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Households' energy burden during the 2022 crisis: a policy impact assessment in a Southern European country

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Abstract

The global energy price crisis that started in 2021 – then exacerbated by the Russian invasion of Ukraine in March 2022 – has caused unprecedented increases in electricity and gas bills. To contrast this rise, EU Member States implemented several 'emergency measures' protecting energy consumers.

This paper theoretically estimates the 2022 burden of energy bills on Spanish households, with a particular focus on vulnerable ones. This assessment is carried out by simulating alternative scenarios to evaluate the consequences of the energy prices rise and the effect of the national emergency measures implemented to counteract the energy crisis impact. A disproportionate expenditure indicator is also applied to the vulnerable consumer group that benefitted from the social tariffs to provide a first proxy of the 2022 energy poverty situation in Spain.

The results show that these policies significantly reduced regulated market consumers' bills, the vulnerable ones being the most protected by them. However, the high energy burden estimated for the latter category of customers reflects the insufficient 'energy efficiency preparation' of these households to react to energy price shocks. The insights of this assessment might eventually advise policymakers on future decisions during emergency scenarios.

Keywords: Energy crisis; Vulnerable consumers; Electricity bills; Short-term emergency measures; Energy Poverty; Spain

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Introduction

The global energy price crisis that started in 2021 has been exacerbated by the Russian invasion of Ukraine in 2022, which has tensioned the international energy markets even more given Russia's hegemony in the gas supply of Europe. Consequently, both electricity and gas consumers experienced unprecedented increases in their bills (Eurostat 2023a), (Eurostat 2023b). This rise was expected to significantly affect low-income families, who already had issues paying their utility bills in previous years (Bouzarovski et al. 2020). However, given the magnitude of the crisis, this might have been a severe concern also for middle-income households (Menyhert 2022), i.e. households who were in the middle deciles and above the income thresholds usually set by the EU countries to identify vulnerable consumers. This collective has not historically been protected by the social tariffs implemented by the EU Member States (Kyprianou et al. 2019). However, in 2022, several policies have been implemented to reduce energy bills in European countries (Wilson 2022), which also include measures for the general population (Sgaravatti et al. 2021) or extensions of the social tariffs to consumers with middle income. In this emergency scenario, particularly interesting is the case of Spain. Indeed, the Spanish Government has taken a broad set of measures to mitigate the impact of the crisis on consumers and businesses (Morell et al. 2023). The main ones for the general population can be summarised as follows:

- Reducing the VAT on electricity bills from 21% to 10% for households with less than 10 kW of contracted power and for vulnerable consumers.
- Suspending the 7% tax on electricity generation for the third quarter of the year.
- The Iberian market exception (González-Salas Mosquera et al. 2022), which was accompanied by a fund to compensate electricity companies for the difference between the regulated price and the market price of gas, in order to reduce their costs and avoid passing them on to consumers.
- Introducing a 5% cap on the increase of the regulated price of domestic natural gas.
- Freezing of the price of bottled butane gas (LPG).
- Promoting energy efficiency and self-consumption initiatives, such as subsidies for installing solar panels, smart meters, and LED lighting.
- Launching a public awareness campaign to encourage consumers to reduce their electricity consumption, especially during peak hours, and to switch to more efficient appliances and tariffs.

In the case of vulnerable consumers, the Government went even further and applied several measures to expand and enhance the social shield implemented to counteract the COVID-19 pandemic impact on these consumers (Romero et al. 2023). These emergency policies affected the three main national instruments to protect vulnerable consumers:

- Social electricity tariff: Its income limits were increased, and a new beneficiary category was introduced. Moreover, the discount applied to the electricity price - until a fixed maximum consumption - were increased in two steps from 25% and 40% up to 65% and 80% (Jefatura del Estado 2022), respectively for vulnerable and severely vulnerable consumers, maintaining the previous discount scheme for "consumers at risk of social exclusion" [2].
- Thermal social allowance (TSA): The average amount of this heating allowance for vulnerable consumers was increased by 246% with respect to 2021.
- Disconnection safeguards: The government implemented a vulnerable consumers' disconnection ban until the end of 2022 (then extended to 2023).

In this context, this paper proposes two different assessments to, on the one hand, estimate the impact of these measures on both general population and vulnerable households' bills, and, on the other hand, carry out an energy poverty evaluation. Within the former one, the article

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[2] Consumers at risk of social exclusion are co-living units that comply with the income criterion set for severely vulnerable consumers and are attended by Social Services. The electricity bills of these consumers are paid half by the Social Services and half by the Energy retailer.

theoretically estimates the 2022 amount of electricity bills in Spanish domestic consumers, with a special focus on vulnerable ones, thus simulating alternative scenarios to evaluate both the impact of the energy prices' rise and the positive effect of the emergency measures introduced by the Government. Concerning the latter assessment, an extended version of the disproportionate expenditure 2M indicator proposed by (Barrella, Linares, et al. 2021) is applied to vulnerable consumers benefitted by the social tariffs to provide a first proxy of the 2022 energy poverty situation in Spain. Results and conclusions extrapolated from these assessments provide a general perspective of the energy crisis impact on Spanish domestic energy consumers.

Methodology

Regarding the first mentioned assessment, this paper estimates the Spanish households' electricity bills' trend throughout 2022 by using the Required ELectricity Expenditure model proposed by (Barrella, Cosín, et al. 2021). Firstly, several electricity prices' scenarios have been simulated to evaluate the impact of the electricity market's gas price cap (Iberian Exception) on the expense of consumed energy throughout the second half of the year. Secondly, the electricity bill amount for households not benefitting from the Spanish social tariff ('general population') was calculated in the actual 2022 price scenario ('REAL' scenario in Figure 1 and Figure 2, then renamed '2022' scenario for comparison purposes in Figure 3 and Figure 4) and in two alternative hypothetical scenarios not considering the measures introduced for them (counterfactual scenarios: 2022_NO-CAP and 2022_NO-CAP&MEASURES). Finally, the same calculation was performed for the two main categories of vulnerable consumers benefitting from the energy consumption subsidies, then comparing the 2022 results with the 2021 ones.

Thereafter, the 2M disproportionate expenditure metric[3] used in previous studies to estimate the share of households in winter energy poverty (due to heating and DHW expenditures (Barrella, Linares, et al. 2021)) and summer energy poverty (due to the cooling expenditure (Barrella et al. 2023)) was expanded by including the expenditure due to use of kitchen (cooking), electrical appliances and lighting – Required electricity expenditure (Barrella, Cosín, et al. 2021). Thus, this $2M_r$ indicator (where 'r' stands for 'required') considers an household (hs) as in energy poverty if the ratio between their total Required ENergy Expenditure ($RENE_{hs}$) (Barrella et al. 2022) and their income ($Income_{hs}$) is more than twice the national median ratio (M) extracted from the Household Budget Survey (HBS), as shown in Eq. (1).

$$RENE_{hs}/Income_{hs} > 2M \qquad (1)$$

Therefore, this paper estimates the share of vulnerable consumers[4] affected by energy poverty in the actual 2022 scenario and in a counterfactual scenario where no social tariffs were applied to these consumers (NO-SOCIAL-TARIFF_VCs; i.e. vulnerable consumers have had no support to pay their RENE). It has to be highlighted that both scenarios consider the short-term measures implemented for the general population (described in the Introduction). This calculation makes it possible to evaluate the effectiveness of social tariffs to protecting vulnerable consumers from energy poverty.

Results

To wrap up the paper's outcomes, the results are shown for a reference household with 3 members. From the first assessment analysis, several insights can be pointed out. Figure 1 shows alternative scenarios of the consumed energy expense component of the electricity bill from March to

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[3] The 2M indicator is an energy poverty metric prescribed by the EPAH-EPOV and the Spanish National Energy Poverty Strategy. The traditional methodology uses actual energy expenditures, while (Barrella, Linares, et al. 2021) proposed to calculate the 2M by using absolute expenditures – calculated with the RENE model (Barrella et al. 2022) – in the estimation of the household's share of energy expenditure over income.

[4] Data on vulnerable consumers benefitting from the social tariffs at the end of the year 2021 were provided by the Ministry for the Ecological Transition (MITECO 2022). These consumers benefitted from electricity social tariff and TSA during 2022.

December 2022 for an average household with a regulated market tariff[5]. The REAL scenario (with the gas price cap applied to the electricity market) has resulted in a cost per energy consumed that is comparable on an annual basis with the simulated STABLE price scenario.
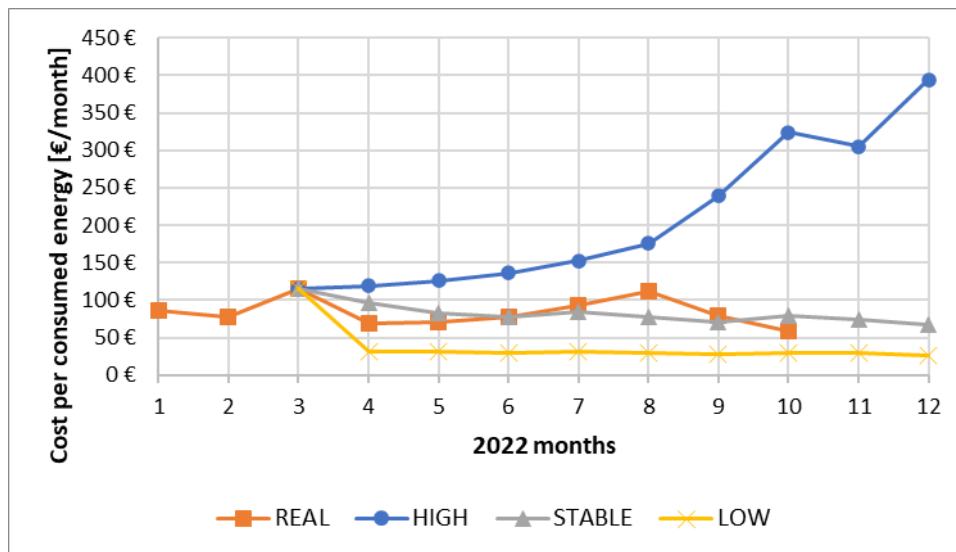

Figure 1. Alternative scenarios of the 2022 monthly consumed energy expense for an average household (REAL: real prices scenario; HIGH: alternative high prices scenario; STABLE: alternative stable prices scenario; LOW: alternative low prices scenario)

On the other hand, Figure 2 compared the REAL scenario with a contrafactual one, i.e. a scenario of prices without Iberian exception (REAL_NO-CAP scenario), simulated by using the data from (González-Salas Mosquera et al. 2022)[6]. The former scenario generated a saving in the consumed energy expense that ranges from 5% to 32% depending on the day.

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[5] It must be highlighted that the HIGH, STABLE and LOW scenarios are only modelled price scenarios for the calculations presented in this graph and are different from the REAL-2022 scenario (which uses actual prices) and the counterfactual scenarios presented in Figures 2, 3 and 4.
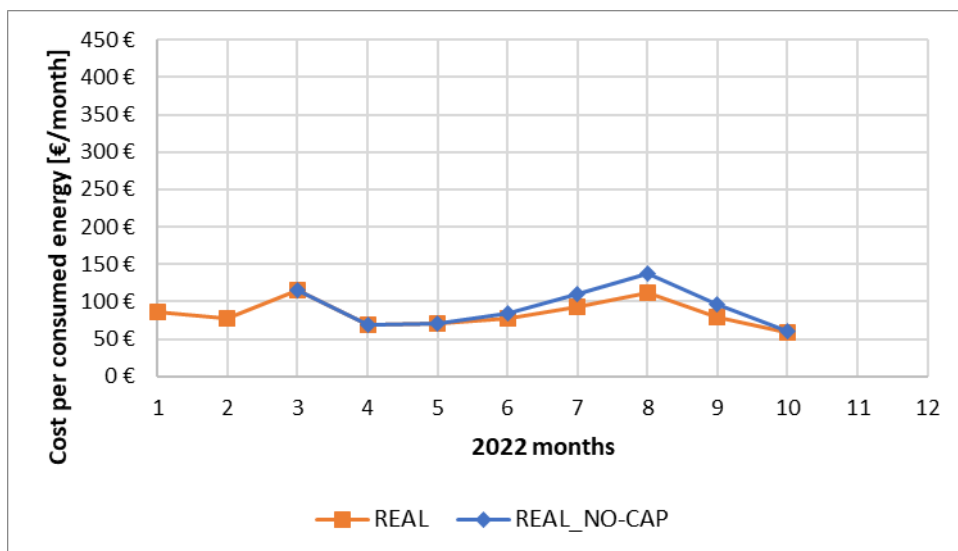[6] This report provides data until October 2022 inclusive.

Figure 2. Alternative real scenarios of the 2022 monthly consumed energy expense for an average household (REAL: real prices scenario; REAL_NO-CAP: counterfactual scenario of prices without Iberian exception of gas price cap)

Considering both the impact of the energy price increase and the Government's emergency measures, the bills of an average family in the regulated market over the course of 2022 have risen by 21% compared to the previous year. However, the modelled counterfactual scenarios show that, if no mitigating measure would have been applied, the households' electricity burden would have been much higher. In particular, the Iberian price cap had a significant impact on the 2022 expenses of consumed energy. Indeed, the bills' increase with respect to in 2021 would have been +34% without this mechanism. The rest of the measures introduced for the general population (i.e. VAT, electricity tax and demand charges reduction) had an even greater impact on families' economies. Overall, the two kinds of measures – the Iberian price cap and fiscal measures – have cut off the 2022 electricity bills by 23% with respect to the scenario with no governmental interventions (2022_NO-CAP&MEASURES). When comparing the latter with previous years, if none of the emergency measures would have been applied, the regulated market electricity bills would have been 58% higher than in 2021.
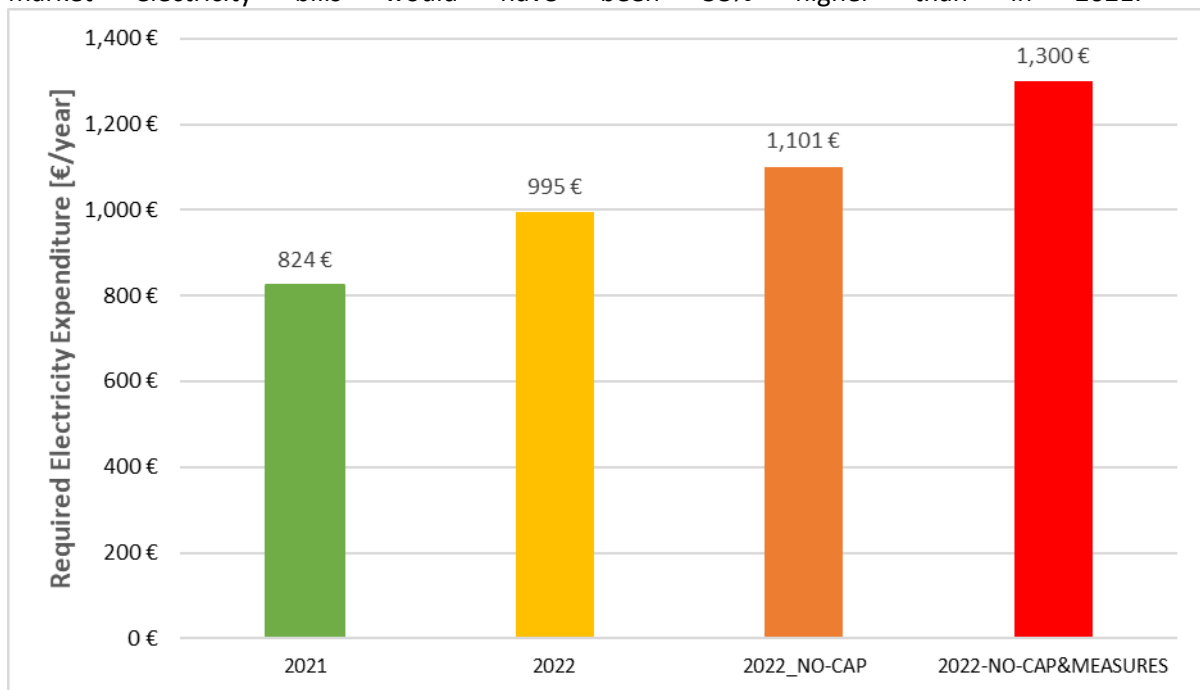

Figure 3 summarises the results for the abovementioned scenarios – 2021, 2022 and the two 2022 scenarios – for an average household with a regulated market tariff.

Besides, according to the paper's results, the increase in the discounts for the electricity social tariff was probably the real lifeline for vulnerable consumers benefitting from it (around 1,3
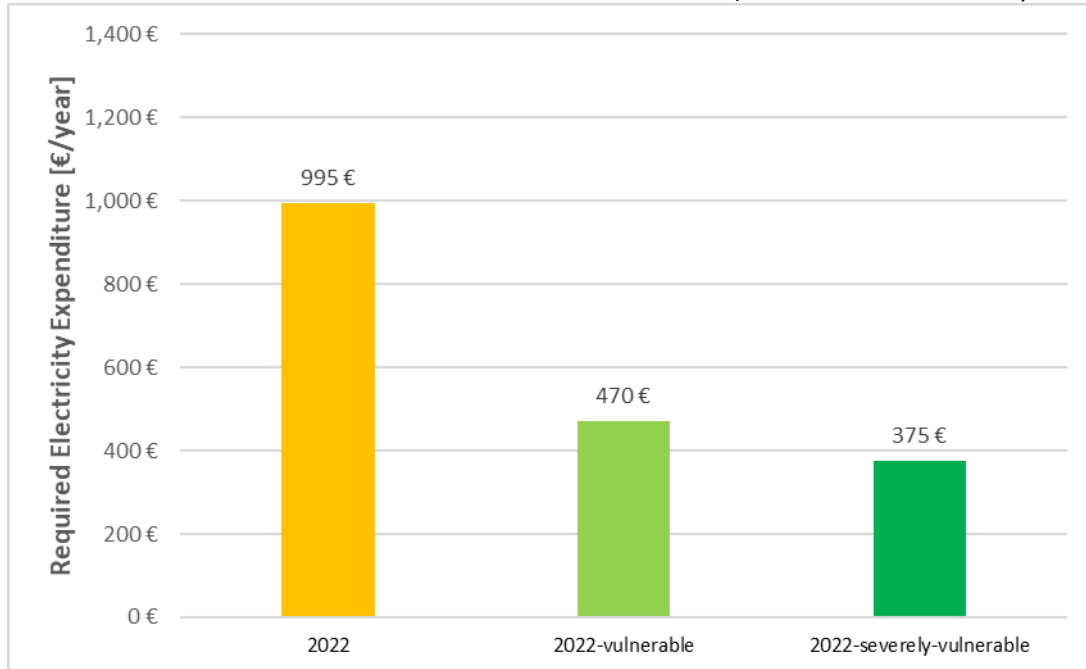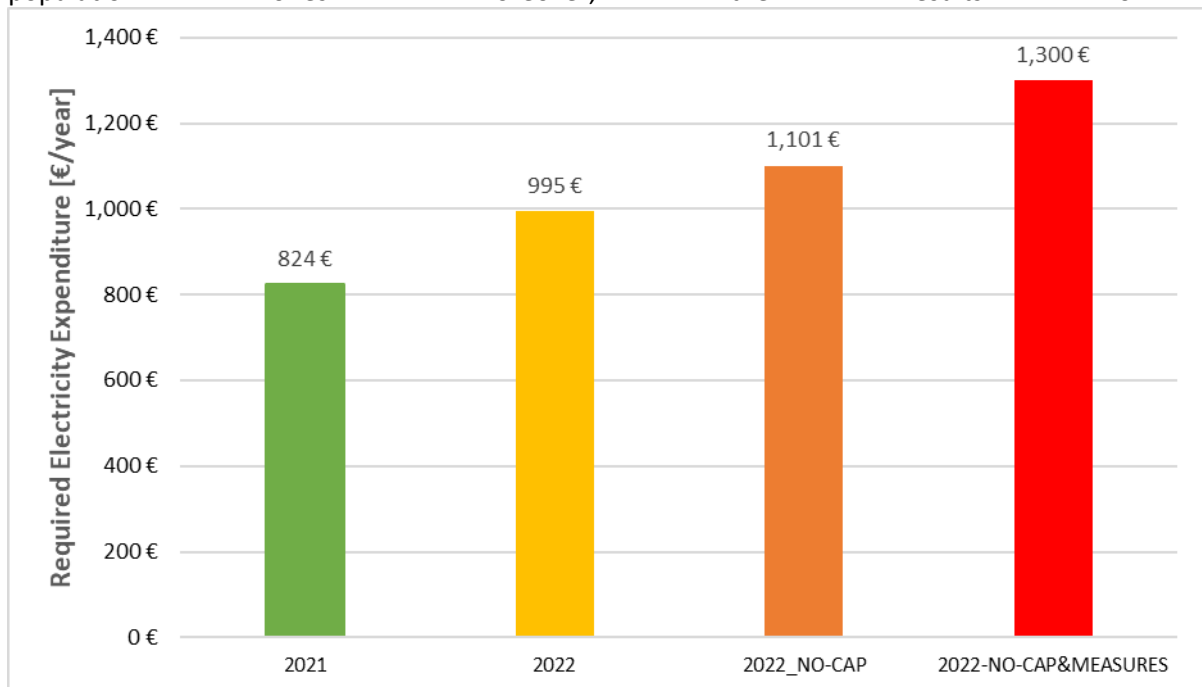
Figure 4 shows the impact of the electricity social tariff on the two main kinds of vulnerable consumers, i.e. vulnerable and severely vulnerable ones. It can be seen as this measure has reduced the bills of these households by, respectively, 53% and 62% with respect to general population   ones.   Moreover,   the   results   of
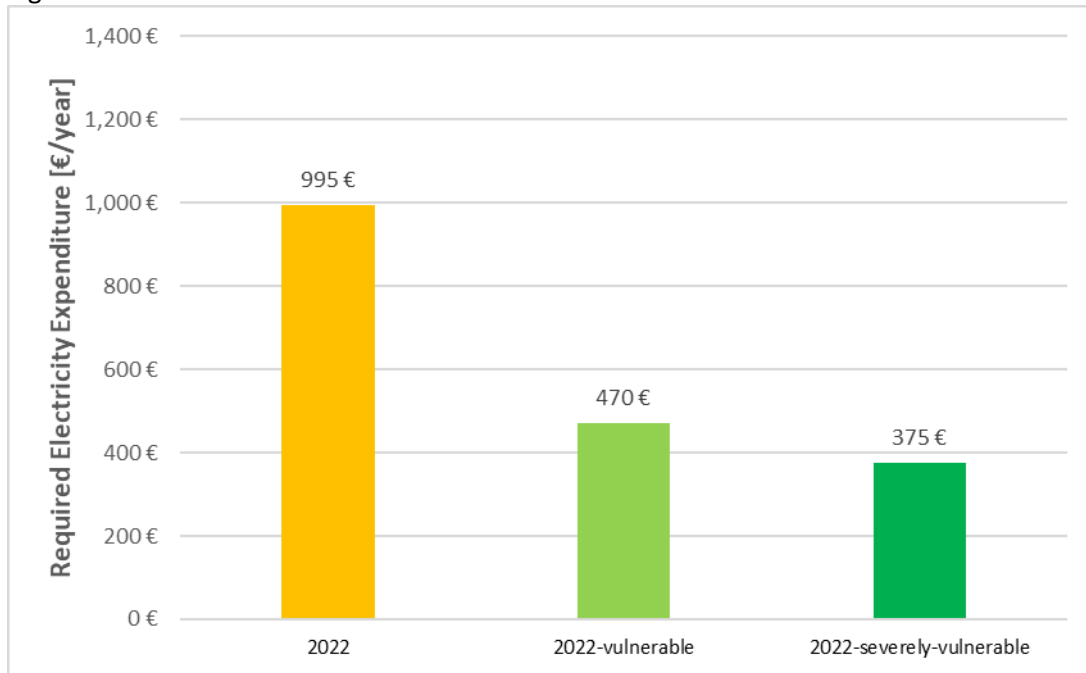
Figure 3 and

Figure 4 point out that vulnerable consumers' bills in 2022 were even lower than the ones of an average 'general population' household in 2021.
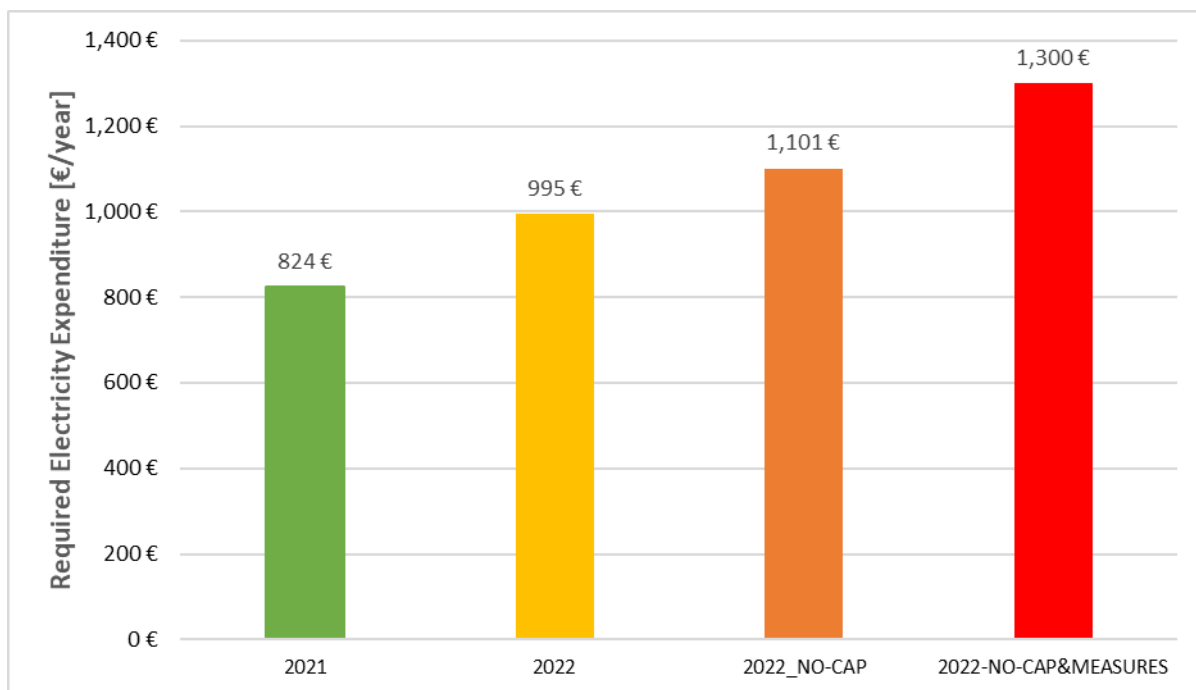
Figure 3. Alternative 2021 and 2022 annual electricity bill scenarios for an average Spanish household with a regulated market tariff (2022 reference prices are the same as in the REAL scenarios of Figures 1 and 2; 2021 shows real prices of that year; NO-CAP: counterfactual scenario of prices without Iberian exception of gas price cap; NO-CAP&MEASURES: counterfactual scenario of prices without Iberian exception of gas price cap and fiscal measures)
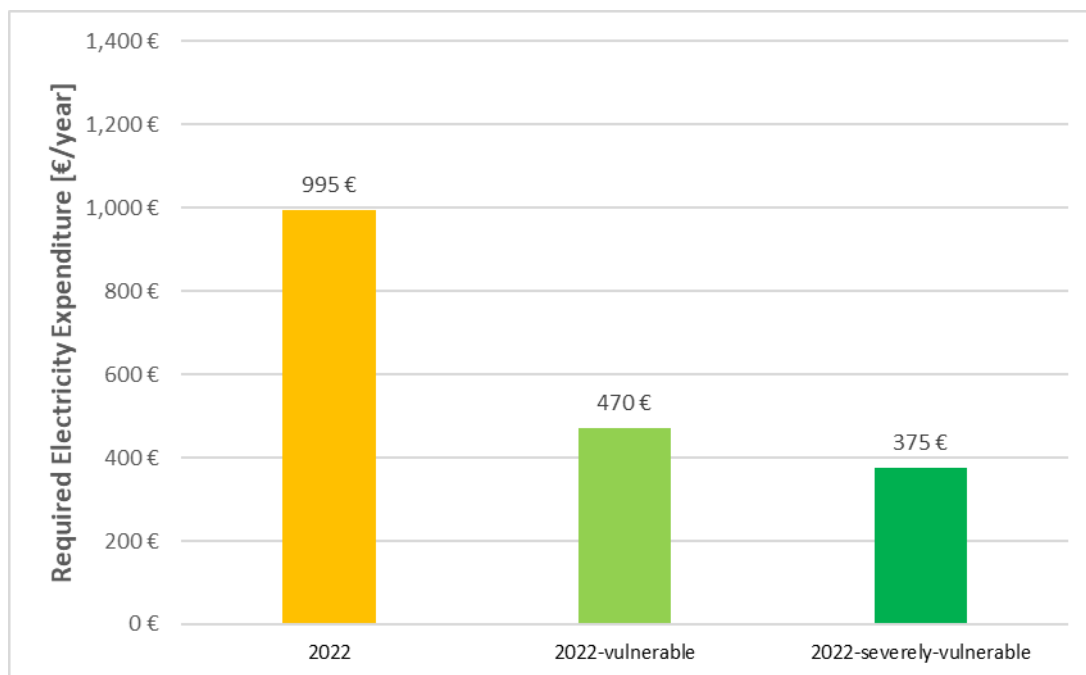
Figure 4. 2022 annual electricity bill for an average 'general population' Spanish household with a regulated market tariff compared to the one of vulnerable and severely vulnerable consumers benefitting by the social tariff scheme

On the other hand, when looking at the impact of the social tariffs on the energy poverty situation of vulnerable consumers, the results are not so straightforward. On the one hand, the energy burden of the three consumers categories was significantly reduced by the enhanced social tariffs implemented by the government. Indeed, Table 1 shows that the vulnerable consumers' median share of required energy expenditure on income in the REAL scenario was 44% lower than the share that they would have in a counterfactual scenario without social tariff application (NO-SOCIAL-TARIFF_VCs). On the other hand, these consumption subsidies only reduced the energy poverty incidence in this consumer group by 1.4% according to the proposed $2M_r$ indicator (Table 2). This 'dissatisfactory' result can be justified by three main issues. The analysed households have a very low-income level, especially the severely vulnerable and at risk of exclusion ones whose social tariffs' income limit ranges from €5,931 for a household without minors and €15,039 for large families, which are, respectively, 18% and 47% of the average income of Spanish households in 2022 (Spanish SILC). The second main problem is related to the insufficient consumption-coverage of the social tariffs. On the one hand, the TSA amount increase is in line with the recommendations stated in previous papers (Barrella, Linares, et al. 2021), but it was partially counteracted by the unprecedent energy price rise. On the other hand, the electricity social tariff enhanced discounts covered only a minority share of the electrical consumption of households that used electric heating systems (mostly inefficient joule effect ones) due to the consumption limits mentioned in the introduction. In sum, the social tariffs coverage for vulnerable households with inefficient electric radiators was still not enough to adequately support their required heating expenditure. Thirdly, this calculated low impact of the social tariffs might also be influenced by the relative nature of the 2M threshold.

Table 1. Vulnerable consumers' median share of required energy expenditure on income in the real 2022 scenario (REAL_VCs) against a counterfactual scenario without social tariffs (NO-SOCIAL-TARIFF;_VCs) – VCs: vulnerable consumers; GP: general population; 2M of GP: twice the median share of energy expenditure on income of general population households in 2022)

Scenario	Vulnerable consumers	Severely vulnerable consumers	Consumers at risk of social exclusion	Median energy burden of VCs (% RENE/income)	2M of GP
NO-SOCIAL-TARIFF_VCs	16.8%	33.1%	33.0%	29.7%	9.8%
REAL_VCs	12.0%	20.7%	16.6%	16.7%	9.8%

Table 2. Share of vulnerable consumers in energy poverty according to the $2M_r$ in the real 2022 scenario (REAL_VCs) against a counterfactual scenario without social tariffs (NO-SOCIAL-TARIFF_VCs) - VCs: vulnerable consumers

Scenario	Vulnerable consumers	Severe vulnerable consumers	Consumers at risk of social exclusion	Total
NO-SOCIAL-TARIFF_VCs	99.9%	100.0%	100.0%	**100.0%**
REAL_VCs	96.1%	99.8%	99.9%	**98.6%**

Conclusions

This paper analyses the 2022 Spanish households' energy expenditure in several scenarios, also including an energy poverty impact assessment for vulnerable consumers. The main insights of this analysis can be summarised as follows.

The emergency measures introduced by the Government had a significant impact on regulated market consumers, the vulnerable ones being the most protected by them. The Iberian exception and the fiscal measures have cut off the 2022 electricity bills of the general population by 23%. Moreover, without these measures the 2022 regulated market electricity bills would have been 58% higher than in 2021. Finally, because of the electricity social tariff enhancement, vulnerable consumers' required expenditure for cooking, lighting and electrical appliances in 2022 were even lower than the 'general population' one in 2021.

On the other hand, the mentioned subsidy did not cover the high electricity consumption due to thermal uses' inefficient systems (for heating, cooling and DHW), which were partially covered by another allowance, i.e. the TSA. The positive impact of the two mentioned subsidies makes it possible to reduce vulnerable consumers' energy burden by almost half, but it did not achieve the final goal of moving most of these consumers out of energy poverty.

These results point out how necessary have been the emergency measures to reduce Spanish households' energy burden during the 2022 energy crisis. However, the lack of "energy efficiency preparation" of the residential sector and the extreme vulnerability of a part of the population have partially counteract the positive effect of these policies in terms of energy poverty reduction. Eventually, the paper's insights might provide a useful tool to analyse the impact of the energy crisis on Spanish households and potentially provide useful insights for European policymakers to enhance their response to energy market shocks.

Further work might consider the evolution of consensual indicators ('inability to keep home adequately warm' and 'arrears on utility bills'), thus analysing how much the energy poverty 'perception' has changed (or not) as a result of this complex energy crisis outline.

DECLARATIONS

Conflict of interest

The author declares no competing interests.

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