204
2007	0.0518	0.0563	0.2523	0.2905	0.0062	0.2325
2008	0.0646	0.0707	0.2493	0.3006	0.0086	0.2275
2009	0.0667	0.0740	0.2329	0.2886	0.0099	0.2120
2010	0.0668	0.0759	0.2244	0.2804	0.0112	0.2024
2011	0.0772	0.0841	0.2493	0.3089	0.0090	0.2226

Table 5: Average gap.

From the minimum standards for the residual income poor and the under-consumers. Euro, current prices.

	No gas				With gas	
	(A) Residual income poor	(B) Under-users	(As) Residual income poor	(Bs) Under-users	(Ac) Residual income poor	(Bc) Under-users
1998	128.45	16.99	139.96	4.14	114.31	20.00
1999	122.02	16.59	124.20	3.68	118.94	19.54
2000	128.03	19.41	140.41	4.04	117.74	21.99
2001	126.88	18.93	138.48	4.09	116.84	20.93
2002	141.88	18.62	151.48	4.14	134.80	20.07
2003	144.52	19.01	153.11	4.03	137.84	20.65
2004	141.01	18.83	147.78	3.71	136.03	19.91
2005	148.87	21.40	163.58	3.88	136.88	22.27
2006	145.21	22.80	150.60	4.46	141.07	24.07
2007	156.49	23.29	169.51	4.74	149.06	24.03
2008	182.03	25.67	192.31	4.26	175.71	26.62
2009	188.26	24.24	213.28	4.45	173.14	25.20
2010	187.27	22.37	201.79	4.81	180.12	23.23
2011	200.36	25.48	209.06	4.51	195.08	26.51

Table 6: Average income, fraction of income poor, eligible households, and households with affordability problems.

Statistics for gas affordability with the budget share approach refer to gas users only. Adult equivalent income (euro per year): household income net of taxes and contribution to the social security system, including imputed rents, divided by the equivalence scale used for the definition of the absolute poverty line. Poor: households whose adult equivalent income is below the absolute poverty line. At risk of poverty: households whose adult equivalent income is lower than 60% of median adult equivalent income

	Adult equivalent income	Poor	At risk of poverty	With affordability problems											
				Benefit eligible						Budget share approach				Residual income approach	
				Electricity	Gas	Normative	Positive	5%	Normative	Positive	10%	Residual income poor	Under- users		
Total	33576.1	0.0533	0.1947	0.1146	0.0919	0.3827	0.0933	0.0611	0.1756	0.0585	0.0262	0.0557	0.2673		
Household types															
No children															
Single	37495.7	0.0513	0.2394	0.1084	0.0819	0.4156	0.0679	0.0737	0.2760	0.0357	0.0425	0.0537	0.2733		
2 adults, less than 65 yrs	39354.8	0.0462	0.1250	0.0732	0.0594	0.3344	0.0805	0.0480	0.1381	0.0438	0.0213	0.0466	0.2749		
2 adults, at least 65 yrs	33910.8	0.0078	0.1373	0.0980	0.0805	0.3492	0.0676	0.0349	0.1314	0.0202	0.0149	0.0084	0.2615		
Others	35962.0	0.0196	0.1084	0.0654	0.0486	0.2612	0.0649	0.0268	0.0811	0.0355	0.0085	0.0203	0.2397		
With children															
Single parent	22145.6	0.2058	0.3440	0.3340	0.2682	0.5704	0.2504	0.1843	0.3054	0.2105	0.0911	0.2189	0.3033		
2 adults, 1 child	30102.1	0.0638	0.1728	0.1195	0.1021	0.3302	0.1202	0.0628	0.1711	0.0716	0.0224	0.0689	0.2640		
2 adults, 2 children	26139.6	0.0832	0.2336	0.1383	0.1167	0.4408	0.1304	0.0720	0.1357	0.1168	0.0160	0.0857	0.2578		
2 adults, 3 or more children	22206.8	0.1475	0.3676	0.2875	0.2194	0.5635	0.2247	0.0953	0.1770	0.1735	0.0251	0.1564	0.3149		
Others	26371.4	0.0692	0.2475	0.1377	0.1208	0.4671	0.1234	0.0530	0.0867	0.0860	0.0147	0.0699	0.2821		
Region															
North	37629.8	0.0340	0.1153	0.0597	0.0529	0.3229	0.0471	0.0307	0.0966	0.0304	0.0306	0.0341	0.3434		
Centre	36498.4	0.0402	0.1659	0.0850	0.0762	0.3227	0.0584	0.0385	0.0593	0.0419	0.0166	0.0422	0.3605		
South and Islands	25605.0	0.0908	0.3331	0.2163	0.1610	0.5107	0.1850	0.1212	0.4058	0.1219	0.0255	0.0968	0.0938		
Degree of urbanisation															
Densely populated area	36187.17	0.0558	0.1807	0.1083	0.0892	0.3397	0.0867	0.0581	0.1400	0.0563	0.0188	0.0568	0.3252		
Intermediate area	32350.9	0.0484	0.1913	0.1035	0.0862	0.4162	0.0961	0.0606	0.1818	0.0554	0.0299	0.0515	0.2193		
Thinly populated area	29455.6	0.0585	0.2410	0.1586	0.1135	0.4178	0.1043	0.0704	0.2688	0.0737	0.0392	0.0629	0.2264		

Table 6: continued

	Adult equivalent income	Poor	At risk of poverty	With affordability problems											
				Benefit eligible						Budget share approach				Residual income approach	
				Electricity	Gas	Normative	Positive	5%	Normative	Positive	10%	Residual income poor	Under- users		
Total	33576.1	0.0533	0.1947	0.1146	0.0919	0.3827	0.0933	0.0611	0.1756	0.0585	0.0262	0.0557	0.2673		
Tenure status															
Outright owner	36585.2	0.0243	0.1740	0.0605	0.0466	0.3425	0.0688	0.0432	0.1627	0.0307	0.0205	0.0263	0.2373		
Owner paying mortgage	36805.5	0.0285	0.0844	0.0363	0.0286	0.2988	0.0656	0.0333	0.1001	0.0386	0.0114	0.0291	0.2821		
Tenant at market rent	23351.7	0.1638	0.2717	0.3354	0.2897	0.5585	0.1959	0.1445	0.2556	0.1632	0.0602	0.1652	0.3345		
Tenant at reduced rent	24475.7	0.0918	0.3116	0.2764	0.2251	0.5220	0.1356	0.0834	0.1872	0.0927	0.0364	0.1010	0.3595		
Free accommodation	29955.8	0.0868	0.3007	0.1562	0.1076	0.4221	0.1131	0.0774	0.2482	0.0959	0.0299	0.0919	0.2885		
Dwelling type															
Detached house	32050.6	0.0510	0.2282	0.1166	0.0869	0.4745	0.1224	0.0761	0.2441	0.0580	0.0330	0.0562	0.1601		
Semi-detached house	32844.0	0.0453	0.1876	0.1104	0.0860	0.4061	0.0936	0.0624	0.1874	0.0586	0.0353	0.0483	0.1831		
In building < 10 units	32324.4	0.0722	0.2100	0.1380	0.1137	0.3840	0.0992	0.0694	0.1829	0.0793	0.0258	0.0750	0.2593		
In building ≥ 10 units	36844.7	0.0454	0.1551	0.0938	0.0831	0.2806	0.0625	0.0398	0.1007	0.0413	0.0117	0.0445	0.4419		
Leaking roof, damp, broken windows etc.	29472.4	0.0726	0.2511	0.1665	0.1323	0.4862	0.1305	0.0872	0.2363	0.0874	0.0393	0.0768	0.2279		
Unable to keep home warm	24456.0	0.1162	0.3710	0.2626	0.1960	0.5586	0.1797	0.1315	0.3065	0.1242	0.0448	0.1224	0.2033		
Arrears on mortgage or rent	18604.2	0.2551	0.4450	0.4443	0.3924	0.7066	0.2891	0.2287	0.3507	0.2796	0.0989	0.2638	0.2676		
Arrears on utility bills	22608.9	0.1574	0.3811	0.3055	0.2597	0.6082	0.2514	0.1740	0.3175	0.1956	0.0605	0.1657	0.1958		
Excessive housing costs	28785.4	0.0750	0.2544	0.1686	0.1403	0.4814	0.1322	0.0859	0.2173	0.0852	0.0344	0.0785	0.2355		
Difficult to face unexpected financial expenses	25070.8	0.1020	0.3353	0.2248	0.1782	0.5274	0.1599	0.1107	0.2550	0.1142	0.0378	0.1070	0.2555		
Difficult to make ends meet	24607.2	0.1026	0.3361	0.2320	0.1859	0.5414	0.1708	0.1160	0.2698	0.1200	0.0403	0.1078	0.2348		

Table 7: Fraction of eligible households among poor households, households at risk of poverty and households with affordability problems.

Poor: households whose adult equivalent income is below the absolute poverty line. **At risk of poverty:** households whose adult equivalent income is lower than 60% of median adult equivalent income. Statistics for gas affordability and eligibility of gas benefits refer to gas users only. Gas and electricity bonuses have the same eligibility criteria, thus the fraction of gas users eligible for the electricity discount coincides with the fraction of gas users eligible for the gas discount.

	Fraction of eligible households for electricity benefits									
	With affordability problems									
	Budget share approach									
	Poor	At risk of poverty	Electricity			Gas			Residual income approach	
Normative			Positive	5%	Normative	Positive	10%	Residual income poor	Under-users	
Total	0.8740	0.4320	0.2292	0.4997	0.5894	0.2862	0.7553	0.5389	0.8720	0.1111
Household types										
No children										
Single	0.7744	0.3076	0.1879	0.4753	0.4642	0.2080	0.7563	0.3247	0.7600	0.0970
2 adults, less than 65 yrs	0.9025	0.4906	0.1851	0.4739	0.6934	0.2775	0.8068	0.7610	0.9179	0.0755
2 adults, at least 65 yrs	0.8024	0.3169	0.1701	0.3323	0.3998	0.1827	0.6820	0.2029	0.8784	0.0742
Others	0.7866	0.4035	0.1539	0.2851	0.4413	0.2466	0.6830	0.4755	0.8148	0.0497
With children										
Single parent	0.8901	0.7453	0.4726	0.7160	0.7718	0.5575	0.8294	0.8896	0.8874	0.3295
2 adults, 1 child	0.9581	0.5670	0.2945	0.5324	0.6696	0.3663	0.7863	0.9108	0.9507	0.1423
2 adults, 2 children	0.9435	0.5423	0.2846	0.6097	0.7583	0.4482	0.7118	0.8283	0.9411	0.1146
2 adults, 3 or more children	0.9644	0.6340	0.4135	0.6269	0.8637	0.4996	0.7523	0.8492	0.9664	0.3942
Others	0.9046	0.4730	0.2573	0.4674	0.6563	0.5471	0.7711	0.7795	0.8964	0.1464
Region										
North	0.7737	0.3400	0.1404	0.4314	0.4827	0.2212	0.7168	0.3756	0.7866	0.0738
Centre	0.8522	0.3562	0.1863	0.4551	0.5436	0.4020	0.6924	0.4900	0.8113	0.1018
South and Islands	0.9370	0.5038	0.3314	0.5349	0.6393	0.3014	0.7886	0.8675	0.9342	0.3404

Table 7 (continued): Fraction of eligible households among poor households, households at risk of poverty and households with affordability problems.

Poor: households whose adult equivalent income is below the absolute poverty line. **At risk of poverty:** households whose adult equivalent income is lower than 60% of median adult equivalent income. Statistics for gas affordability and eligibility of gas benefits refer to gas users only. Gas and electricity bonuses have the same eligibility criteria, thus the fraction of gas users eligible for the electricity discount coincides with the fraction of gas users eligible for the gas discount.

	Fraction of eligible households for gas benefits									
	With affordability problems									
	Budget share approach									
	Poor	At risk of poverty	Electricity			Gas			Residual income approach	
Normative			Positive	5%	Normative	Positive	10%	Residual income poor	Under-users	
Total	0.8747	0.4254	0.2224	0.4992	0.5810	0.2862	0.7553	0.5389	0.8702	0.1018
Household types										
No children										
Single	0.7675	0.3004	0.1838	0.4798	0.4608	0.2080	0.7563	0.3247	0.7461	0.0786
2 adults, less than 65 yrs	0.8944	0.4731	0.1821	0.4805	0.6612	0.2775	0.8068	0.7610	0.9126	0.0625
2 adults, at least 65 yrs	0.8411	0.2995	0.1565	0.3127	0.3762	0.1827	0.6820	0.2029	0.9131	0.0674
Others	0.7885	0.3802	0.1384	0.3046	0.4206	0.2466	0.6830	0.4755	0.8259	0.0460
With children										
Single parent	0.8777	0.7176	0.4570	0.7115	0.7465	0.5575	0.8294	0.8896	0.8709	0.3068
2 adults, 1 child	0.9510	0.5647	0.2927	0.5306	0.6593	0.3663	0.7863	0.9108	0.9422	0.1398
2 adults, 2 children	0.9377	0.5436	0.2785	0.5978	0.7665	0.4482	0.7118	0.8283	0.9342	0.1106
2 adults, 3 or more children	0.9554	0.5853	0.3750	0.6068	0.8013	0.4996	0.7523	0.8492	0.9561	0.3759
Others	0.9079	0.4740	0.2571	0.4524	0.6633	0.5471	0.7711	0.7795	0.8980	0.1550
Region										
North	0.7912	0.3466	0.1377	0.4312	0.4729	0.2212	0.7168	0.3756	0.8059	0.0730
Centre	0.8365	0.3645	0.1862	0.4582	0.5445	0.4020	0.6924	0.4900	0.7904	0.0969
South and Islands	0.9426	0.4949	0.3393	0.5426	0.6424	0.3014	0.7886	0.8675	0.9366	0.3267

Table 8: Fraction of poor households, households at risk of poverty and households with affordability problems by eligibility status.

Poor: households whose adult equivalent income is below the absolute poverty line. **At risk of poverty:** households whose adult equivalent income is lower than 60% of median adult equivalent income. Statistics for gas affordability and eligibility of gas benefits refer to gas users only. Gas and electricity bonuses shares the same eligibility criteria, thus the fraction of gas users eligible for the electricity discount coincides with the fraction of gas users eligible for the gas discount.

	Not eligible	Eligible		Pre - post difference	
		Pre payment	Post payment	Eligible	Total
Income poverty					
Poor	0.0076	0.4067	0.3979	0.0088	0.0010
At risk of poverty	0.1249	0.7341	0.7208	0.0133	0.0015
Budget share approach for electricity and gas					
Normative	0.2001	0.6449	0.5264	0.1186	0.0136
Positive	0.0177	0.4268	0.3502	0.0765	0.0088
5% + 10%	0.0185	0.2204	0.1838	0.0366	0.0042
Residual income approach for electricity and gas					
Residual income poor	0.0080	0.4239	0.4203	0.0035	0.0004

Appendix A:

Setting the minimum standard for energy and other goods/services

In order to implement the residual income approach to affordability measurement, it is necessary to set the minimum reference quantities (q^{up}) for gas and electricity and (q^{cp}) for the other goods and services consumed. To maintain consistency with the definition of absolute income poverty, these quantities should coincide with those determining the absolute poverty line. We thus refer to the components of the Italian absolute poverty line as documented by the Italian Central Statistical Institute (ISTAT, 2009). The procedure allows us to identify the minimum spending level for electricity, heating and cooking necessary to achieve an acceptable standard of living. The definition of the official poverty line does not make any distinction between households using different fuels for heating and cooking. For the purposes of this paper, we consider the minimum expenditure for gas to coincide with the heating and cooking component of the poverty line, which can be seen as an average of the minimum of such costs regardless of the fuel type. For electricity, ISTAT considers basic needs to include spending on lighting, a television, a washing machine and a fridge; the basic heating costs also include spending for the use of gas for cooking and hot water. Having determined the set of electric appliances, electricity consumption has been estimated by the Authority for Electricity and Gas for different household sizes and priced at the rates in effect in January and October 2005. As for heating expenditure, its value has been inferred using a linear regression model estimated on households living in houses with an independent heating system (therefore excluding households with central heating systems), accounting for the size of the (standard) dwelling, the region of residence and the age of the household members. We use the parameters published by ISTAT in the Survey on Household Budgets (ICF) to compute the minimum household expenditure for electricity and heating at 2005 prices. The current price values are obtained for electricity expenditure using the national price index; for heating we refer to the national aggregate price index which includes electricity, gas and other fuels because ISTAT's regression model does not distinguish between different fuel types.

In a similar way, we reconstruct the minimum expenditure for the other consumption items (goods and services) that make up the total bundle of the absolute poverty line. Wherever possible we use regional price indices to update 2005 values to current prices.

Unfortunately, the ICF public use data file does not contain detailed information on the date of birth of the household members, nor the size of the urban area of residence. Therefore, it is not possible to perfectly replicate the official poverty line for each household. Nevertheless, a comparison between the statistics we produce and the official poverty indices shows that the deviations are marginal. A further deviation from official estimates occurs when updating the values to the current price levels because we can only use published price indices, while official statistics refer to (unpublished) locally disaggregated price indices.

Appendix B:
Electricity and gas benefits amounts

Table B1: Electricity benefits, Euros per year

Household members	2008	2009	2010	2011	2012	2013
1-2	60	58	56	56	63	71
3-4	78	75	72	72	81	91
5 +	135	130	124	124	139	155

Table B2: Gas benefits, Euros per year

Climatic area	2009		2010		2011		2012		2013	
	1-4	5+	1-4	5+	1-4	5+	1-4	5+	1-4	5+
A/B (Warmest)	60	85	62	87	70	98	85	119	94	132
C	75	110	78	113	87	127	105	154	116	170
D	100	145	103	149	115	167	139	202	154	223
E	125	180	129	184	144	206	173	248	191	273
F (Coldest)	160	230	164	236	183	264	220	318	242	350

Appendix C:

Using the Survey on Income and Living Conditions (EU-SILC 2011) to compute the ISEE income indicators

The Survey on Income and Living Conditions EU-SILC 2011 allows us to estimate the gross taxable income for each household interviewed, a necessary ingredient in computing the ISEE income indicator. This information, together with other data on real estate, financial assets and demographics allows us to compute the indicator for a representative sample of Italian households, regardless of their choice to submit an ISEE form to the administration for whatever reason.

There are two main differences between the households covered by the EU-SILC survey data and those included in the database managed by the Social Security Institute (INPS) which collects all the ISEE forms submitted. First, EU-SILC provides data on a random representative sample of Italian households (about 19,000) while INPS data refer only to households who actually submitted an ISEE form. Households have no incentive to complete the form if they do not expect to meet the eligibility criteria for the benefits or services they are interested in or if they are unaware of the existence of such eligibility criteria. The households included in the INPS database are therefore self-selected, with low income households being over-represented with respect to the total population. A second difference is due to the fact that the EU-SILC sampling scheme excludes all individuals living in institutions, such as hospitals and nursing homes. These individuals are however included in the administrative databases. This omission is not a major concern for our study because institutionalised individuals are not usually nominees of an electricity or gas contract.

Finally, the definition of household used by EU-SILC is: *“Private household is defined as a person living alone or a group of people who live together in the same private dwelling and share expenditures, including the joint provision of the essentials of living”*. Such a definition coincides with the definition adopted by the ISEE indicator, but we cannot exclude that the individuals submitting ISEE forms actually used a different concept of household, causing a further difference between survey and administrative data.

Household taxable income

The ISEE indicator defines taxable household income as the sum of: (i) gross employment income (net of social security contributions); (ii) gross self-employment income (net of social security contributions); (iii) gross pension income, excluding the basic social security benefits, and all the benefits related to blindness, deafness, work related disability or other disabilities;

(iv) gross income from unemployment benefits; (v) gross income from real estate properties, net of mortgage interest.

Actual rent to be deducted from household taxable income

Tenant households can deduct from their taxable income the rent paid for their main residence if their tenancy contract is officially registered, up to an annual maximum of €5,164. The EU-SILC survey records the rent value, the type of contract, and the type of landlord but not whether the contract is registered or not. In Italy, some tenancy agreements are informal; thus we need to make some assumptions on deciding whether or not tenants are entitled to deduct their annual rent. As the registration of the contract is necessary for the owner to take advantage of certain tax concessions, we assume that the tenancy contract will be registered if it is the type that grants the lessor fiscal advantages (e.g. long term “4+4”- year contracts, locally agreed tenancy rate contracts or standard contracts) or if the lessor is not a private individual. Looked at in this way, 95% of the tenant households in the sample can enjoy the deduction of the annual rent from their taxable income.

Real estate properties and financial asset value assessment

The ISEE indicator combines information on household income as well as data on household wealth. More specifically, the ISEE indicator is the combination of an income indicator (ISE, based on the household taxable income as discussed above) and a wealth indicator (ISP). To compute the ISP indicator it is necessary to estimate the cadastral values of the properties of all the household members. To this aim, we follow two different strategies according to the types of properties:

- (i) Main residence: the EU-SILC survey does not disclose either the cadastral or the market value of the main residence of the household, but it does ask homeowners to self-assess an imputed rent for their home. By using this figure, we can estimate the market value of the house assuming that the gross yearly rate of return for the residential property is equal to 3%, and we further assume that the cadastral value is a third of the market value. The one third ratio is determined on the basis of common practice adopted by real estate market operators.
- (ii) Other properties: the EU-SILC survey records the amount of local property tax paid in the previous year for all the properties except the main residence. The questionnaire does not ask households to provide any details about the nature of these real estate assets. We estimate the cadastral value of these properties assuming that the municipal

specific tax rates on these properties are on average equal to 0.5%, which was the standard tax rate applied to properties other than main residences.

The ISP indicator considers the cadastral value of the primary residence net of the outstanding mortgage. In this respect, the EU-SILC survey discloses the initial value of the debt, the year in which the mortgage has been underwritten, and its duration. We compute the outstanding debt assuming a constant annual reimbursement rate.

Finally, the ISEE form requires households to declare the total amount of their financial assets. This amount is estimated from the EU-SILC data by summing up the answers of all household members to the following question asked during the interview: “What was the total value of all your savings at the end of 2010?”

Equivalence scale

In order to compare the economic conditions of households of different sizes and composition, the combination of the ISE income indicator and the ISP wealth indicator (ISP) is weighted by an equivalence scale determined by: (i) the number of household members; (ii) the number of disabled people in the household (individuals are considered to be disabled only if they are in receipt of a disability related benefit); (iii) the number of cohabitating children either of the household reference person or his/her partner; (iv) the number of cohabitating children whose annual gross income is less than €2.840 whose parents are the head of the household or his/her partner; (v) the presence of a single parent household with children; (vi) the presence of children both of whose parents were employed for at least six months and where they were the household reference person and his/her partner (independent of their marriage status).

Appendix D: Using the Survey on Income and Living Conditions (EU-SILC 2011) to compute energy expenditure

The EU-SILC questionnaire asks households if they have incurred expenses for electricity over the past 12 months. Only 1.9% of respondents claimed not to have incurred expenses, but the vast majority of these households still say that they own the most common electric appliances. We therefore consider these households as nominees of a contract for power supply, and thus potential beneficiaries of the electricity benefit. The amount of the expenditure is determined with the simple question “Over the past 12 months, how much did you spend on electricity?”

We assume that all the households who claim to have incurred expenses for gas are nominees of a contract for the supply of network distributed natural gas. The EU-SILC survey does not actually specify the type of gas used by the households; we therefore include in the pool of potential beneficiaries households that use, for example, LPG. On the other hand, due to lack of information, we exclude those households living in apartment buildings sharing a gas central heating system but not paying an individual gas bill.

Among the nominees of contracts for gas provision, we assume that households who declare that at least part of their heating expenses are included in the gas bill use gas for heating, cooking and hot water production. By so doing, we have a higher estimate of the percentage of consumers who use gas for heating.

Finally, the annual expenditure for gas is assessed by the question “In the last 12 months, how much did you spend on gas?” On the one hand, the answer also includes expenditure for gas which is not distributed natural gas; on the other hand it excludes all charges for gas included in condominium expenses.

In conclusion, there is an overall overestimate of the size of the set of households potentially eligible for the gas benefit, while the sign of the bias of the estimated expenditure for natural gas is uncertain.