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# The Effects of the Spanish Gas Cap on Prices, Inflation, and Consumption Six Months Later

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## KEY FACTS

- After six months in effect, the regulated electricity prices in Spain are 32% cheaper than they would be without the "Iberian exception": according to our estimate, the resulting savings for each household in 2022 were about 209€.
- Inflation in 2022 would have been 0.3 points higher without a cap on gas prices, 8.7%, instead of the 8.4% recorded.
- The downside is higher consumption of gas for electricity generation, as well as the lower price of Spanish electricity, which facilitated the increase in exports to France with the consequent risk of subsidization in favor of French consumers at the expense of Spanish consumers.

## EXECUTIVE SUMMARY


The most notable measure to curb the escalation of electricity prices during 2022 has been the temporary gas price cap implemented in Spain and Portugal. This is a compensation paid to combined cycle gas turbines (CCGT), coal, and cogeneration plants to lower the price offered in the wholesale market, thus seeking a decrease in the final price.

We present here the most accurate, rigorous, and updated estimate of the effects of this measure on the regulated electricity rate, known as the "Voluntary Price for Small Consumer" (PVPC, in its Spanish initials), which directly replicates the wholesale market price. To do so, we updated the data we presented in September until the end of December 2022, comparing the real evolution of this price with a statistical model that draws the same line but in an alternative world without the gas price cap.

The result is that the average price of electricity in the regulated market would have been 31.8% higher without this measure. This roughly corresponds to a cumulative savings of about 209€ per consumer. Assuming that there are 10 million households on the regulated rate (that


Research Line

Green transition

Directed by Pedro Linares


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was the figure for January 2022), this would mean total savings of almost 2.1 billion euros for all consumers with the regulated rate at the end of 2022. Assuming 9 million households (the figure for August 2022), savings would be slightly below 1.9 billion.

As a result of this lower price, we estimate that year-on-year inflation in 2022 was 0.3 points lower: Spain would have closed at 8.7% instead of 8.4%.

However, during 2022 the higher consumption of gas for electricity generation in combined cycle power (CCGT) plants has continued, indicating that the incentive for greater use of this energy source would continue to exist, with the consequent conflict between the objective of savings in household bills and the overall savings in gas consumption for the Spanish and European economy.

It appears, though, that the daily use of gas for CCGT plants is closer (but not quite equal) to what would have been expected without a gas price cap during the last few months of the year. In other words, the largest increase was in the summer months, suggesting that the unavailability of sources such as hydroelectric power due to the drought during those months may have influenced the extra reliance on gas.

Finally, our estimate indicates that, without the mechanism, the Spanish price would have been slightly higher than the French price at almost all times since mid-September. This suggests that the high energy export during 2022 could indeed be partly due to the lower electricity price in Spain thanks to the compensation paid by Spanish households.

# 1. Introduction

In the context of the European energy crisis since the Russian government's decision to invade Ukraine, and the subsequent rupture of commercial and political relations that now seems irreversible, the EU has set out collectively—but also individually—to urgently adapt its institutions to a radically new and different world. In electricity, one measure has stood out for intervening most drastically in the functioning of supply: Spain and Portugal set up a mechanism in June 2022 to prevent the rising cost of gas from being reflected in the bills of electricity consumers. This "gas price cap", as it has been popularly known since then, consists of a compensation to certain power generation plants from fossil-based energy sources to reduce the price in the wholesale electricity market, specifically CCGTs, coal-fired plants and cogeneration plants. This compensation is communicated publicly so that the affected plants can incorporate it into their energy price offers, thus reducing the final price of electricity. The cost of the compensation is passed on in the electricity bills of consumers under the regulated price (PVPC) and also in those of free market consumers, although only for new contracts or contract renewals. Savings for consumers occur when the cost of compensation is lower than the return received by technologies that offer lower cost than gas in the electricity market (usually wind, solar, hydro and nuclear), resulting in lower matching prices and therefore a higher surplus for the consumer.

Since its implementation, the gas price cap has generated uncertainty about its effectiveness, as well as concerns about its impact on European policy trade-offs in the transition to decarbonized energy sources and independence from Russian gas. These concerns have become more important since the EU announced the reform of electricity markets as an explicit objective. When discussions about implementing a temporary Europe-wide gas price cap, two important debates merged into one: the most effective tools to balance the potentially conflicting goals of (economic) savings for households and (gas consumption and emissions) savings for the economy as a whole. Measures such as the gas price cap respond to the urgency of the situation in an ostensibly agile manner, but they also occupy a space in the debate that could lead to structural changes at both Spanish and European level, even while structural reform and temporary action are theoretically compatible. The perception of short-term effectiveness without specific data feeds the incentive of political decision-makers to sustain measures that were initially conceived as temporary.

Therefore, in order to help assess the effects of the gas price cap, last September we published a methodologically innovative, robust and accurate assessment of the effects in three areas: first and foremost, on the price of electricity for households. Second, on the consumption of gas for electricity generation and finally, the possible drain in the form of exports to France. In doing so, we sought to present a balanced picture of the gas price cap measure, with its pros and cons calculated in a way that had never been done before. That estimate went up to August 31, as data was only available up to that point. Now we present an update of the data that includes four more months of time series, something that broadens and deepens our evaluation, not only because of the larger sample size but also because of its variation of circumstances: the data now includes

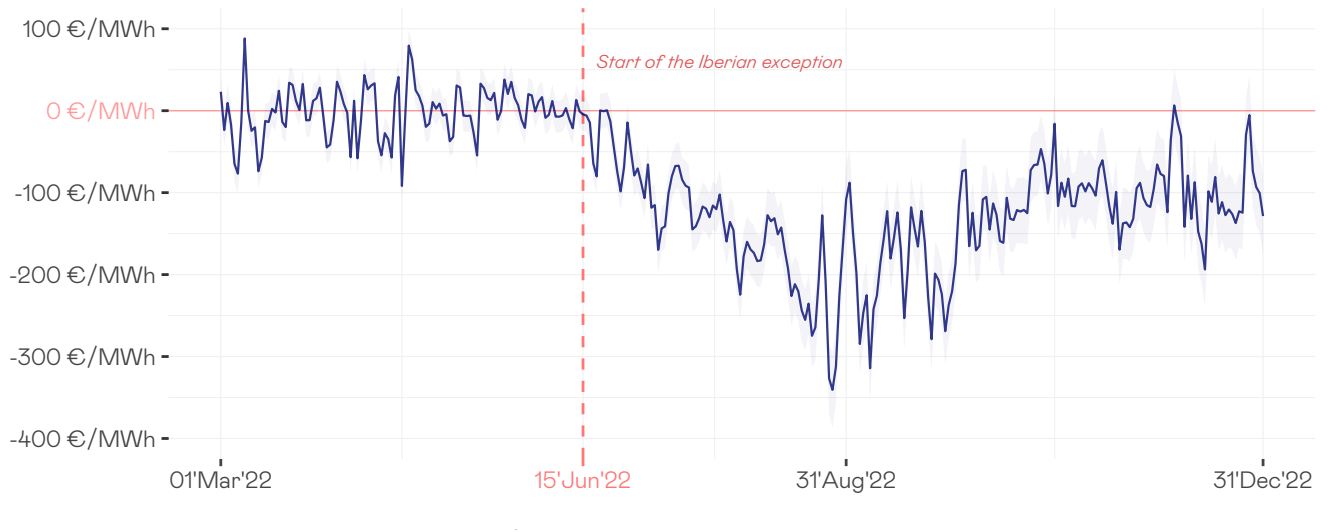
summer and autumn days, and different factors in terms of available supply of other energies, as well as endogenous or exogenous dynamics of the electricity and gas markets, etc.

This allows us to present an additional estimate: the effect of the measure on inflation in the Spanish economy. Inflation has become one of the most concerning problems to Spaniards (and to Europeans in general), as well as an unprecedented challenge in this century for an economy that was accustomed to very low inflation rates. Therefore, it is essential to produce a truly complete picture of a measure that aims to attack a basic input of prices that affects not only the bill for individuals and companies, but also, secondarily, those of many other goods or services. That is what we devote ourselves to in the third section of this text, while in the second we update the data for the price, consumption and export variables, adding extra considerations that have arisen in these months and which are necessary to complete the picture of the Iberian exception.

# 2. Impact on prices, gas consumption and the French market

The evolution of gas prices during the months following the summer in Spain has made it necessary to update the impact that the gas price cap mechanism introduced in June 2022 may have had on electricity generation. For this purpose, all the data (PVPC spot prices, electricity generation, gas in the TTF and MIBGAS markets) have been updated to reproduce the same exercise that was presented in our policy brief published last September, and whose methodology can be consulted in detail in the appendix to this text. The main result can be seen in Graph 1.

**Graph 1. Estimated savings in the PVPC derived from the gas price cap**

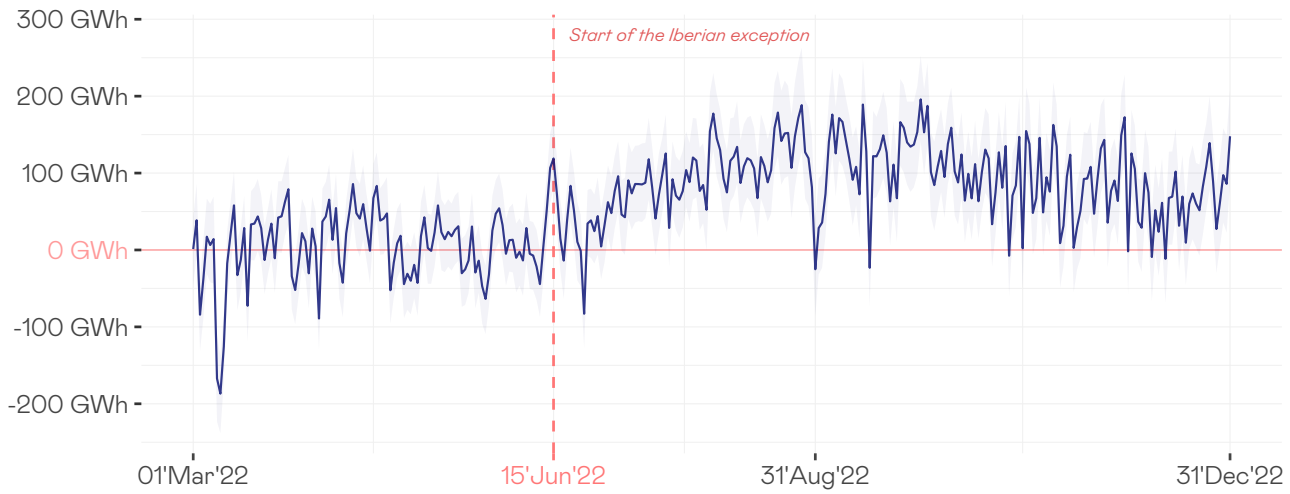



Source: authors

In principle, and despite the fact that the mechanism did not come into operation on some days in November due to low gas prices, it has continued to accumulate savings among Spanish households and companies. Between June 15 and December 31, the average bill for households with a regulated price would have been 31.8% higher if the mechanism had not been in place. It should be recalled that the savings up to August 31 were 24.4%. The probable reason for this higher saving is that gas prices remained high for a large part of September and the first half of October, which, compared to the period analyzed above (15 June to 31 August), has led to greater savings.

Regarding the effect observed in the previous study on the greater use of gas in electricity generation, CCGT plants seem to maintain a greater weight than expected if the Iberian exceptionality was absent, especially until mid-November. However, from that moment on, the use of these plants seems to be closer to what we would have expected without the mechanism, although it remains significantly higher than expected.

**Graph 2. Effect of the gas price cap on electricity generation from CCGT plants, from March 1st to December 31st**



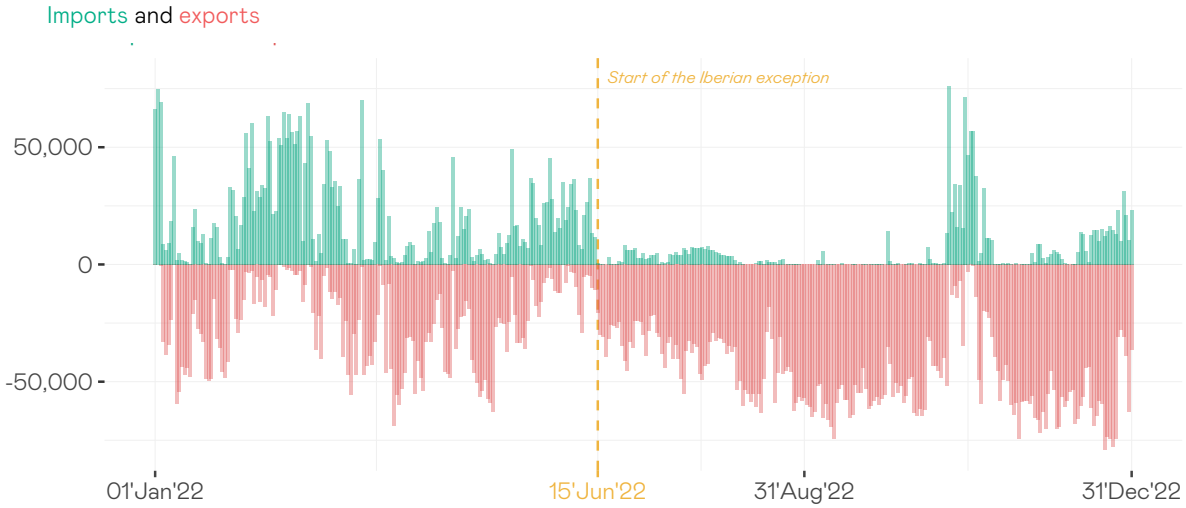

Source: authors

Thus, we still consider that one possible effect of the mechanism was the intensity of use of CCGT plants. However, the updated data leads us to think that part of the increase observed in the summer months could be due to a minor use of other sources for reasons unrelated to the mechanism itself, as is the case of hydroelectric power, strongly conditioned by the drought. This, thanks to the rains of recent months, has recovered part of its presence in the generation mix.

Another aspect that may have conditioned the intensity of gas consumption has to do with the variables chosen to calculate the compensation. The law that regulates the gas price cap indicates that it is calculated as a difference between an indicator referenced to the price of gas in the MIBGAS index and a price set in the regulation itself, which is initially set at 40€ and progressively increases to 70€. As noted in the appendix, something we were able to verify when calibrating our model is that the PVPC price series was better explained by incorporating the TTF gas price index, which more closely reflects the variation in international prices. The MIBGAS, on the other hand, only captures a small proportion of the transactions that take place in the Iberian Peninsula. The divergence between the two indexes has indeed been growing over time. As a result, the compensation, calculated only based on MIBGAS, could have been higher than the actual price of gas paid by Spanish power plants, thus generating an implicit subsidy and therefore an incentive for gas consumption by energy operators compared to other available technologies. The possible impact of the reference indexes chosen for the compensation effect on the real costs of the power plants remains open. In any case, this would require a more detailed specific analysis.

As for the increase in exports to France, the trend observed during the summer continued and excluding the period from mid-October to early November, would even have been more pronounced. However, towards the end of the year, electricity imports from France recovered slightly. The bottom line is that in 2022 exports more than doubled compared to 2021 and imports were reduced by less than half, completely reversing the traditional balance between the two countries and, at the same time, intensifying the terms of trade, which increased by 56.3%.

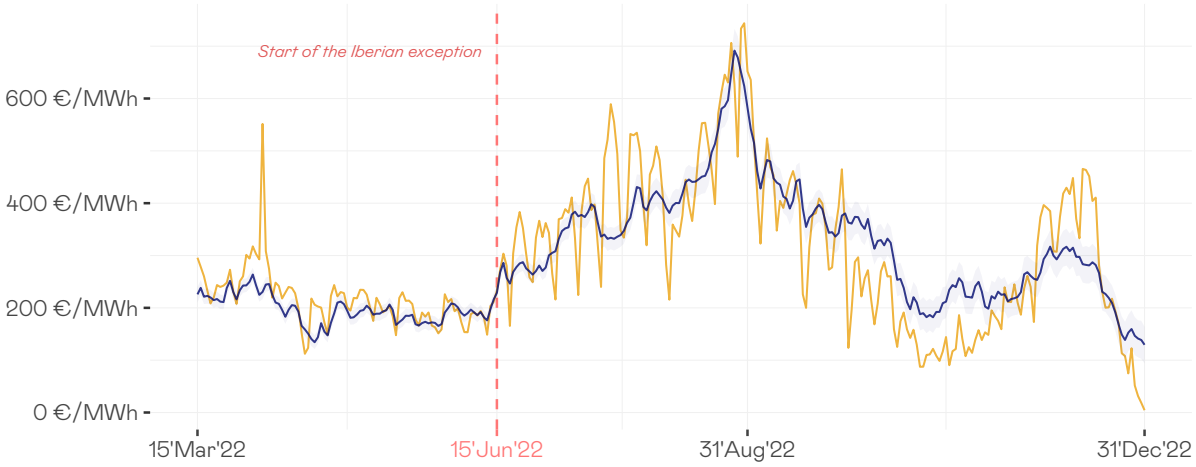
**Graph 3. Use of the Spain-France cross-border electricity interconnection in MWh in 2022.**




Source: authors, based on data from Red Eléctrica.

To evaluate the potential impact of the Iberian mechanism on this increase in exports, we compare the French wholesale market price and the price we would have observed in Spain if the mechanism had not been implemented. If, in the figure below, the price in France (yellow) is higher than the price estimated without the cap in Spain (purple), the increase in exports would have occurred in the same way but, if the opposite occurs, this increase could be attributed to the implementation of the Iberian exception.

**Graph 4. Comparison of wholesale electricity price observed in France and estimated gas price without the cap in Spain, from March 15th to December 31st**




Source: authors

What can be observed with the updated data is that, without the mechanism, the Spanish spot price would have been slightly higher than the French spot price since mid-September, except for about three weeks in December. This means that if during this time, exports have remained high, one possible reason is precisely the introduction of the mechanism. Conversely, it is quite likely that without it we would not have seen similar levels of exports.

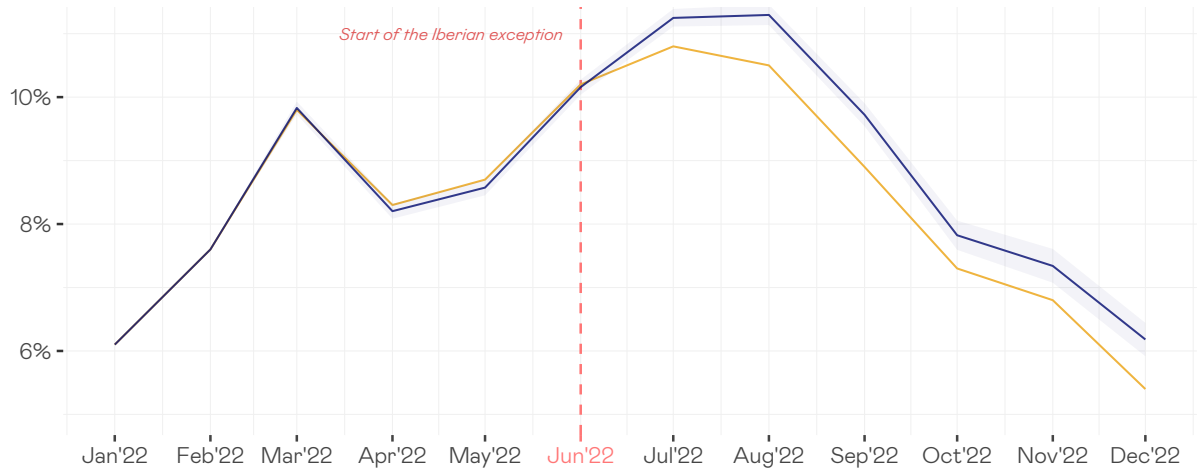
In view of the result above, it is worth remembering how the compensation for CCGT plants is financed. Consumers under the regulated price (PVPC) and those who, belonging to the free market, make a new contract or update their contract, are the ones who pay this cost. However, the law regulating the gas price cap allows the exceptional use of congestion income (generated by the price differential between Spain and France) to reduce the amount of the surcharge that consumers pay to finance the compensation paid to the power plants in application of this mechanism. The balance of these congestion incomes varies according to the electricity trade balance between Spain and France, which means that at certain times there could have been a favorable balance in favor of the Spanish system, which has contributed to reducing the cost of the mechanism for Spanish consumers and thus the amount of the "implicit subsidy" to French consumers. In any case, the scope of this circumstance would require a more detailed analysis to capture the balance of these congestion incomes.

# 3. Estimation of the inflation-reducing effect

One exercise of extreme interest is to estimate the impact that the Iberian mechanism has had on the evolution of Spanish inflation since its introduction. To do so, we use the estimated counterfactual for the PVPC as the electricity price to be incorporated in the CPI calculation instead of using the actually observed price. The first step is to establish an econometric relationship between the PVPC and the CPI price series under the heading "Heating, lighting and water distribution". The approximation is almost perfect, which allows us to deduce what this series would have been in the absence of the mechanism. Finally, the availability of the weights of each heading in the overall CPI allows us to estimate a counterfactual series for this indicator and its year-on-year growth rate, i.e. inflation.

Our estimates are shown in Graph 5. The rate of growth of the CPI would have been somewhat higher as of June, when the mechanism was introduced, and this difference would have remained approximately constant starting in July. With data up to December, inflation would have been 0.5 percentage points higher in year-on-year terms at that time (6.2% estimated vs. 5.7% observed). In terms of annual averages, the effect of the mechanism is a reduction in inflation of 0.3 percentage points (8.4% observed vs. a counterfactual of 8.7%), although the average since its implementation, if we take into account the months of the year without the mechanism (before June) would have been about five tenths of a percentage point lower (8.6% observed vs. an estimated 9.1%).

**Graph 5. Evolution of inflation observed in Spain and estimated without the gas price cap in 2022.**

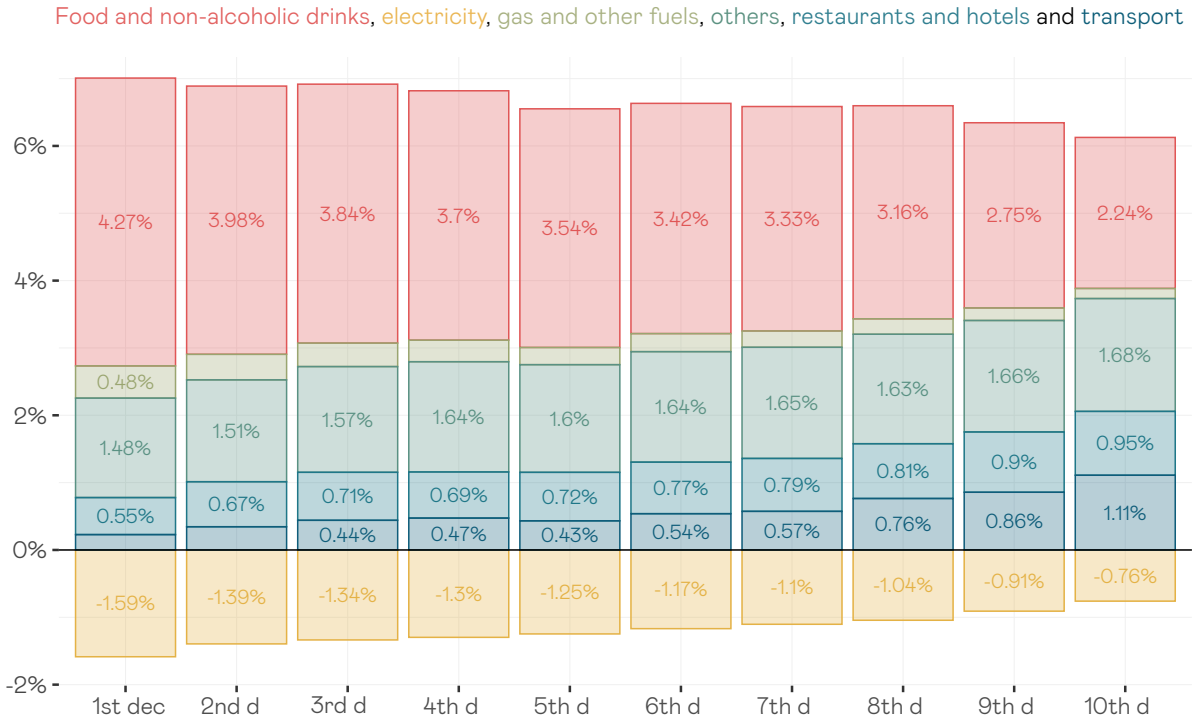



Source: authors

These results are particularly relevant in view of the leveling effect that electricity has had on inflation among different income groups in 2022. In this EsadeEcPol analysis, Ángel Martínez and

Javier Martínez point out that the greater weight of electricity in the expenses of low-income households means that any variation in its price affects them disproportionately. In addition, this sector of the population is over-represented among those who have contracted the PVPC, since one of the requirements for accessing the "social electricity voucher" is to be covered by this rate. This meant that, in 2021, the increase in the price of electricity and other energy products raised the inflation of the poorest households by 2 percentage points higher than that of the richest households. On the other hand, as the following figure shows, the drop in electricity bills in 2022 has offset the impact that other categories of expenditure, heavily represented in the shopping basket of lower-income households, has had on their purchasing power. While electricity has reduced the inflation borne by the most vulnerable households by 1.59 points, this reduction is only 0.76 points for the better-off households. Thus, the implementation of the Iberian mechanism has made it possible to equalize the inflation rates borne by households with different economic capacity.

**Graph 6. Inflation by deciles of household expenditure**




Source: EsadeEcPol Blog

# 4. Conclusion

To summarize what this update of our model shows, the gas price cap implemented in Spain and Portugal has had a positive impact on the price of electricity in the wholesale electricity market and, consequently, on consumer prices in the regulated market. According to the most accurate and updated estimate, there has been a cumulative savings of approximately 32% for consumers under the regulated price, which translates into total savings of 1.9-2.1 billion euros by the end of 2022. Consequently, the results shown here indicate that this measure has contributed to year-on-year inflation being 0.3 points lower in Spain than it would have been without the Iberian exception, something that has been decisive in Spain's economic outperformance as compared with its Eurozone neighbors.

However, it is essential to mention that this measure has also had an impact on the use of gas for electricity generation in CCGT plants, generating a potential conflict between the savings target for households and the overall gas savings target for the Spanish and European economy. It is true that this difference was greater in summer and was reduced during autumn, indicating that it is likely that the hypothesis that the drought in the first half of 2022 (which disappeared with the rains from September-October) has acted as a concurrent and reinforcing factor to the gas price cap itself in increasing the use of CCGT plants, by limiting the availability of hydroelectric power until the last quarter of the year.

At the same time, in 2022, Spain's electricity exports to France increased significantly compared to 2021, while imports decreased. Updated data suggest that, without the gas price cap, the Spanish electricity price would have been slightly higher than the French price most of the time since mid-September. This suggests that the introduction of this mechanism could have been a key factor in the increase in Spanish exports, as it is likely that similar levels of exports would not have been recorded without it.

Finally, it is important to consider the possibility that other issues, such as the reform of the PVPC or even the modification of the criteria for the computation of electricity prices in the CPI were shelved due to this supposedly temporary mechanism and the expectation of its results. These aspects shaping the regulatory structure of the market would have had a direct impact on price volatility and inflation, especially in the first phase: it does not seem coincidental that Spanish inflation escalated early on. Instead of reforming the price, or seeking perhaps less market-distorting solutions (such as an extraordinary tax or a "one-off" aid) Spain demanded and obtained the "exception", which will now be extended for the whole of 2023 after the Spanish government's requests to European bodies were accepted. It is true that the gas price cap is compatible with the above-mentioned reforms. They could even be complementary. Moreover, the very urgency of the inflationary situation in Spain demanded a politically feasible action in the immediate term. But a follow-up of the pending structural reforms and the degree to which they are conflated both in the current debate and in their eventual final execution with the current mechanism will be necessary

to organize future decisions and to prevent short term fixes from being passed off as solution, no matter how convenient, effective or inevitable the former may turn out to be.

Precisely to inform this decision-making process, in the medium term we must continue to update the estimates in the variables considered here, extending them once the data are sufficient to cover the Spanish electricity market as a whole and not only the regulated price. Additionally, it is important to consider two additional factors that we have referred to in this analysis: first, the uncertainty to what extent the "leakage" of electricity to France means a greater or lesser subsidy in favor of the French consumer at the expense of the Spanish consumer. And secondly, whether the reference rates chosen to calculate the compensation are appropriate or whether they could actually be driving the extra use of gas that we have observed under the Iberian exception during 2022, and that the data presented here corroborate.

# Methodological annex

In order to evaluate the measure, we must focus on the main stated objective: to reduce the final bill of consumers in the regulated market. Therefore, it is useful to observe whether, since its implementation, there has been a significant reduction in the regulated price (PVPC from now on), and if so, by how much. However, we also want to observe two possible undesired effects of the policy: the lower inflation differential, the potential greater use of CCGT plants and the increase in exports to France. To this end, a representation of the evolution of all these variables, starting with the PVPC, is needed in a hypothetical world without Iberian exception.

We suggest here to start from a model that best approximates retroactively the historical evolution of the market. If we have high confidence that this model can explain prices from the past, we can estimate with reasonable confidence a counterfactual into the future, or a "what if": an approximate series of plausible PVPC prices (and gas usage in electricity generation, inflation, or consumption in France) in a world in which, as the only difference and if properly modeled, the measure would never have existed. It is by comparing this hypothetical series with the real one, and assessing whether the difference is statistically significant, that we will be able to understand whether or not the measure has had the desired effect.

Thus, the first step must focus on the design of a model, together with the choice of the appropriate variables, that will allow us to predict the market as closely as possible. The central target variable in our assessment is the PVPC, so we anchor the reliability of the model first and foremost on its ability to estimate this price throughout the available time series.

**Price series used**. We began by choosing which gas price series to use as a reference for the PVPC estimation. Spanish gas companies have two reference markets at their disposal: the gas price in the virtual market in the Netherlands (Dutch TTF) and the price in the Iberian Gas Market (MIBGAS). Our main criteria for the selection has been that the gas price used to estimate the model should be the one that best statistically approximates the PVPC price series. For most of the period where both gas prices are available, it is observed that both TTF and MIBGAS have evolved in a very similar way. However, this similar evolution breaks from April 4, 2022, at which point both prices start to diverge. To better discern, we estimate two possible models: one for each gas reference price, from September 2021 (at which time we have a daily MIBGAS series) until April 3. Once these models are estimated, we use data from April 4 to June 14 as a test group for the accuracy of each model, extrapolating both for that period. It turns out that the reference price that best approximates the evolution of the PVPC in the days of the test period is undoubtedly the TTF, so this should be the price to be considered in the causal impact analysis. However, even though that the data discriminated in favor of the TTF, it is also true that in the last year MIBGAS has significantly increased its presence in the contracts made by the Spanish gas and electricity system, intensifying even more in the last few months. These gains in market share, which have reached 20% in 2022, oblige us to consider its possible role, especially at a time when the Iberian market could be gaining

relevance in Spain. For this reason, we believe it is an appropriate decision not to rule out its use. Consequently, for the estimation of the PVPC prediction model, a weighted average of the TTF and MIBGAS reference prices will be used for the period in which both are available, i.e. from September 7, 2021. The weights will be 80% for the former and 20% for the latter. If both series have evolved similarly, there will be no difference between this weighted price and either one separately. By the time the two series separate, the weighted series will be between the two, although closer to the TTF. In this way we ensure that the TTF has prevalence over the MIBGAS (as the data states), but that the evolution of the latter must be present in the estimates, especially due to the existence of such a different evolution since April 2022.

**Additional variables**. The model used to estimate the evolution of the PVPC incorporates, in addition to the weighted price described in the previous section, the same PVPC series but with time lags of one day and seven days (variables that seek to capture the structure of the time series). Along with these, the daily production level of CCGT and cogeneration plants in Spain (i.e.: the weight of each technology in the daily mix) is included, thus trying to capture the market structure and the presence of alternatives each day to minimize the risk of biased estimates. The less visible factors are in any case captured indirectly via the backbone of the model: the reference prices, which would pick up (by correlating) hidden variables by having responded to them in the past. Finally, two interventions are incorporated into the model, one corresponding to the reform of June 1, 2021 and the other to that of September 15, 2021, whose effects on the price could be significant.

**Validity of the model**. The analysis of the regression results suggest it is difficult to question the validity of the model and of the variables included in the approximation of the daily evolution of the PVPC since January 2014. Moreover, its capacity to approximate the PVPC is very high (above 92%). This gives us confidence in its ability to capture almost all the dynamics affecting the market even if they do not have a specific variable in the model, finding a balance point between underfitting and overfitting.

**The final models**. Once it has been proven that it is possible to design a model capable of approximating (and predicting quite accurately) the evolution of the price series, the next step is to use it to analyze the impact of the gas price cap intervention on prices. To this end, we use Bayesian structural models (BSTS) to estimate the counterfactual. These models allow us to estimate not only the difference between the two, but especially the approximate probability that the difference is due to a random reason or to the assumed cause, in this case the gas price cap. In other words, not only can we measure whether there has been a causal impact, but it is also possible to know with what probability this is due to the policy applied.

With this approach, modifying in each case the dependent variable, we measure the impacts of the gas price cap on the PVPC, gas consumption for electricity generation, the price differential between the Spanish and French markets (section 2), and, finally, on inflation (section 3)