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What will be the effect in Spain of the new EU emissions tax on imports?

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AUTORES

Natalia Collado,
EsadeEcPol

Pedro Linares,
Professor at Comillas Pontifical University

Ángel Martínez
Research Economist in EsadeEcPol

Research, data and visualization support: Ramón Pacheco

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economics for energy

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Line of research:

Green transition

KEY IDEAS

- → The new European CO_2 tax on imports (CBAM) will mean, on average, an additional €100 in spending per year or 0.3% of total spending.
- → Moreover, its effect seems to be progressive: households with higher purchasing power would be the most exposed to price increases.
- → Sectors most exposed to international markets, such as the automotive industry and metallurgy, would be the most affected in Spain by the CBAM, with an aggregate cost of more than 2.5 billion euros per year.

EXECUTIVE SUMMARY

Energy-intensive sectors in the European Union pay for the environmental costs of their activities through an emissions allowance market, where each tonne of CO_2 emitted has a specific price. To prevent these additional costs from putting European industry at a disadvantage compared with imports from third countries, a free quota was previously allocated to the sectors most exposed to competition. However, this removed the incentives for these sectors to decarbonize.

To address this issue, the EU has adopted a Carbon Border Adjustment Mechanism (CBAM) to help balance decarbonization between European and foreign industries while maintaining the competitiveness of our companies. To this end, imported products will be taxed according to their emissions in order to level the playing field between local producers and third countries exporting to the EU. Despite their importance and potential to align incentives for decarbonization at the European and global levels, their impact needs to be assessed in two further dimensions:

1. To what extent it reduces the competitiveness of European exports by increasing the cost of raw materials imported from third countries.
2. The extent to which it may drive up prices paid by EU consumers.

In this policy brief, we assess these potential effects using Spain as an example.

In examining how the increase in product costs associated with CBAM would be passed on to Spanish households and regions, we find that:

- The impact would be relatively small: on average about €100 per household per year, or 0.3% of total expenditure.
- However, the impact is very different depending on the differences in the basket of goods: households with higher purchasing power suffer more from the increase in transportation goods, while households with lower purchasing power spend their most on food, furniture and equipment.
- The overall effect is progressive: lower-income households bear less of the tax burden than higher-income households.
- This progressive effect is amplified in areas with more dispersed populations, where higher-income households pay more.
- Among autonomous communities, the wealthiest have a greater impact,

Regarding industry competitiveness, we extended our previous analyses to the agri-food and manufacturing sectors and found that:

- In manufacturing, final product prices would generally increase by less than 7-8%, although there are exceptions where costs could increase by as much as 20%.
- The sectors most dependent on international markets, such as automotive and metallurgy, would be the most affected by CBAM, with a total impact of more than 2,500 million euros.
- In the agri-food sector, the impact would be more moderate, as price increases for most products would be below 1%.

To avoid the undesirable impact of the new tax on the external competitiveness of the industry, we recommend:

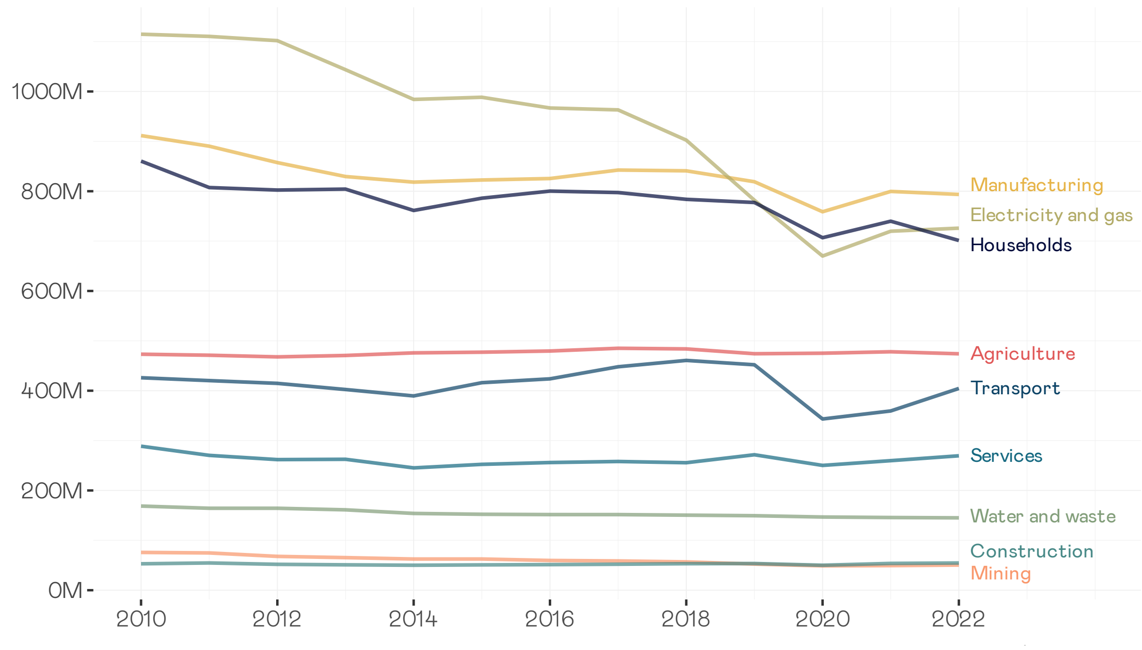
- Targeted support measures for industry to facilitate access to low-cost, low-carbon technologies in the sectors that will be most affected by this increase in emissions costs. This analysis can help inform these decisions in Spain.
- Monitor the operation of the CBAM to prevent importers from circumventing it, especially in sectors where competition or the risk of doing so is greatest.
- Move toward more internationally coordinated climate policies so that costs associated with emissions tend to converge across countries and markets to minimise distortions in international trade while ensuring appropriate incentives for decarbonization.

1. Introduction

The European Union's strategy for making companies and consumers bear the cost of industrial emissions is based on an emissions trading system (EU ETS). In this system, European producers have a shared emissions ceiling and must have sufficient allowances to cover their CO_2 emissions. If a power plant or factory emits less gas than allowed, it can sell its surplus allowances to others. This creates an economic incentive to reduce emissions: if you can reduce your emissions, you can sell your excess allowances and make a profit. Without any additional mechanism, this system could penalize sectors exposed to external competition because, by forcing them to internalize the price of emissions, it makes their goods more expensive vis-à-vis non-European competitors. This in turn would generate a risk of emissions leakage: a shift of manufacturing of products whose processes emit greenhouse gases to other regions where a price for these associated emissions has not been introduced. Along with the displacement of production comes the displacement of these emissions, which may even increase in aggregate if the destination territory is less "clean" in its production standards and processes.

To minimize this risk, the European system allocates several emission allowances free of charge to these specific sectors. Although this free delivery does not in all cases cover the total emissions produced, it decreases the CO_2 price signal embedded in the product and thus the incentives to reduce carbon emissions from industry. The evolution of emissions in the different sectors points in this direction: while the energy sector has reduced its emissions by 40% in the last 10 years, the manufacturing sector has reduced its emissions by 13%.

Figure 1. **Developtment of emissions by sector in the European Union**
Measured in millions of tones of CO_2



Source: Own elaboration based on Eurostat data I EsadeEcPol

To close this gap and provide a solution that balances the efforts of European producers with those of the third countries from which we import goods into the EU, a Carbon Border Adjustment Mechanism (CBAM)[1] has recently been approved that would tax imported products according to their emissions, bringing them in line with the price of European goods. In its final model, the CBAM will apply to imports of cement, iron and steel, aluminum, fertilizers, electricity, and hydrogen, which will have to pay the EU ETS price for their "embedded" emissions. This would allow the elimination of free allowances, as European industries would not lose competitiveness vis-à-vis imports, although European exports would lose competitiveness in international markets.

In a previous policy insight (Linares & Collado, 2022) we analysed the impact of the CBAM on Spain's industrial competitiveness, observing that the most affected sectors were the automotive and metallurgy sectors. In this paper, we extend the analysis by focusing on the agri-food sector following the inclusion of fertilizers in the final design of the mechanism. In addition, we estimate how the policy would affect different types of households depending on their income and place of residence.

1 Regulation (Eu) 2023/956 Of The European Parliament And Of The Council of 10 May 2023 establishing a carbon border adjustment mechanism: Publications Office (europa.eu)

2. Data and methodology

First, to analyze the economic impact of the mechanism, we extend the methodology already applied in Linares and Collado (2022) to the Spanish agricultural and livestock sector. The objective is to calculate the potential increase in costs to which these activities would be exposed after the inclusion of fertilizers within the materials taxed by the CBAM.

Following Stede et al. (2021), the process consists of several steps. First, the carbon cost associated with each good after the introduction of the mechanism is calculated. With CBAM, producers face a cost premium: they have to purchase permits for the emissions associated with the processes covered by the EU ETS, hitherto distributed free of charge, at the market price of CO_2. To approximate the emissions that would become covered by the EU ETS in the fertilizer production chain, we use the ammonia emissions benchmark established for the period 2013-2020[2]. We then estimated the direct and indirect fertilizer use for the different agricultural and livestock products. We use the average fertilizer rate per ton for the different crop types based on Urbano (2015). In case we do not have the data for a specific product, we approximate it with the average fertilization rate of the ECOICOP[3] consumption group to which it belongs. For livestock products we use the average fertilizer content of corn and barley, assuming that the feed is mostly composed of these two ingredients. We then multiply this by the number of kilograms of feed needed to produce one kilogram of product (Ritchie et al., 2017), and thus obtain the amount of fertilizer needed to produce one kilogram of product. Multiplying the emissions benchmark by the specific fertilizer content we obtain the amount of emissions associated with the production of a given feed that are currently not subject to a CO_2 price by receiving free allocations. Thus, the carbon cost is the result of multiplying these emissions by the CO_2 price, which we assume to be €80/ton.

The next step is to estimate the price increase resulting from this new cost. We use the production and production value data for primary crops and livestock published by the Food and Agriculture Organization of the United Nations (FAO) for 2019 to obtain the unit price of each product[4]. We assume that the price of this and imports is similar, and that, following the introduction of CBAM, the cost increase will similarly affect both items. In line with Stede et al. (2021), we assume that producers fully pass on CO_2 costs and that, with this, the composition and weight of products do not change. We also assume that the cost increase is passed on to exports through production. Thus, the price increase will be the result of dividing the carbon cost described in the previous paragraph by the unit price of each product as shown in the following formula.

2 See Annex 1 of COMMISSION DECISION of 27 April 2011 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council (notified under document C(2011) 2772) (2011/278/EU). L_2011130EN.01000101.xml (europa.eu)

3 European Classification of Individual Consumption by Purpose used in the INE Household Budget Survey.

4 The value of production provided by FAO is in dollars. To convert it to euros, we use the average exchange rate published by the European Central Bank for 2019.

$$\Delta \text{ Price} = \frac{\text{Carbon cost}}{\text{Unit price}} = \frac{CO_2 \text{ Price} * \text{Ammonia emissions benchmark} * \text{Fertilizer use}}{\text{Unit price}}$$

Once the price increases for the different food products have been obtained, and added to the estimates for manufactures presented in Linares and Collado (2022), we can infer what the distributional impact of the CBAM will be among Spanish households. Based on the above results, we group price increases into categories of household spending on goods and services, collected through the ECOICOP classification. The purpose of obtaining the price increases in this classification of expenditure groups derives from the existence of the Household Budget Survey (HBS), prepared by INE, which uses this classification and provides a wealth of information on the composition and characteristics of a representative sample of Spanish households.

For this analysis we use the HBS microdata corresponding to the 2019 wave, since the most recent waves of 2020 and 2021 still present a strong affectation of mobility restrictions on key expenditures for the analysis, as is the case of spending on transportation. Once we impute the price increases, disaggregated to five digits in the ECOICOP, we calculate the increase in monetary expenditure that the application of the CBAM would entail for households using the following formula:

$$\Delta \text{ Spending} = \Delta \text{ Price} * \text{Spending}$$

This imputation of monetary expenditure increase entails a relevant assumption, that household consumption would remain constant despite the price increase we consider. This assumption seems reasonable to us since the vast majority of price increases are less than 2%. For example, the WHO recommends price increases of more than 20% to achieve significant decreases in the consumption of unhealthy foods, such as sugar-sweetened beverages (Martínez et al., 2023).

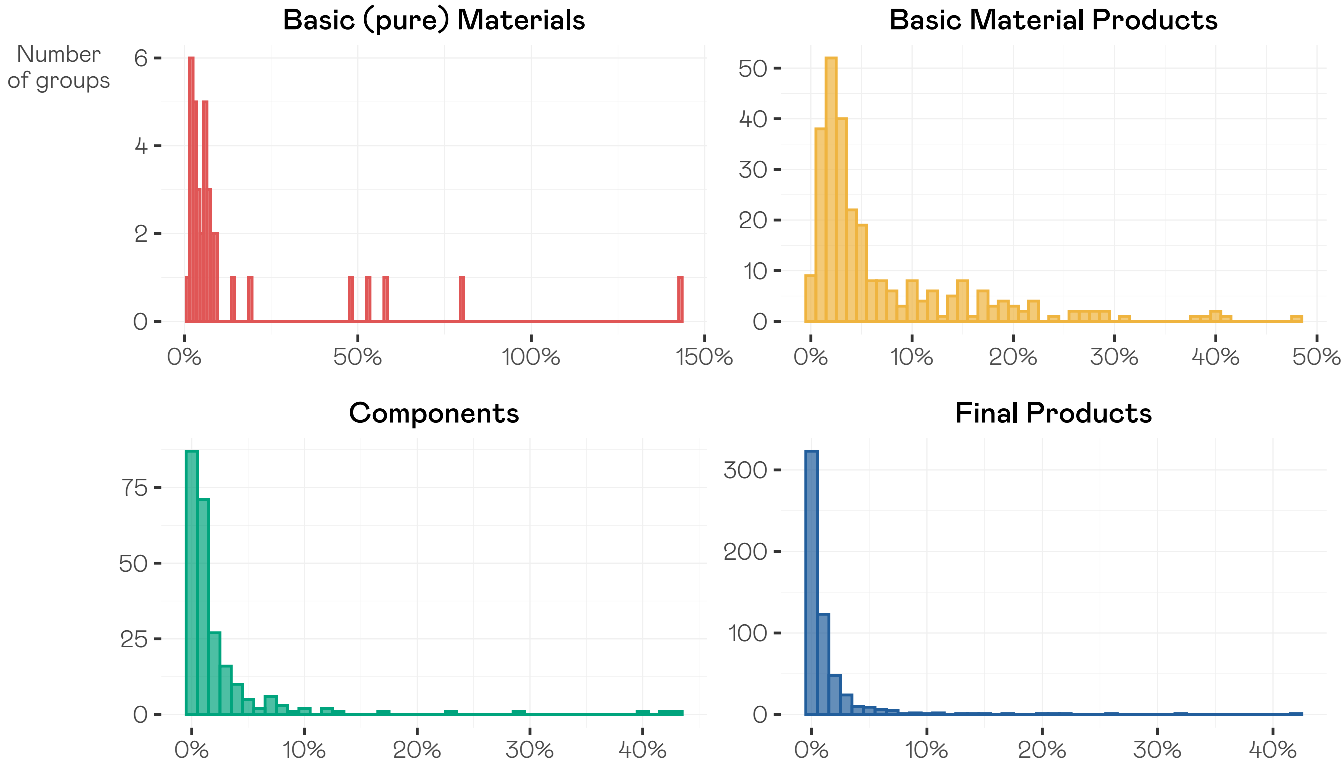
Finally, being the objective of this study to calculate the distributional impact of the CBAM, and given that we have estimated the price increases for food, we can apply them to those foods consumed outside the home in catering establishments or hotels. The inequality in spending in restaurants and hotels makes this imputation especially necessary, although unfortunately it cannot be done with the same degree of accuracy concerning the rest of the expenditure groups, since it is applied to the entire expenditure group, without disaggregating between different subgroups. For this purpose we use input/output tables, which provide information on the importance of the different inputs on the output of a given sector. For data interpretation, it should be noted here that our approach does not take into account the connections between sectors in the purchase and sale of intermediate goods, but simply starts from final goods. Thus, the results shown below should be viewed in this light.

3. Results

Impact on industrial competitiveness

In Linares and Collado (2022) we concluded that the introduction of CBAM has an unequal impact on the different product categories of the manufacturing sector. The most basic products are the most affected, experiencing more significant price increases: up to 150% in the case of cement clinker, or 50% for steel or aluminum ingots. As we move up the value chain, price increases are mitigated. In particular, final products would generally suffer price increases of less than 7-8%, although agricultural and industrial machinery could see increases of more than 20%. In general, the price increase will be proportional to the metal, plastic, or cement content, and of the approximately 1,100 NACE categories considered, some 400 would see price increases of more than 2%.

Figura 2. **Distribution of trade groups by price increase**
Carbon price of 80€/t



Own elaboration based on data from PRODCOM and Stede et al (2021) I EsadeEcPol

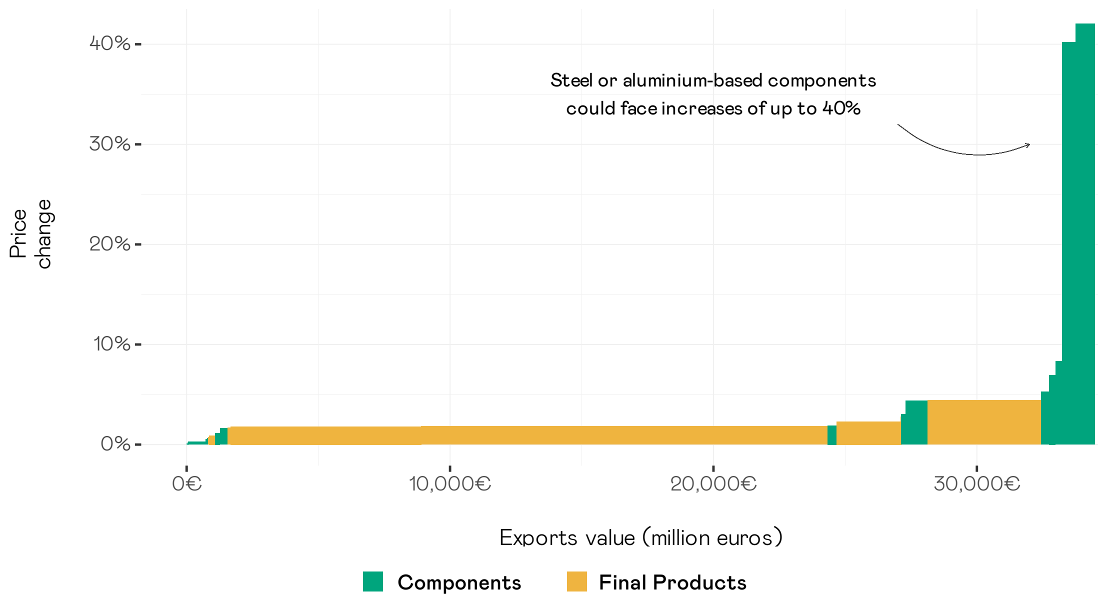
The sectors most exposed to international markets, such as the automotive industry, machinery, metallurgy, non-metallic minerals, and plastics, would be the most affected by the CBAM. In particular, it is estimated that base metals and the automotive sector would suffer an aggregate impact of more than €2.5 billion.

Table 1. **Potential increase by manufactured goods group (change in price in terms of export value)**

Manufactured goods group	Millions of €
Basic metals	€1,570.93
Motor vehicles, trailers and semi-trailers	€1,295.15
Manufacture of metal products	€524.26
Other non-metallic mineral products	€338.45
Machinery and equipment	€225.65
Chemical products	€207.04
Rubber and plastic	€149.79
Electrical equipment	€104.72
Other manufactured goods	€75.63
Paper	€65.59
Furniture	€38.21
Textiles	€26.89
Clothing	€23.50
Wood, basket making and wickerwork	€13.49
Other transport equipment	€9.50
Computer, electronic and optical products	€9.46
Leather	€3.84
TOTAL	€4,682.11

Exports in the automotive sector would experience price increases of less than 2-3%, but there are subsectors where the Spanish industry is a leader, such as components based on steel, aluminum or plastic, which could face increases of up to 40%.

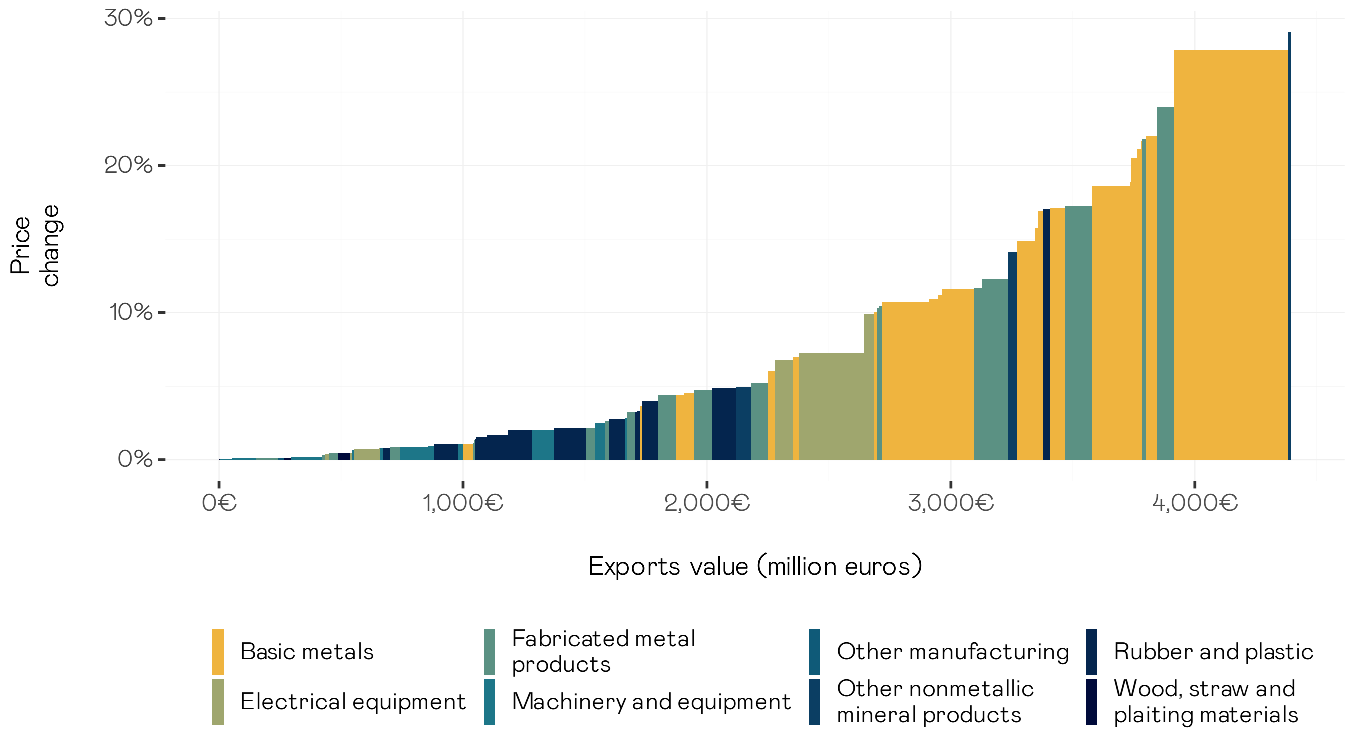
Figure 3. **Distribution of price increases for the automotive sector relative to the importance of its exports**



Own elaboration based on data from PRODCOM and Stede et al (2021) I EsadeEcPol

In the case of construction, given the impossibility of estimating the impact directly, because there is no such category in the manufacturing data, an index of products used in this sector such as cement, bricks, doors, windows, ceramics, glass or pipes has been prepared. It is observed that in this activity, which is important for both exports and domestic consumption, prices are expected to increase significantly in several related categories.

Figure 4. **Distribution of price increases for the building sector relative to the importance of its exports**



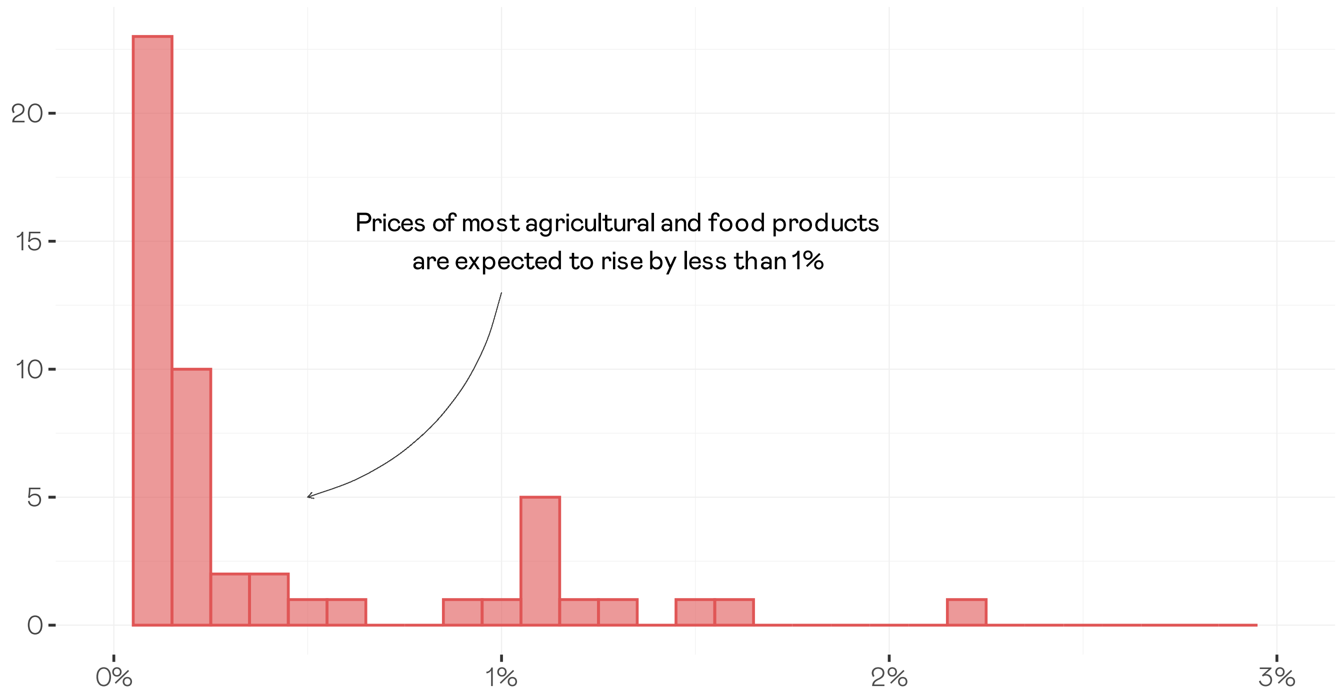
Own elaboration based on data from PRODCOM and Stede et al (2021) I EsadeEcPol

Impact on the competitiveness of the agricultural and livestock sector

Below, we show the impacts on the prices of agri-food products as a result of fertilizer price increases. It is important to remember that these price changes would affect domestic production, which would use more expensive fertilizers, but not imported food, which would become more competitive, or international markets, where the Spanish agri-food sector would lose competitiveness. In this regard, the agri-food sector was in 2019 the main export sector outside EU borders, with more than 10% of the value of exports. On the other hand, exports account for almost 10% of the value of agri-food production in Spain. It is therefore of vital importance to pay special attention to the possible impacts on their external competitiveness.

The following figure shows how the price increases of the agricultural and livestock products analyzed are distributed. Of the 60 foods for which data were available, 49 would increase their price by less than 1%, the average for the total sample being 0.4%. At the top of the list is beef, whose price would increase by 2%, followed by peas and beans with 1.6% and 1.5% respectively. Cereals (oats, rye, corn, maize, barley, wheat) would increase in price by between 1% and 1.3%. Among the least affected foods are berries (blueberries, blueberries, currants and raspberries), spinach, leeks and avocados.

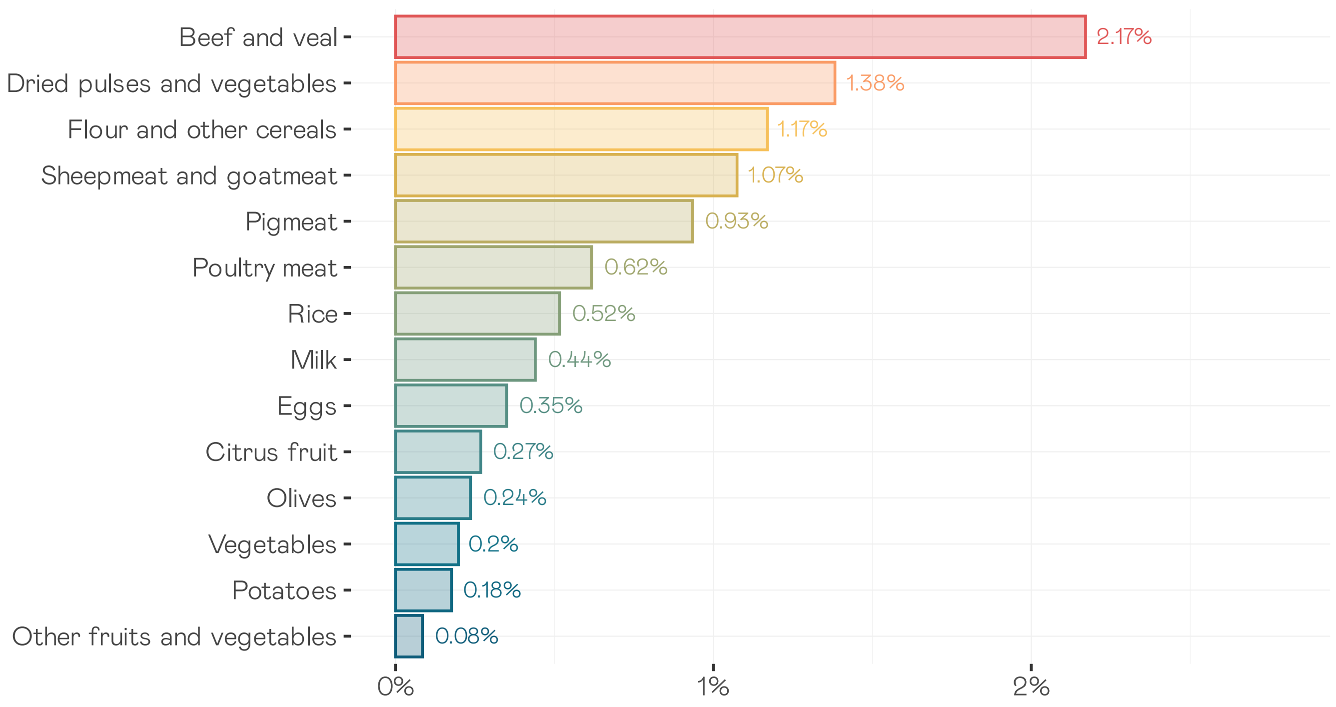
Figure 5. **Number of agricultural and livestock products according to the estimated price change after the application of EU CO_2 tax on imports**
CO_2 price 80€/t



Fource: Own elaboration based on data from FAO and Urbano (2015) I EsadeEcPol

If we group the above products by groups, we obtain that beef is at the top of the distribution together with legumes and cereals with price increases of over 2%. This is followed by sheep and goat meat, pork and poultry with increases of 1.9%, 1.6% and 1.1% respectively. The different impact on the livestock sector is directly related to feed consumption: to produce one kilogram of beef requires 4 times more feed than to produce one of pork and 8 times more than for poultry (Ritchie et al., 2017). Finally, rice, milk and eggs would increase in price by less than 1%.

Figure 6. **Change in food prices after the introduction of the EU CO_2 tax on imports**
By expenditure categories



Source: Own elaboration based on data from FAO and Urbano (2015) I EsadeEcPoL

These estimated price changes are partially consistent with those experienced during the energy crisis caused by the Russian invasion of Ukraine: against fertilizer price increases of 90%, cereals increased their price by 20-40%, although in this case it should be taken into account that the price increase of cereals is also due to the reduction of the Ukrainian supply of cereals. In other products the price increases are smaller, and closer to the ratio we obtain in the case of CBAM, but there is still some divergence, which can be explained both by external factors (the drought) and by possible methodological errors (higher than theoretical fertilizer rates). In any case, the orders of magnitude are similar.

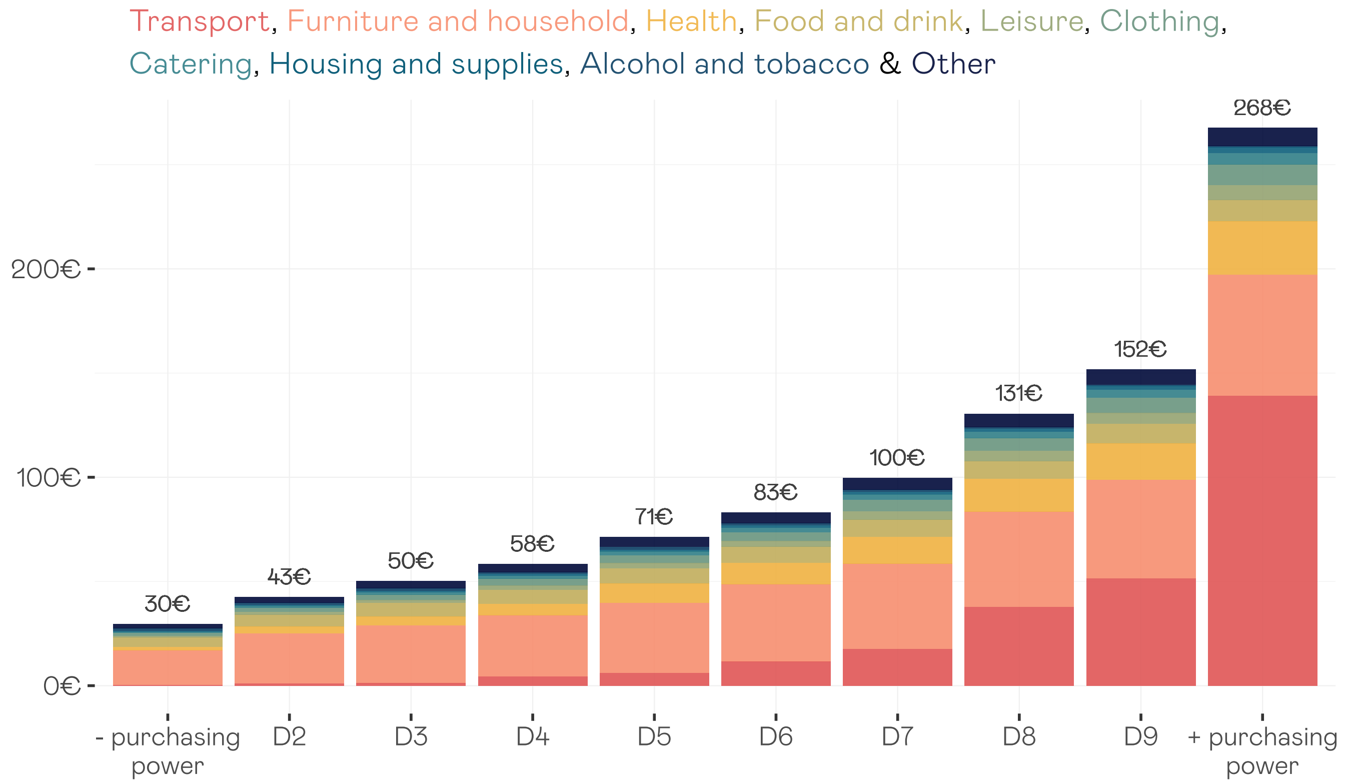
Impact on households

To facilitate the analysis, we aggregate the spending increases calculated as a consequence of the CBAM for each of the 361 ECOICOP groups into twelve major groups: food and non-alcoholic beverages; alcoholic beverages and tobacco; clothing and footwear; housing, water, electricity, gas and other fuels; furniture, household equipment and maintenance expenses; health; transport; communications; leisure, entertainment and culture; education; restaurants and others. Thus, to study the final distributional impact, we calculate the cost of the CBAM per household in the different deciles of the equivalent expenditure distribution[5]. Finally, we also show the effect according to different characteristics of the household, such as its composition and the population density of the area in which it lives, in order to better characterize the most affected households.

5 This serves as a proxy for household income, following Comité de personas expertas (2022)

The following graph shows the extra expenditure after the implementation of the CBAM, disaggregated into the twelve categories mentioned above by deciles of equivalent expenditure. As would be expected, the overspending entailed by the mechanism increases considerably as one moves up the distribution of equivalent expenditure, although the composition changes substantially between deciles. Among the first five deciles, extra spending on food consumed in the home and on furniture are the main components of the increase in spending, while from the sixth decile onwards, spending on health, restaurants and, above all, transportation, take on a more prominent role. Specifically, the extra spending per household associated with the CBAM is less than €50 among households in the poorest 20%, while it exceeds €250 among households in the top 10%.

Figure 7. **Estimate of additional expenditures that the new CO_2 tax on imports will entail for Spanish households by purchasing power level**



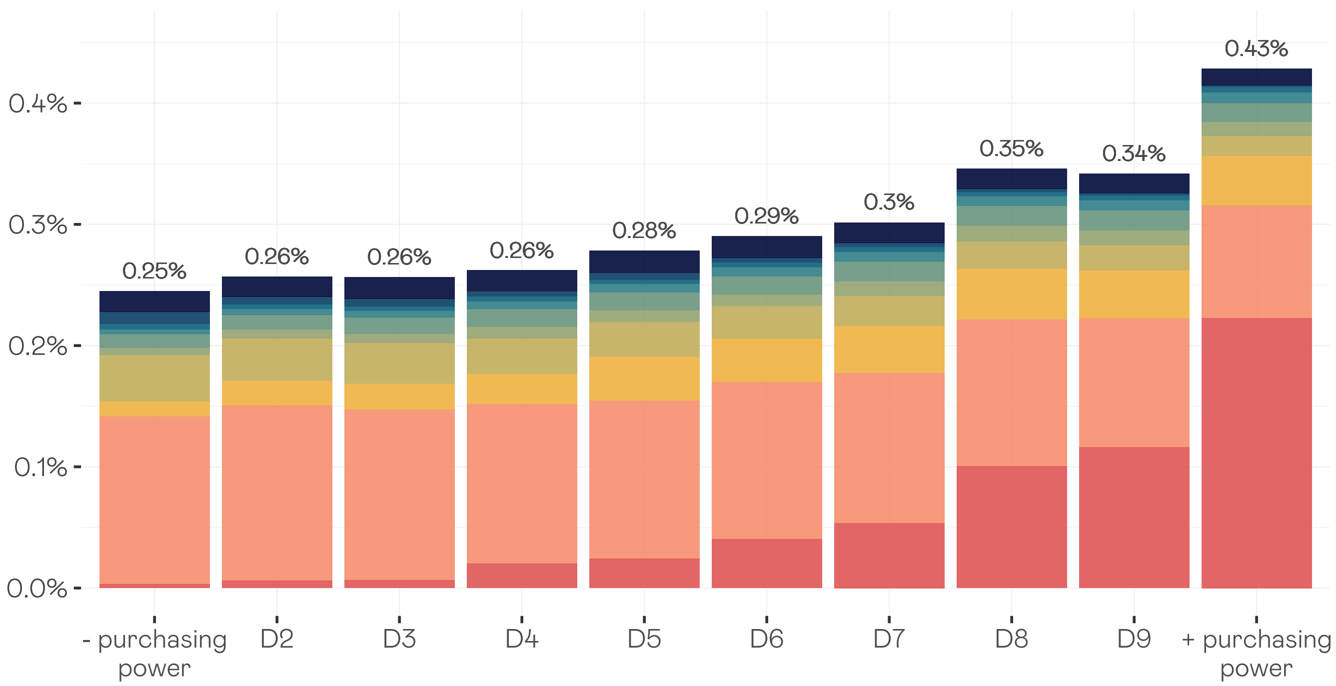
Source: Own elaboration based on data from EPF I EsadeEcPol

However, the simple fact that households with greater economic capacity bear a greater additional cost derived from the CBAM tells us little about the final redistributive impact of the CBAM, since, given the inequality in household spending, it would be expected that those with greater spending would bear a greater additional cost in absolute terms. To provide a more adequate picture of its distributional impact, we calculate the percentage of the additional cost derived from the CBAM over total household expenditure, again by deciles of equivalent expenditure. It should be borne in mind that, if this exercise were replicated with household income, which unfortunately we do not have, it is very likely that the result would have a more negative redistributive impact than that obtained using the distribution of equivalent expenditure, essentially because of the differences in savings rates along the income distribution.

The following graph shows the weight of the extra spending derived from the CBAM by deciles of equivalent spending, again disaggregated into the twelve major spending groups of the ECOICOP. As expected, we observe a much lower slope with respect to the previous graph, but which continues to present an increasing path from the fourth decile onwards, again, explained in its entirety by the growing weight of transportation. It is worth noting that, in relative terms, the increase in spending associated with CBAM does not reach 0.5% of total household spending even among the 10% of households with the greatest economic capacity, and is less than 0.3% among the 50% of less well-off households.

Figure 8. **Estimate of additional expenditures (in %) that the new CO_2 tax on imports will entail for Spanish households by purchasing power level**

Transport, Furniture and household, Health, Food and drink, Leisure, Clothing, Catering, Housing and supplies, Alcohol and tobacco & Other



Source: Own elaboration based on data from EPF I EsadeEcPol

In recent years, the effect of environmental taxation on households in rural areas has deserved special attention[6]. To combine this urban/rural perspective without losing sight of the effect of the household's economic capacity, we show the above graphs in three broad categories according to the population density in the municipality where the household lives..

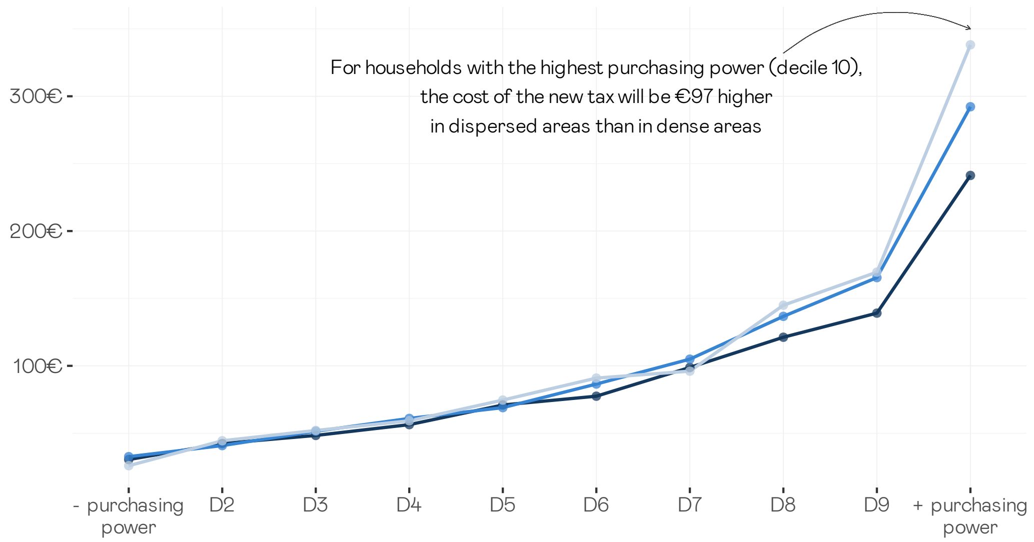
In the first graph we can see that the additional cost associated with the CBAM hardly changes between densely populated areas and scattered areas in the first seven income deciles, but that

6 See for example the simulations conducted in Comité de personas expertas (2022) on the increased impact of equalizing diesel and motor gasoline taxation on rural households.

a gap is formed from the eighth decile onwards due to a higher cost between intermediate and scattered areas. The largest gap in absolute terms occurs among the 10% of households with the greatest economic capacity, where there is a maximum in households in scattered areas with a cost associated with the CBAM of €340 per household, while in urban areas it barely reaches €250. In Figure 10, we can see the same graph expressed as a percentage of total household expenditure, where the same gap can be seen from the eighth decile onwards.

Figure 9. **Cost associated with the new CO_2 tax by purchasing power level and population density**

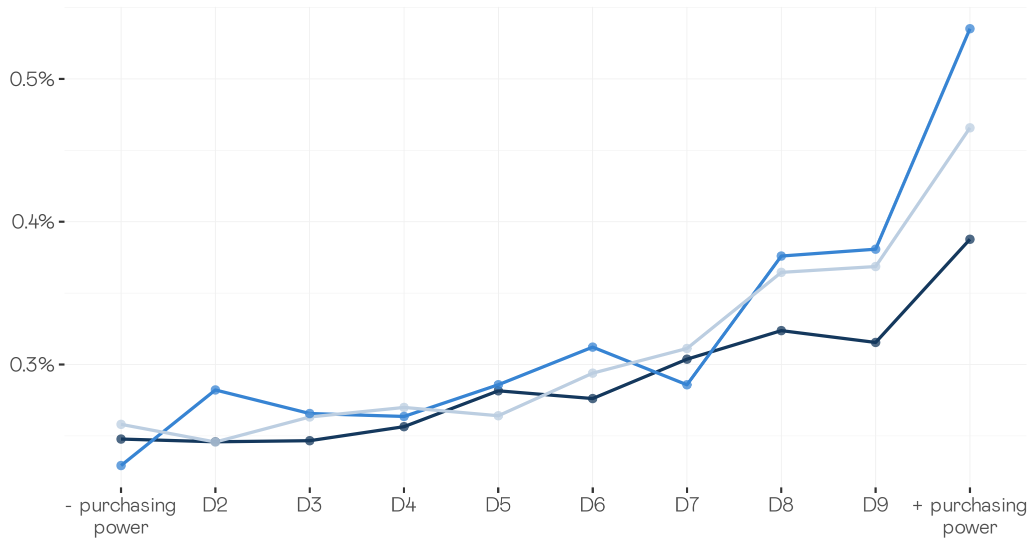
Densely populated, intermediate and dispersed area



Source: Own elaboration based on data from EPF I EsadeEcPol

Figure 10. **Costs associated (in %) with the new CO_2 tax by purchasing power level and population density**

Densely populated, intermediate and dispersed area

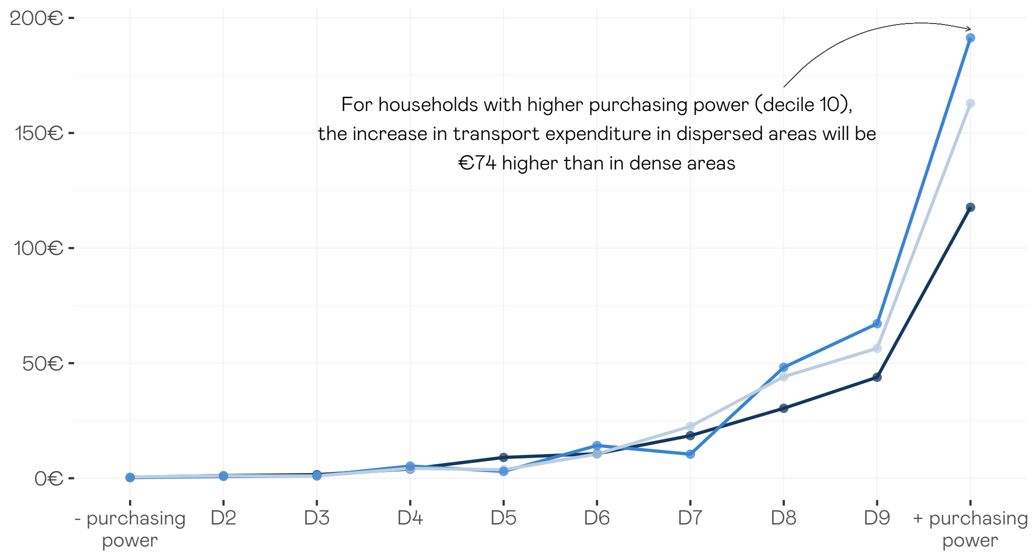


Source: Own elaboration based on data from EPF I EsadeEcPol

This urban/rural gap between high-income households can be explained in its entirety by the increase in spending associated with transportation, essentially through the higher cost of purchasing vehicles. This can be seen in the following graph, which replicates the previous one for the CBAM cost overrun associated with transportation. In this case, of the €100 urban/rural gap between the 10% of households with the greatest economic capacity, nearly three quarters would be explained by the increase in transportation spending. This, in turn, can be explained by the greater weight of transportation spending by high-income rural households relative to their urban counterparts.

Figure 11. **Increase in transportation spending associated with the new CO_2 tax by purchasing power level and population density**

Densely populated, intermediate and dispersed area

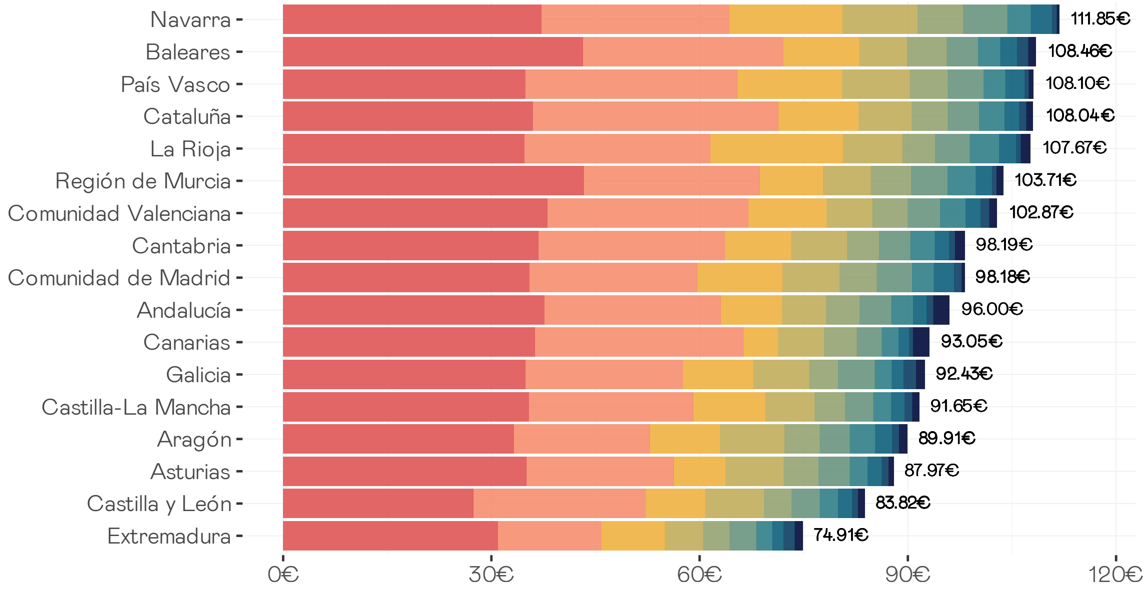


Source: Own elaboration based on data from EPF I EsadeEcPol

Additionally, from a more aggregate perspective, we can analyze which regions within Spain may be more affected, regardless of whether this greater or lesser effect of the CBAM can be explained by differences in the characteristics of the households living in the different regions. The following graph shows the total cost of the CBAM by Autonomous Region, broken down into the different ECOICOP expenditure groups defined above.

As might be expected from the previous graphs, the richer ACs have a higher average cost, although the differences between regions are much less marked than those observed by income. The region with the lowest average cost would be Extremadura, with around €75 per household, while the one with the highest extra expenditure for the CBAM would be Navarre, with €110. Although there is a strong relationship between the income of the Autonomous Region and the extra cost associated with the CBAM, there are some notable exceptions, such as the case of Madrid, which, despite being one of the richest regions in Spain, has a relatively low extra cost of around €100. This is explained, once again, by the difference attributable to spending on transport, which in Madrid does not exceed €25 per household per year, which can be understood by the fact that it is such a densely populated region, with extensive public transport networks, making it relatively less relevant to have a private vehicle for mobility.

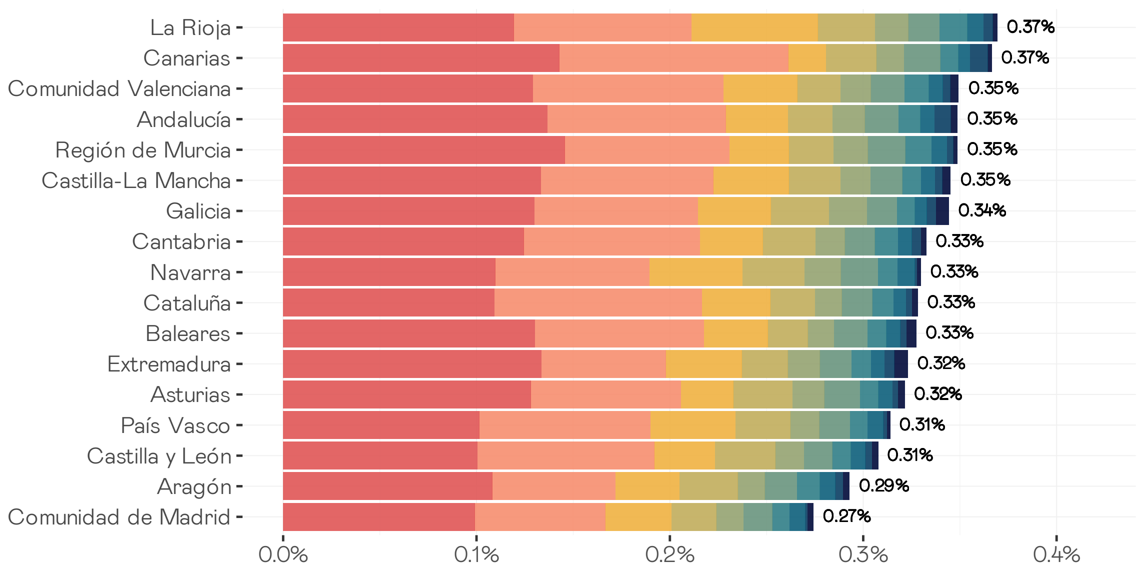
Figure 12. **Cost associated with the new CO_2 tax per autonomy and concept**
Furniture, Transport, Health, Food and beverages, Other, Clothing, Leisure, Catering, Alcohol and tobacco & Housing and utilities



Source: Own elaboration based on data from EPF I EsadeEcPol

When we replicate the previous graph as a percentage of total household expenditure the picture changes substantially, as expected, and it is the wealthier regions that are in the middle/lower part of the distribution, while regions with a higher percentage of households with lower economic capacity, such as the Canary Islands, Andalusia and Castile-La Mancha are now in the upper part. In relative terms the differences between regions are even smaller than those observed in the previous graph, which confirms the relatively marginal role played by the region of residence in determining the distributional impact of the CBAM compared to other variables such as income or population density.

Figure 13. **Cost associated (in %) with the new CO_2 tax per autonomy and concept**
Furniture, Transport, Health, Food and beverages, Other, Clothing, Leisure, Catering, Alcohol and tobacco & Housing and utilities



Source: Own elaboration based on data from EPF I EsadeEcPol

Conclusions

The entry into force of the European carbon border adjustment mechanism (CBAM) may lead to an increase, substantial in some cases, in the prices that European consumers pay for certain basic materials, and indirectly, for the rest of the products that include or require these materials as inputs.

This will, on the one hand, contribute to the decarbonization of European industry, by passing on the carbon price signal to industry and consumers, and will also send an emissions reduction signal to foreign producers, who will have to pay for importing carbon-embedded materials into Europe. But it may also affect the competitiveness of the European economy in international markets (where European producers would be penalized), and even competitiveness in European markets if the CBAM fails to correctly tax emissions from imported products.

In this study, we have made a first assessment of the foreseeable effects of the CBAM, both on the competitiveness of the economic sectors concerned and on the household shopping basket. The results show that, in the manufacturing sector, final products would generally suffer price increases of less than 7-8%, although some products, such as agricultural machinery, could see their costs rise by up to 20%. The sectors most exposed to international markets, such as the automotive industry, machinery, metallurgy, non-metallic minerals and the chemical industry, would be the most affected by the CBAM, with an aggregate impact of more than 2,500 million euros. Exports in the automotive sector would experience price increases of less than 2-3%, but there are subsectors where the Spanish industry is a leader, such as components based on steel, aluminum or plastic, which could face increases of up to 40%.

In the agri-food sector, another of the leading sectors of our international trade, the consequences of the increase in the cost of fertilizers would be more moderate, with price increases of less than 1% for most products.

As for the impact on households, it is moderate, with spending increases of between 0.25 and 0.45%. However, the effect is very asymmetric, with significant differences in the baskets according to the type of household; it is also slightly progressive. Thus, households with higher income suffer more from the increase in transportation goods, while those with lower income owe their higher expenditure to food and furniture and equipment. The higher expenditure on transport of higher income households also explains the rural gap: in scattered areas, higher income households suffer a greater increase in expenditure. By autonomous communities, the richest ones show a greater impact, although the differences between regions are much less pronounced than those observed by income.

It is convenient to consider when interpreting these results that, as noted above, our approach does not start from the connections between sectors in the purchase and sale of intermediate goods. This would require identifying step-by-step the value chain of each good and how that ultimately works out for consumers, with similar approaches transposed to this problem as those implemented by Basso, Jaimes and Rachedi (2022) or Basso, Dimakou and Pidkuyko (2023), something that we see as a promising avenue that would enrich the present analysis in future research, especially at the more academic level.

In any case, we see that the introduction of CBAM has the potential to affect primarily the earlier stages of value chains, and also some sectors that are highly dependent on international markets. It will be in these areas that targeted measures will have to be deployed, aimed at improving their competitiveness through access to cost-competitive decarbonized technologies. However, these limited impacts will depend on the proper functioning of the CBAM, and also on the evolution of international climate and trade policy. In this regard, it will be essential to closely monitor the functioning of the CBAM to prevent importers from circumventing the penalty for embedded emissions (for example, by sending their cleaner products to Europe without changing their total emissions). And it will also be necessary to move towards a more internationally coordinated climate policy (including carbon clubs) that minimizes the loss of competitiveness of producers subject to a carbon price.

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