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The impact of the carbon border adjustment on industrial competitiveness

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EXECUTIVE SUMMARY

The European Union is working to establish a carbon border adjustment mechanism (CBAM), so that imported products pay the same price as that now paid by European producers through the existing emission rights trading system (EU ETS). The objective is to level the playing field between local producers and foreign producers that export to the EU, levelling up the cost associated with emissions. However, the risk is that this could reduce the competitiveness of European exports in international markets by increasing their costs, as well as driving up domestic prices by eliminating free allowances and taxing imported goods. In this insight, we make a first evaluation of the impact that the approval of this mechanism could have on Spain.

Following the introduction of the CBAM, these cost increases are not symmetrically distributed across the different categories of goods. To be specific:

- → Basic products are the most affected. As you move along the value chain, the price increases resulting from the rise in costs gradually fall.
- → The products with the biggest price increases are those with the highest metal, plastic or cement content.

Furthermore, the CBAM will have a greater impact on those production sectors that are more exposed to international markets, such as the car sector, the machinery sector, metallurgy, non-metallic minerals and plastic:

- → Basic metals and the car sector would be affected most, with an aggregate impact of more than €2,500M.
- → Prices of exports associated with the car sector would go up by less than 2-3%, but there are some subsectors in which Spanish industry is the leader, such as steel, aluminium and plastic-based components, which may be subject to increases of up to 40%.
- → There are many export categories related with the construction sector in which prices may rise considerably. These same increases would occur in domestic consumption, for which this sector is even more important.

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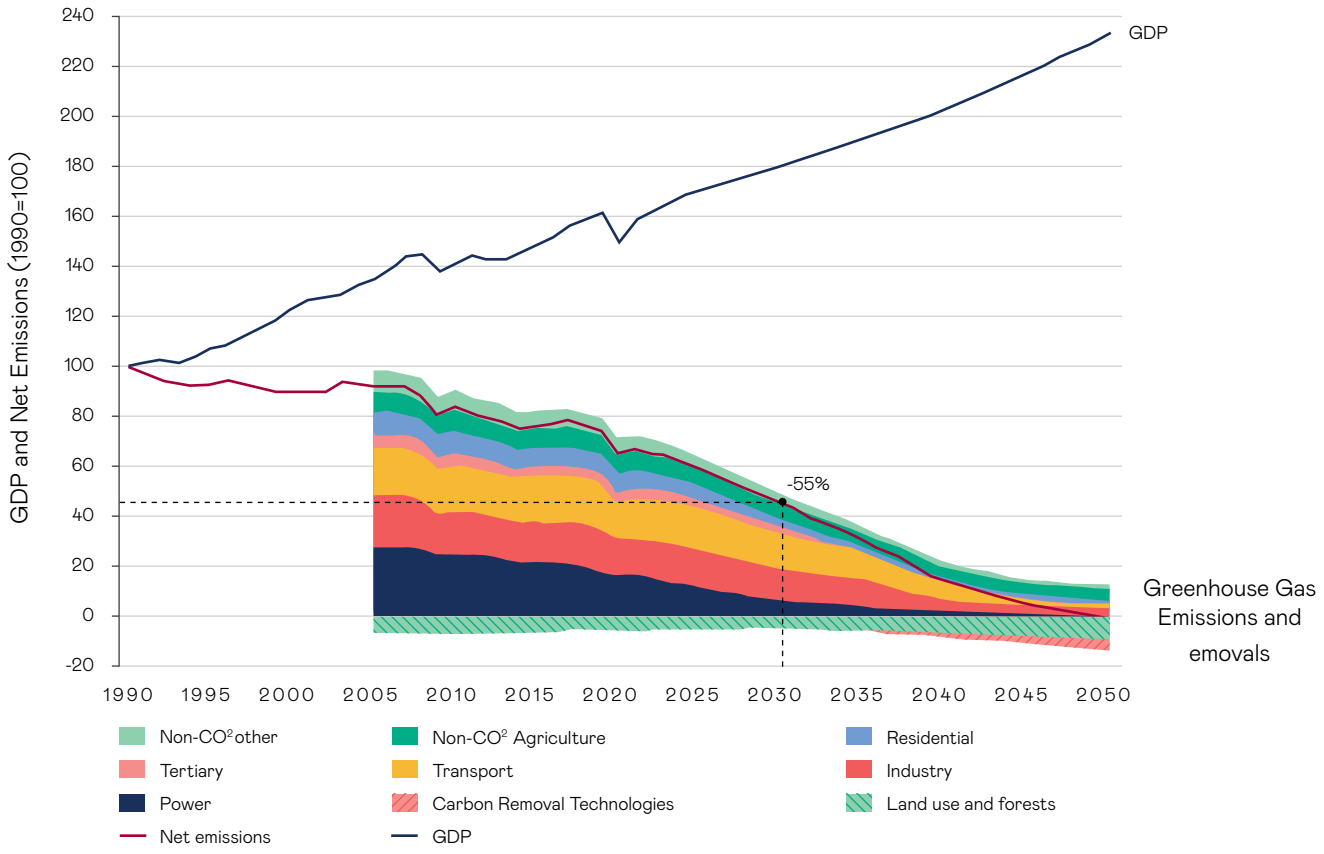
Bearing in mind that the European CBAM proposal only applies to basic materials, imported vehicles or components would automatically be more competitive than those produced in Spain. Moreover, this proposal does not exempt exports from paying a carbon price, which would also lead to a loss of competitiveness in the global market.

Thus, it would appear to be essential to make a careful analysis of the implications of these price increases in the sectors affected, with a view to either drawing up national measures to offset these negative effects, or to considering a reform of the current proposal; such a reform would involve levying a tax on all products imported, not only basic materials, in addition to exempting exports from paying the carbon price.

1. Introduction

The European Union is in the throes of an unstoppable process of decarbonising its economy, which should enable it to meet the international commitments to reduce emissions undertaken in the Paris Agreement. This process is outlined in various documents (European Climate Legislation, European Green Deal), in which the goal of achieving net zero emissions by 2050 is set out.

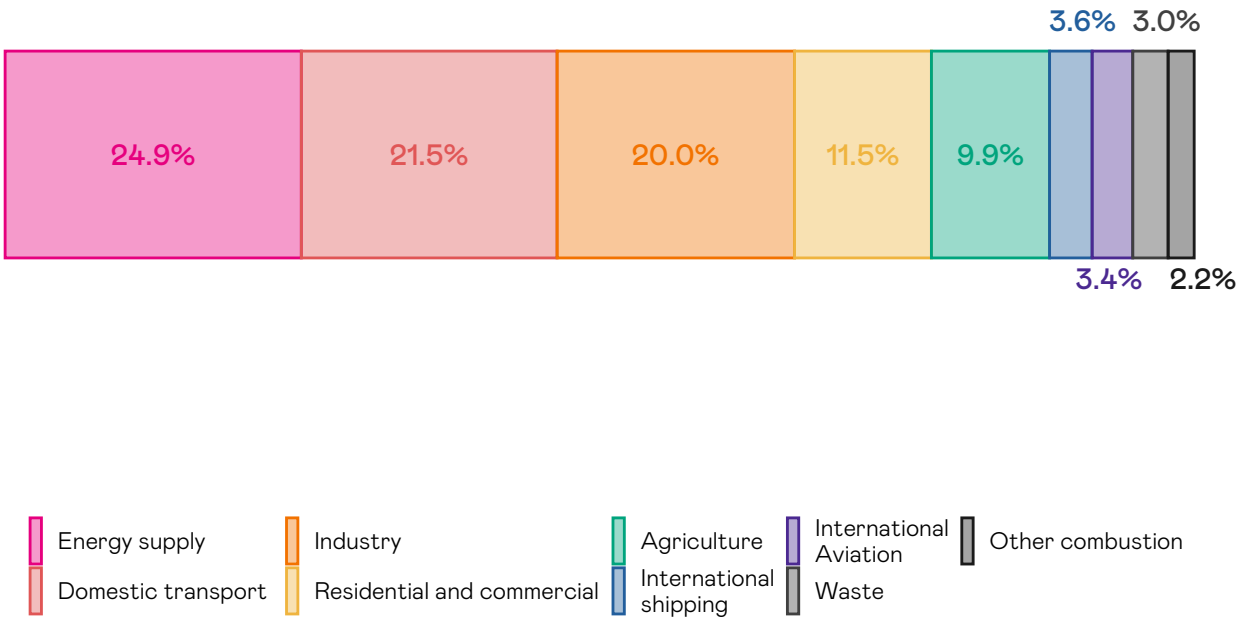
Figure 1.
Emission reduction path for the European Union to 2050



Source: Communication COM(2020) 562 final

To date, the European strategy to reduce emissions has rested on two pillars: on the one hand, the European emissions trading scheme (ETS), which regulates emissions from industrial and electricity generation plants; and on the other hand, the setting of indicative targets for Member States for "diffuse" sectors, not covered by the ETS, such as the residential sector or transport. This strategy has been supplemented by other high-impact policies, such as the promotion of renewable energies for electricity generation and energy efficiency regulations for transport or buildings. As Figure 2 shows, each of the aforementioned pillars covers approximately 50% of all European greenhouse gas emissions.

Figure 2.
Greenhouse gas (GHG) emissions in the European Union by sectors
Year 2019



Source: Data from the European Environment Agency | EsadeEcPol

The reduction of emissions in these sectors has been very uneven. Although the partial or total abandonment of coal and the massive penetration of renewable energies have led to a significant reduction in emissions from the electricity sector, the same cannot be said of the remaining sectors. In the case of industry, the main reason is the risk of carbon leakage.

Carbon leakage occurs when a price on greenhouse gas emissions is introduced in a region (such as the European Union) and the cost of products whose manufacture creates emissions increases with respect to other regions where this price has not been introduced. The result is that production is relocated to these regions, as they are now more competitive, and this production is accompanied by the associated emissions, which could even increase if the production processes in these regions are less "clean".

Although empirical evidence is not clear regarding the actual risk of carbon leakage, the European Union decided to establish a protection mechanism for the industrial sectors under threat: they would receive free emission rights, so they would not have to transfer the price of emissions to their costs. Although this free allowance does not cover the total emissions actually produced in every case, the product's

carbon price signal is very low.

And this is where the main problem with this mechanism lies: if the price signal transferred to the product is insignificant, the incentive to reduce emissions in the processes involved will also be insignificant. This was tolerable while the necessary reduction in emissions remained at a low level, and attainable with reductions in other sectors. But Europe's enhanced climate ambition, demonstrated in 2020 with the "Fit for 55" package, makes it unviable for this situation to continue.

Thus, this package recognises the need to recover the carbon price signal for industry, while seeking to minimise carbon leakage. The mechanism proposed for this purpose is a Carbon Border Adjustment Mechanism (CBAM), whereby products imported into Europe will have to pay the price of the ETS for the emissions embedded in them. Ideally, this mechanism would make it possible to phase out the free allowances, since European industries would not lose competitiveness with respect to imports (although European exports would become less competitive in international markets). In practice, the situation is not so simple: when this mechanism is introduced, it may not be so efficient (see the criticism of the European Commission's current proposal in Linares and Galindo [2021]).

At all events, the recovery of the carbon price signal for industrial products has a consequence that is sometimes forgotten, but which is highly relevant in the current environment of rising inflation: depending on the type of product, costs will increase, both for domestic production and for imported goods; and depending on how exports are regulated, these may also lose competitiveness. This cost increase will basically depend on the volume of CO_2 emissions (and their associated cost) in the cost balance of the product. Normally, the more manufactured the product is, and the greater its added value, the less of an issue this will be. On the other hand, in the case of basic materials like cement or steel, the carbon price may have a more significant impact. As for its impact on national economies, this will essentially depend on the composition of the consumption basket and the balance of trade.

Stede et al. (2021) have analysed the impact of the introduction of a CBAM in Europe. In our study, the analysis is focused on Spain, in order to evaluate the impact that the approval of the European proposal would have on our country. In particular, we analyse the impact that the CBAM could have on export sectors, since this is one of the most controversial aspects of the European proposal.

2. Data and methodology

In this section we outline the methodology used to evaluate the economic impact of the European Commission's proposal. This proposal presents the possibility of establishing a CBAM that affects cement, steel and aluminium. Given that this is likely to be extended to plastics, we also consider this material in our analysis. The aim is to calculate the potential increase in costs for manufacturers following the introduction of the CBAM and to pinpoint the sectors that would be most affected.

This process consists of several stages in which we use different databases. In the first of these, we calculate the carbon cost associated with each good after the introduction of the mechanism. The industrial production data has been obtained from PRODCOM, an annual survey that provides statistics about more than 4,000 goods and services of companies established in the European Union[1]. This includes data about the physical volume (in kg, m^3, number of items…), the monetary value of production sold, exports and imports for each product. In the analysis, we have taken data from 2019, the last pre-pandemic period. In order to consider the emissions that would be covered by the EU ETS in the production chain of each good, we use the emissions benchmark developed by Stede et al. (2021). These authors calculate the tonnes of CO2 emitted to obtain the basic materials (cement, aluminium, steel and plastic) based on the benchmarks established by the EU for industrial processes[2] and electricity[3] and the life cycle of the products, and they multiply these by the specific content of these materials in the goods recorded in PRODCOM. The result indicates the volume of emissions associated with the production of a specific good which, at present, are not subject to a carbon price, since free allowances are received. With the CBAM, producers will face an extra charge: they will have to acquire permits for these emissions at the carbon market price. In this way, we obtain the carbon cost of each product in euros per tonne by multiplying the emissions benchmark by the carbon price.

The next step is to estimate the cost increase resulting from this new cost. For this calculation, we use the data about production, assuming that its price and that of imports is similar, and that after the introduction of the CBAM, the increase in costs will affect both items in a similar way. In line with Stede et al. (2021), we assume that producers totally transfer the carbon costs and that, as a result, the composition and weight of the goods does not change. We also assume that the increase in costs is transferred to exports through production. In this way, the price increase will be the result of dividing the carbon cost described in the previous paragraph by the unit price of each good, obtained by

1 To be specific, the survey covers three branches of activity in the Spanish National Classification of Economic Activities (CNAE): extractive industries (section B), manufacturing industry (section C) and materials recovery (section E). The target population are the companies that cover at least 90% of national production for each CNAE class and which employ at least 20 people. The products have an 8-digit code in which the first four digits refer to the CNAE branch and the remaining digits to sub-categories in the Classification of Products by Activity (CPA).

2 COMMISSION DELEGATED REGULATION (EU) 2019/331 of 19 December 2018 determining transitional Union-wide rules for harmonised free allocation of emission allowances

3 EU-ETS 2012/C 158/04 y EU-ETS 2012/C 387/06

dividing the physical volume by the production value recorded in PRODCOM. In summary, the formula we can use to deduce the price change of manufactured goods is the following:

$$\Delta Price = \frac{Carbon\ cost\ of\ each\ good}{Unit\ price} = : \frac{Carbon\ price * Emissions\ benchmark * Material\ content}{Unit\ price}$$

Before proceeding to present the results, it is worth mentioning some limitations due to the nature of the data.

First, in Stede et al. (2021), estimations are made for the whole of the European Union, and so the indicators of production, imports and exports reflect the aggregate of the Member States. However, when we come down to the national level, we find that of the nearly 4,500 products included in the database, 50% of these do not have production data, either because the data is confidential (20%), or because there really is no production, or because the data is not recorded, since it represents less than 1% of the total for the EU. Thus, the sample of products is substantially reduced. On the other hand, it is more representative: for the EU as a whole, the analysis shows a certain bias, for although there is production for all the commodities, there are considerable regional differences, and consequently the results cannot be extrapolated to each Member State.

Secondly, the emissions benchmark is generally smaller than the carbon footprint calculated by product life cycle assessment. This is because Stede et al. (2021) simplify the value chain of the various goods and because the EU ETS emission benchmarks represent the 10% most efficient installations, not industrial averages. In this respect, our emission estimations are a lower limit of the actual emissions.

3. Results

3.1. Impact of the CBAM on prices by product category

PRODCOM includes data about various types of products, from pure materials such as cement clinker, to end products such as cars, and so it is useful to draw a distinction between the impact on each type of product. For this purpose, we follow the classification used by Stede et al. (2021), in which the different goods are grouped into four categories:

1. **Pure basic materials.** Composed of either a (technically pure) substance or a mixture of substances in a physical form that can be sold and transported, such as gaseous (hydrogen, ethylene, etc.), liquid (gasoline) or solid (cement clinker, metal ingots, etc.).

2. **Basic material products.** Products which consist of one single basic material, and which are often produced in a process coupled and performed in the same installation as the basic material production. Examples are bricks, ceramic tiles and glass bottles.

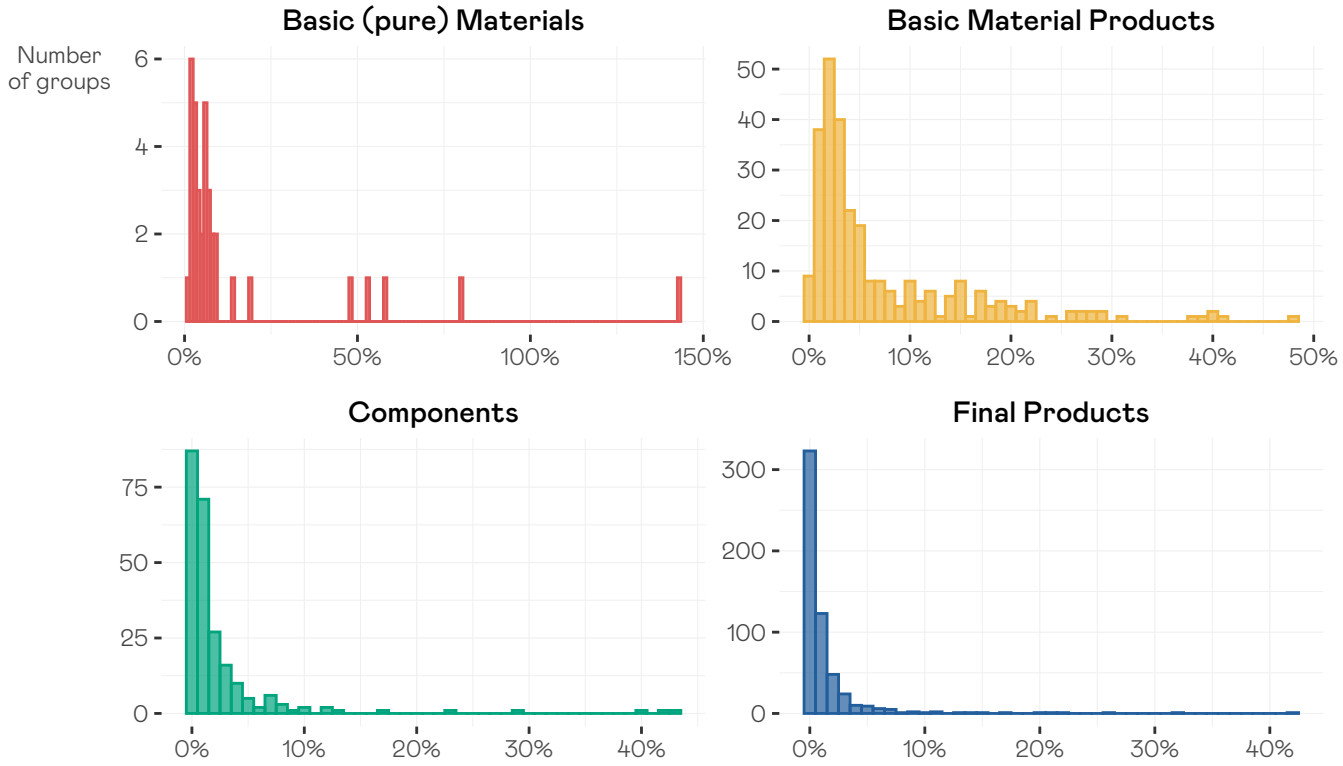
3. **Components.** Products made of more than one basic material or basic material product, which require additional manufacturing processes. They are not intended for end consumers, but are manufactured into final products. Examples in this group are car wheels and wood fibreboards.

4. **Final products.** Products composed of components and/or several basic materials or products derived from basic materials. They are not intended for end consumers. This group includes a great variety of goods, from mobile phones and televisions to simpler commodities such as blankets and clothing.

In principle, and given the structure of the CBAM proposed, the logical outcome would be for price increases to be greater for basic materials, and for these increases to fall as we move along the production chain.

The analysis has been made for two hypothetical carbon prices: €80/tCO_2, similar to the current values in the European market, and €30/tCO2 (considered to be the most likely value before the increase in summer 2021, and the value with which Stede et al. (2021) make their estimations). Below are the results for €80/tCO_2. The values for €30/tCO_2 can be consulted in the Appendix. These values are in line with those of Stede et al. (2021).

Figure 3.
Distribution of price increases by product category for a carbon price of €80/t



Source: Own elaboration based on data from PRODOCOM and Stede et al (2021) | EsadeEcPol

Figure 3 confirms our initial intuition. **The most basic products are subject to the most significant price increases:** up to 150% in the case of cement clinker, 80% in the case of Portland cement, and 50% for steel or aluminium ingots. In the case of plastics, increases are less, between 10% and 20%.

As you move along the value chain, the price increases become smaller. There are still a large number of categories of products made with basic materials, such as concrete, or steel or aluminium parts, that show price increases of between 10% and 50%. In the case of components, the biggest price increases correspond to car gearboxes and suspensions (increases of up to 40%), and electric motors (30%).

Final products would be prone to smaller price increases, generally below 7-8%, although prices of agricultural and industrial machinery could rise by more than 20%. **The price increase will be proportional to the metal, plastic or cement content.**

At all events, of the approximately 1,100 CNAE categories considered, around 400 would show price increases of more than 2%.

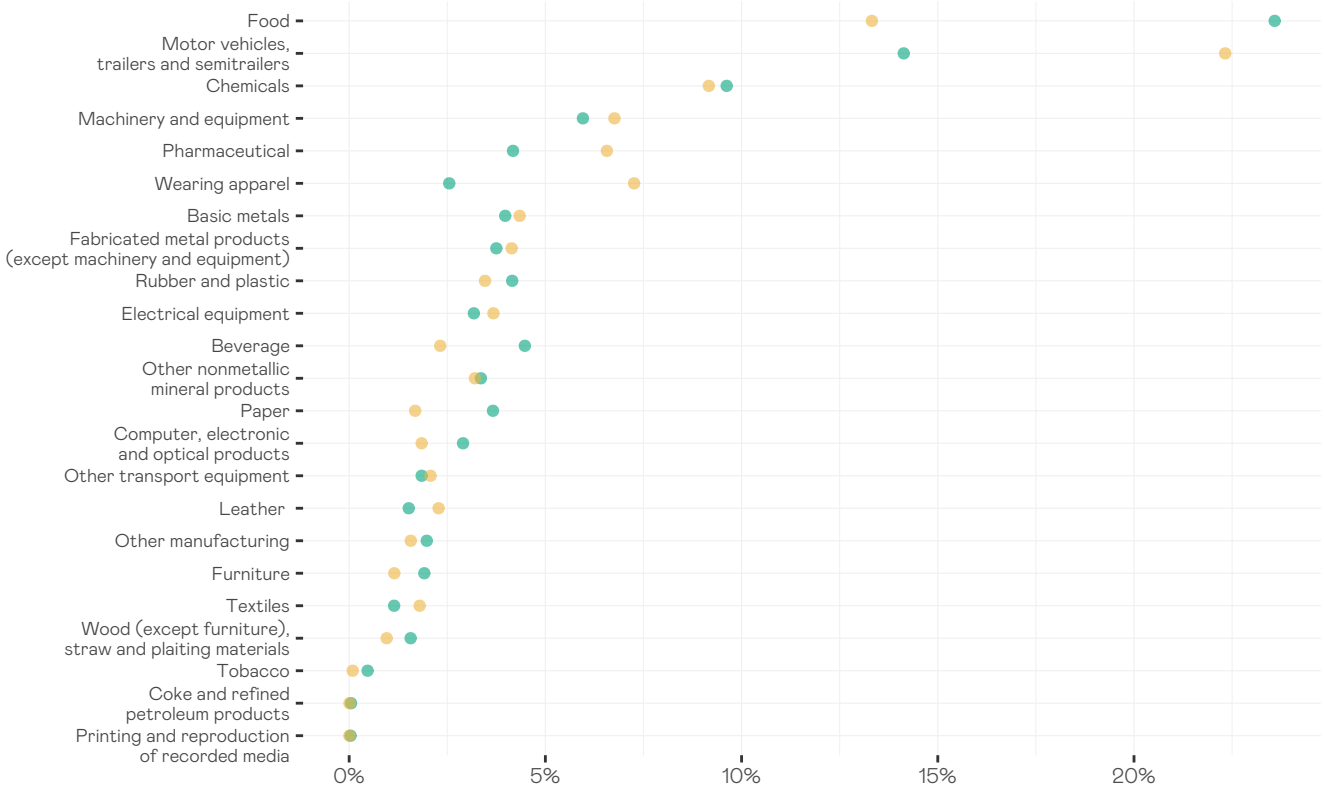
3.2. Impact of the CBAM by sectors

In the previous section, we have observed that **cost increases due to the introduction of the CBAM are uneven:** cement, steel or plastic derived products show higher increases. Thus, there is a need to identify **the sectors that may be most affected by the introduction of this measure,** and, given the non-exemption of exports, **the sectors that may suffer the greatest loss of competitiveness** in the global environment.

Therefore, in this section we analyse the exposure to international markets of the various Spanish production sectors, prior to assessing the possible impact on these sectors of the introduction of the CBAM. Finally, we study two sectors of strategic importance to the Spanish economy in greater detail: the car sector and the construction sector.

With regard to exposure to international markets, the figure below shows that there are some sectors such as the car and the food sector that account for more than 30% of the total value of Spanish manufacturing exports. The chemical sector and metallurgy are also important in this respect. Nevertheless, other sectors that are also important for exports, such as the textile sector, will be less affected by the CBAM.

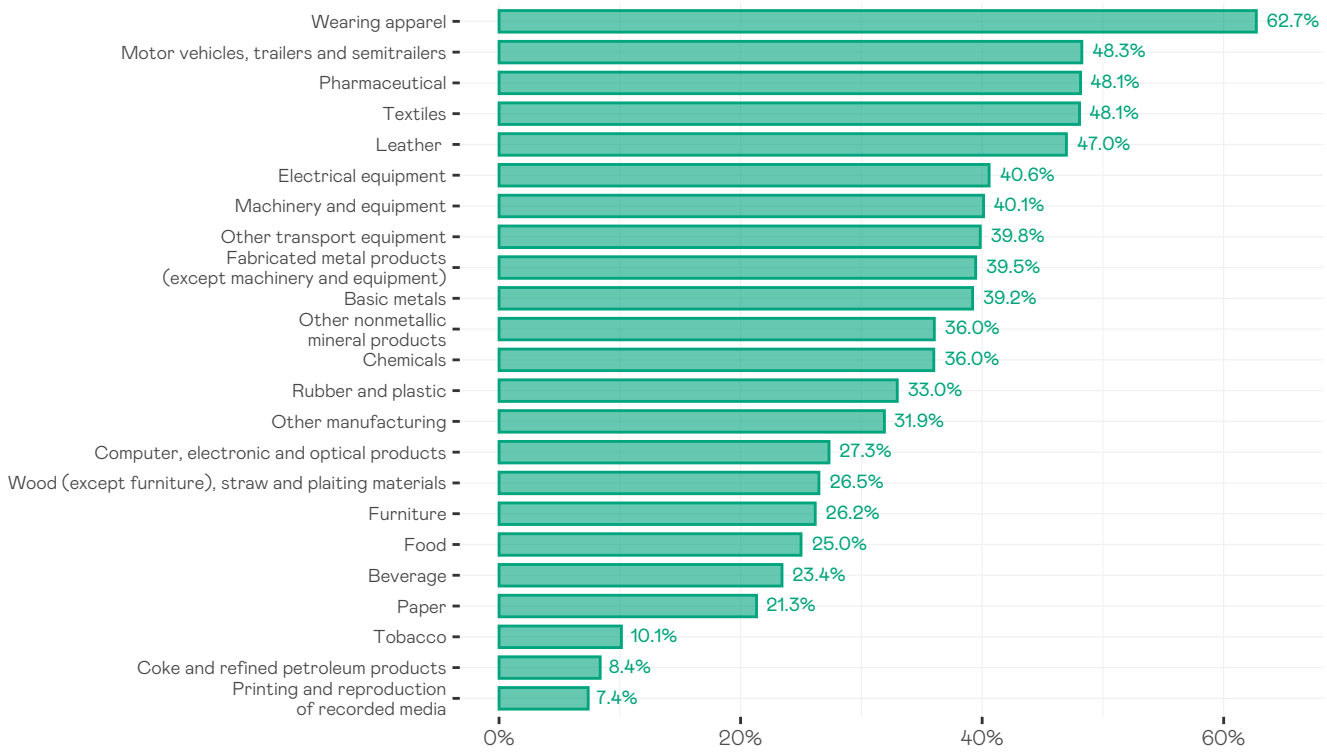
Figure 4.
Importance of the various manufactured goods groups to domestic consumption and exports



Source: Own elaboration based on data from PRODCOM (2019) | EsadeEcPol

It is also interesting to compare the sectors in terms of their exposure to the international market. This comparison can be found in Figure 5, which shows exports as a percentage of domestic consumption (production + imports). In this case, we may observe that the most export oriented sectors are the textile sector, once again, but also the car and the machinery sectors (affected by the introduction of the CBAM due to steel), metallurgy and non-metallic minerals (in which steel is included). Exports also play a very important role in the plastics sector. Potentially, these would be the sectors most adversely affected by the introduction of the European proposal for the CBAM, since their price increases would lead to a loss of international competitiveness.

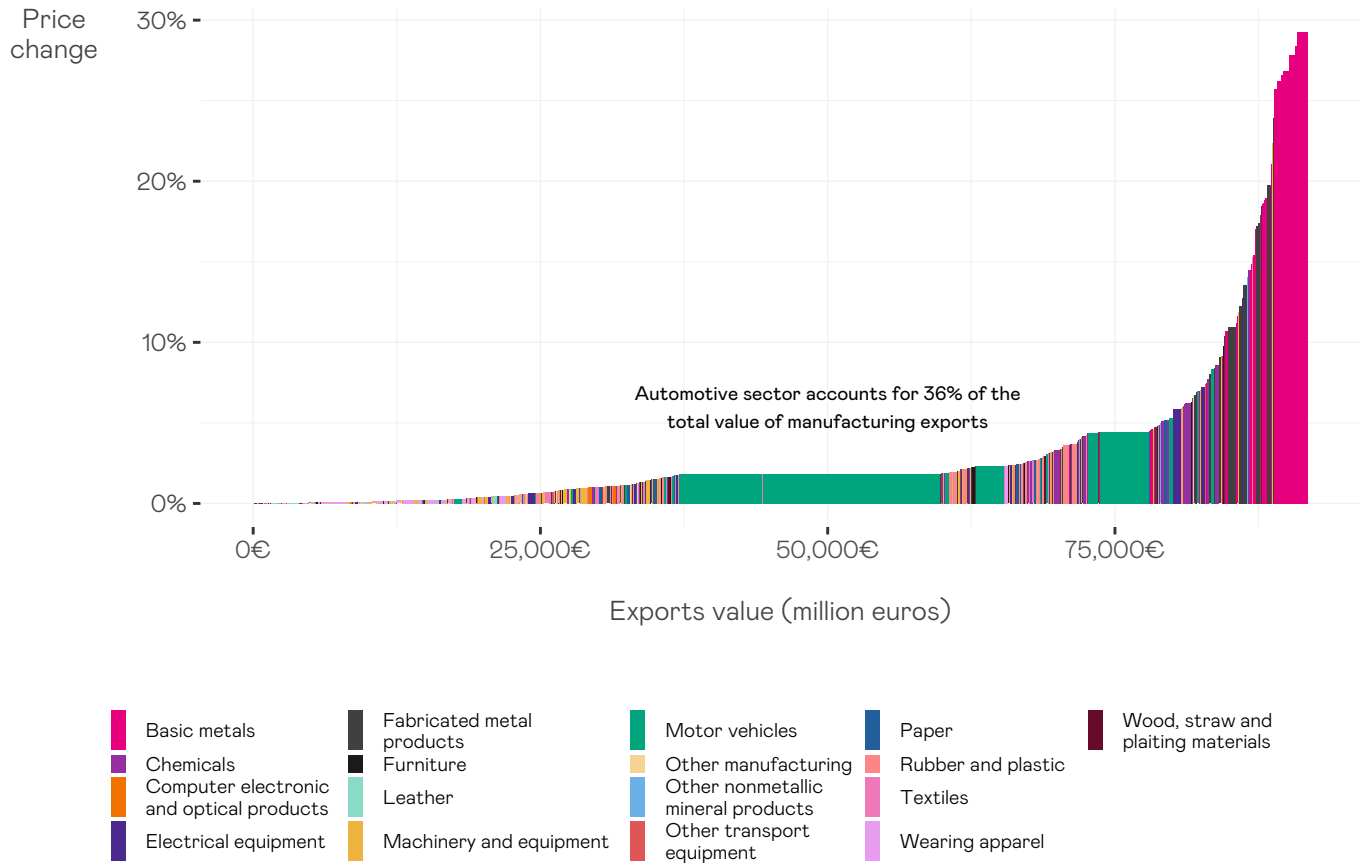
Figure 5.
Exports as a percentage of total production and imports by manufactured goods groups



Source: Own elaboration based on data from PRODCOM (2019) | EsadeEcPol

What will be the potential impact on these sectors after the introduction of the mechanism? In Figure 6, we show the volume of exports that could be affected by the CBAM, in addition to the potential price increases in exports. As may be observed, the car sector represents 36% of the total value of manufactured goods exports; there is also a large volume of exports linked with metals such as aluminium, which could become significantly more expensive. In total, there are exports with a value of more than 100,000 million euros that could be affected by price increases, although the increase would not be significant in all cases.

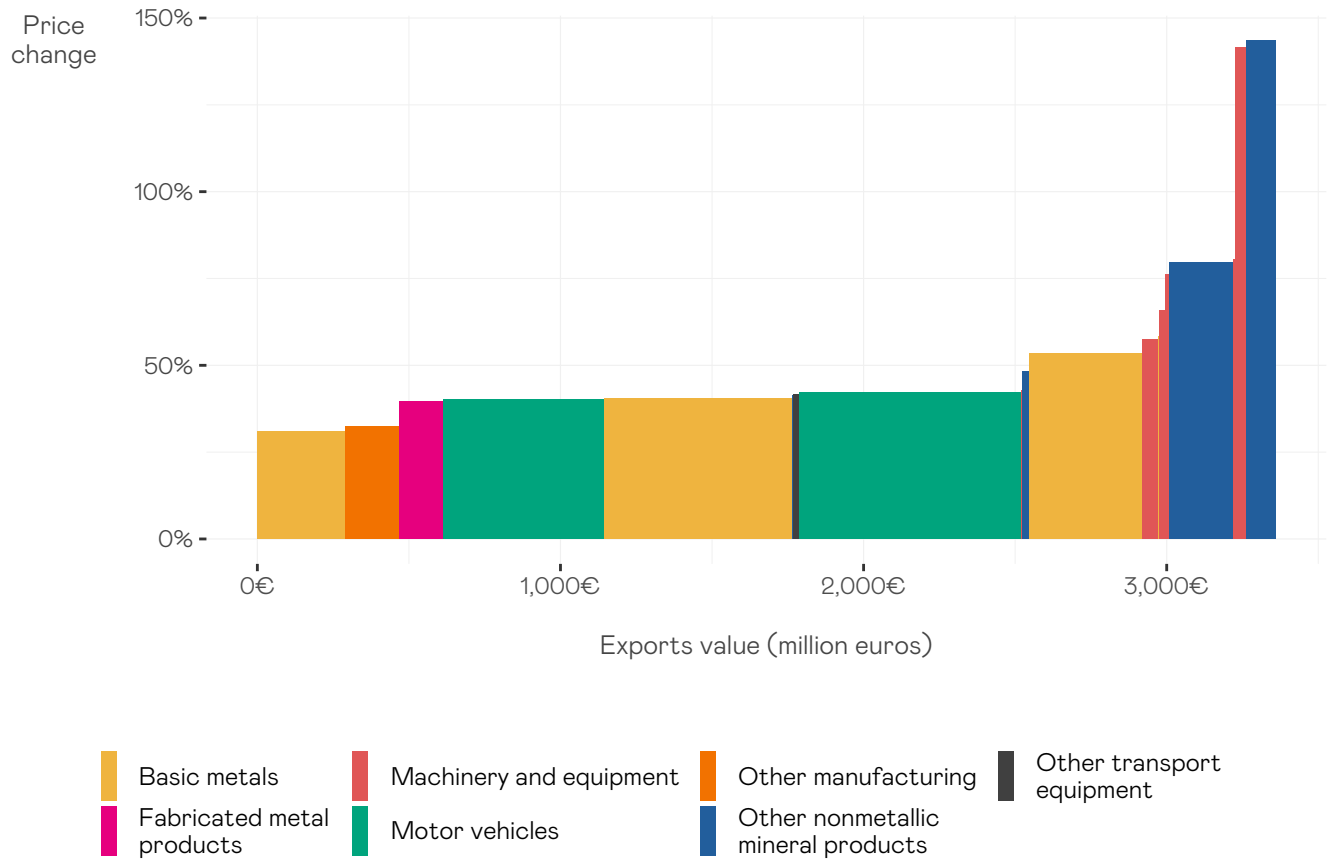
Figure 6.
Distribution of price increases by manufactured goods groups and importance of the foreign sector



Source: Own elaboration based on data from PRODCOM and Stede et al (2021) | EsadeEcPol

The next figure shows the outliers, that is to say, sectors that are less representative in terms of export volume, but much more affected in terms of price: there are exports with a value of more than 3,000 million euros that could be endangered by price increases of 50% or more.

Figure 7.
Distribution of price increases by manufactured goods groups and importance of the foreign sector for outliers



Source: Own elaboration based on data from PRODCOM and Stede et al (2021) | EsadeEcPol

Finally, Table 1 shows the cost increase that the CBAM could trigger for exports from different sectors: basic metals and the car sector would be affected most, with an aggregate impact of more than €2,500M.

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

3.2.1. THE CASE OF CONSTRUCTION

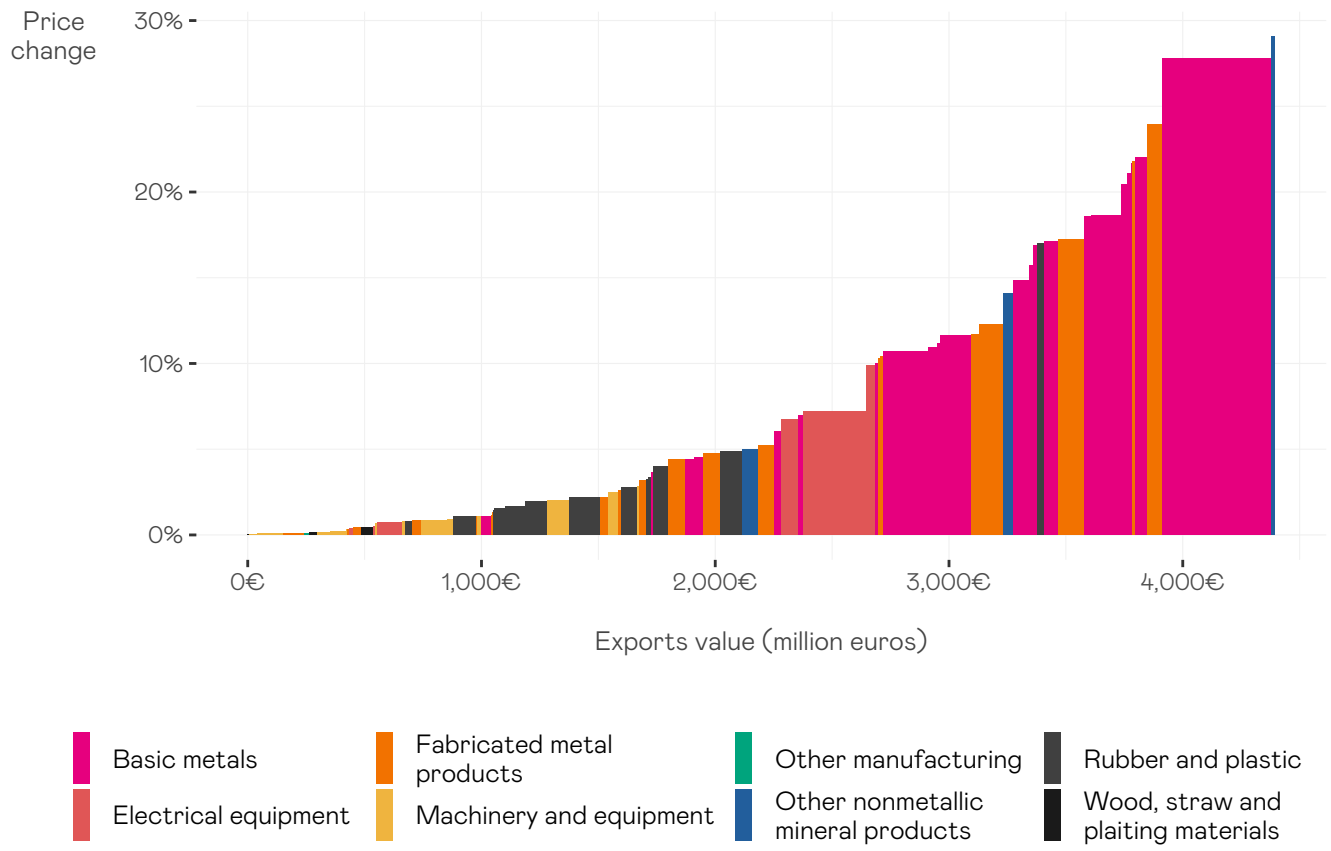
Traditionally, the construction sector has been very important for the Spanish economy. In 2019, this sector represented 6% of the gross value added of the economy. Although this is far from the 12% recorded in the years of the real estate boom, this figure remains above the average of 5.4% for the European Union.

To deduce the potential effect of the mechanism, given that PRODCOM only compiles data about manufactured goods, an index has been created of products that are used in this sector, such as cement, bricks, doors, windows, ceramic, glass and pipes.

In the figures below, there are many export categories related with the construction sector in which prices may rise considerably. These same increases would also occur in domestic consumption, for which the construction sector as a whole is even more important.

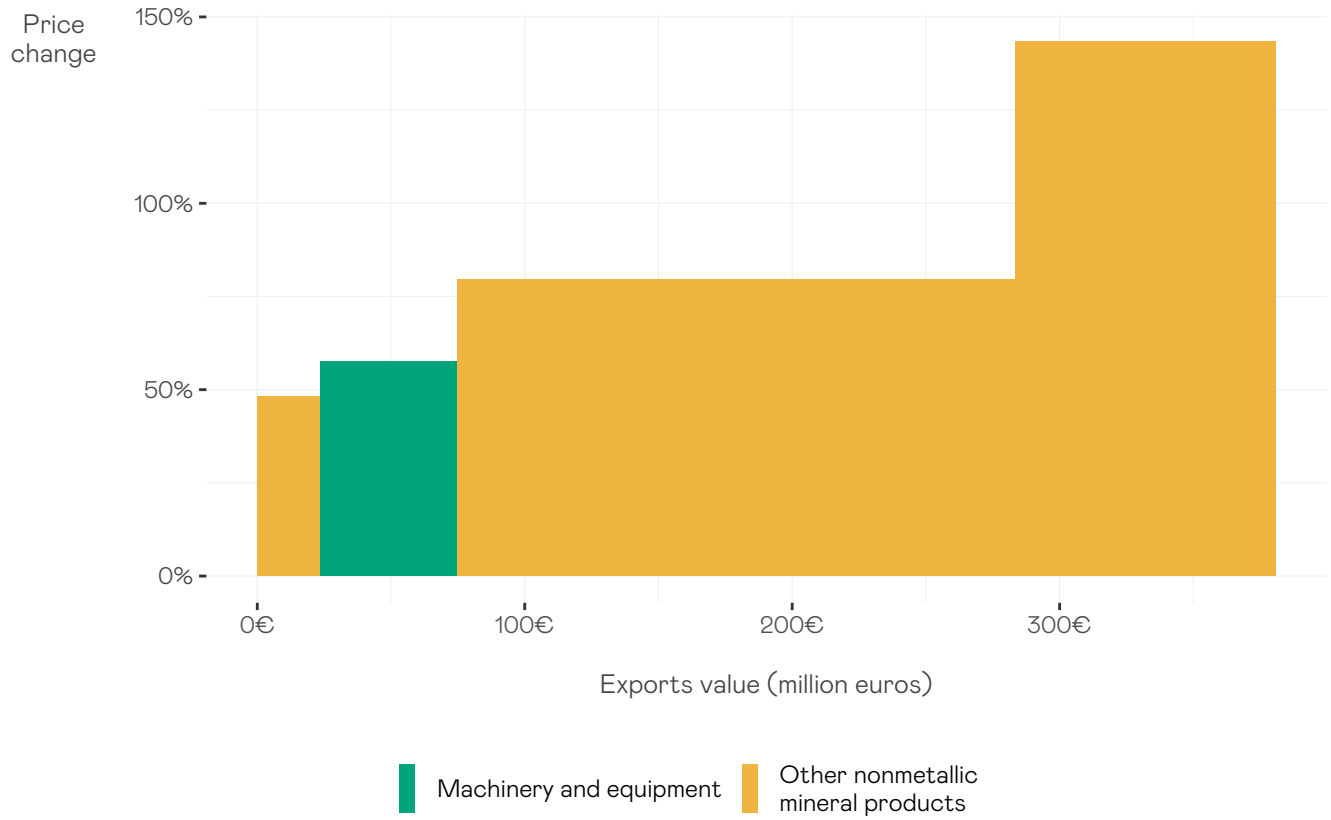
Nevertheless, it is worth remembering that the CBAM proposal does not include important export oriented sectors such as the ceramics sector.

Figure 8.
Distribution of price increases for construction and importance of its imports



Source: Own elaboration based on data from PRODCOM and Stede et al (2021) | EsadeEcPol

Figure 9.
Distribution of price increases for construction and importance of its exports for outliers

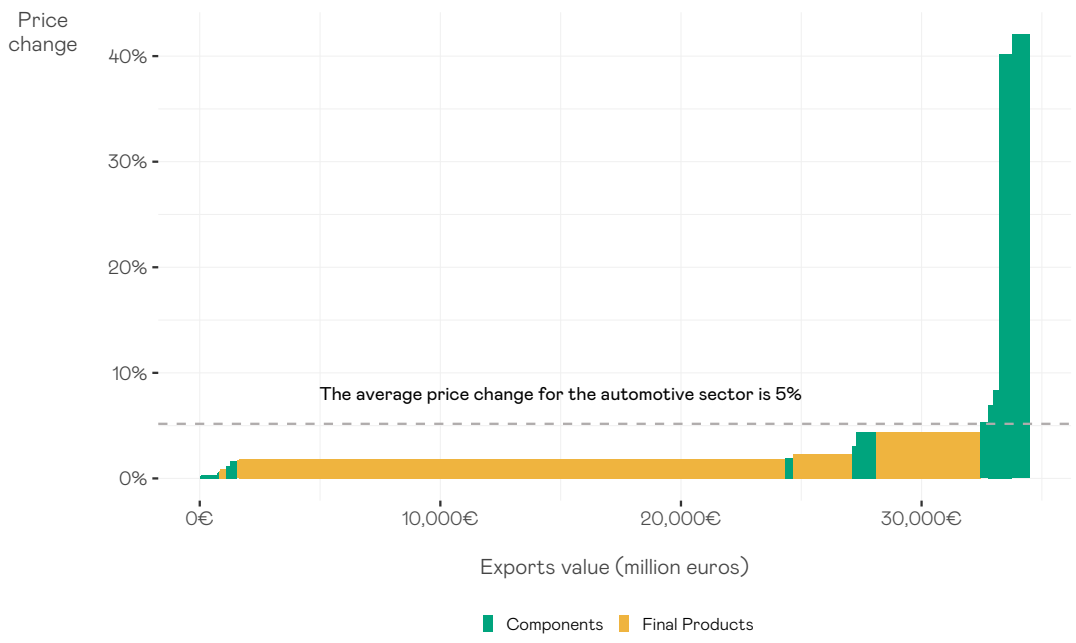


Source: Own elaboration based on data from PRODCOM and Stede et al (2021) | EsadeEcPol

3.2.2. THE CAR SECTOR

We mentioned earlier that the car sector accounts for 36% of manufactured goods exports, and therefore it is extremely vulnerable to a possible loss of competitiveness following the introduction of the CBAM. In the figure below, we may observe that a large proportion of exports associated with this sector would experience small price increases of less than 2-3%, but there are some subsectors, such as steel, aluminium and plastic-based components, which may be subject to increases of up to 40%. It should be borne in mind that Spain leads the car component industry, which could clearly be affected by the CBAM.

Figure 10.
Distribution of price increases for the car sector and importance of its exports



Source: Own elaboration based on data from PRODCOM and Stede et al (2021) | EsadeEcPol

In the figure below, we break down the increase in costs of some of the sector's components and final products according to their inductor (steel, aluminium or plastic). We may observe that metals are mainly responsible for an increase in costs, which may rise to 4% in the case of diesel vehicles and trailers, and to as much as 40% in the case of suspension systems and gearboxes.

Figure 11.
Breakdown of price changes for the car sector by product group and material
Aluminum, plastic and steel

Source: Own elaboration based on data from PRODCOM and Stede et al (2021) | EsadeEcPol

4. Conclusions

The introduction of a carbon border adjustment mechanism (CBAM) or an equivalent alternative is essential, in order to successfully restore the carbon price signal in European industry and thereby drive its decarbonisation, preventing a loss of competitiveness and, as a result, a potential relocation of the industry.

However, it should not be forgotten that the CBAM, and the corresponding withdrawal of the free allowance for most industrial sectors, may cause a significant increase in costs in some goods that are of strategic importance to the Spanish economy, which in turn may lead to a loss of competitiveness in exports from Spain, if these are not finally exempted from the carbon price.

In this study, we have evaluated the impact of the introduction of a CBAM in the Spanish manufacturing sector, finding highly significant price increases (of between 40 and 150%) in some materials, such as cement, aluminium and steel, all of which play an important role in Spain's exports, which could be affected to a considerable extent.

Although these cost increases fall as you move along the value chain, products with a high steel or aluminium content may also experience sizeable increases. This is particularly relevant for the car sector, which accounts for 36% of manufactured goods exports in Spain. Although the price increases for many products in this sector are relatively small, there are certain elements that may be seriously affected (increases of up to 40% in some components, and 4% for some vehicles).

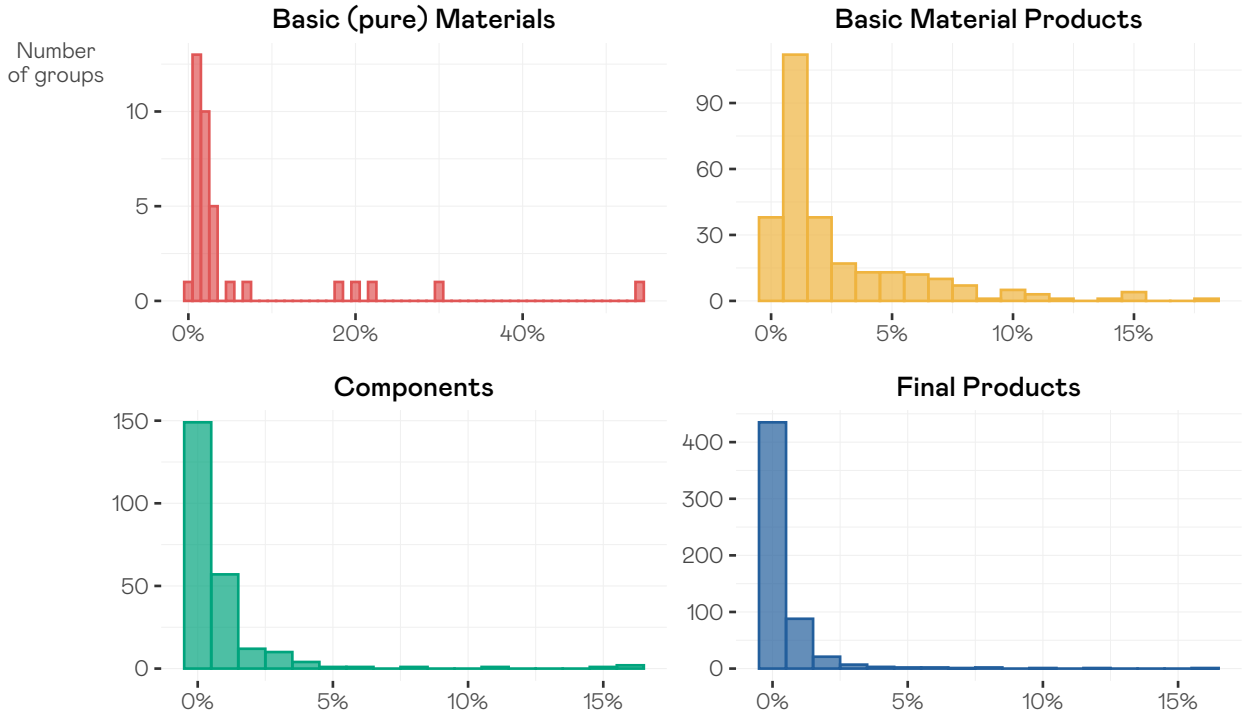
In this respect, it is worth remembering that the European CBAM proposal only applies to basic materials (and not vehicles or components), as a result of which imported vehicles or components would automatically be more competitive than those produced in Spain. Moreover, this proposal does not exempt exports from paying a carbon price, which would also lead to a loss of competitiveness in the global market.

Other sectors that are also of great importance to the Spanish economy, such as construction, are less exposed to the international market (this does not include some subsectors such as ceramics which are still not affected by the CBAM, and which, it is understood, would continue to receive free allowances). Nevertheless, these sectors such as construction would experience price increases in the domestic market, which may be sizeable in some cases.

Thus, it would appear to be essential to make a careful analysis of the implications of these price increases in the sectors affected, with a view to either drawing up domestic measures to offset these negative effects, or to considering to what extent it may be expedient to reform the current CBAM proposal; such a reform would involve levying a tax on all products imported, not only basic materials, in addition to exempting exports from paying the carbon price.

Annex

Figure 12.
Distribution of trade groups by price increase
Carbon price of 30€/t



Source: Own elaboration based on data from PRODCOM and Stede et al (2021) | EsadeEcPol

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REGULATION (EU) 2021/1119 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law')