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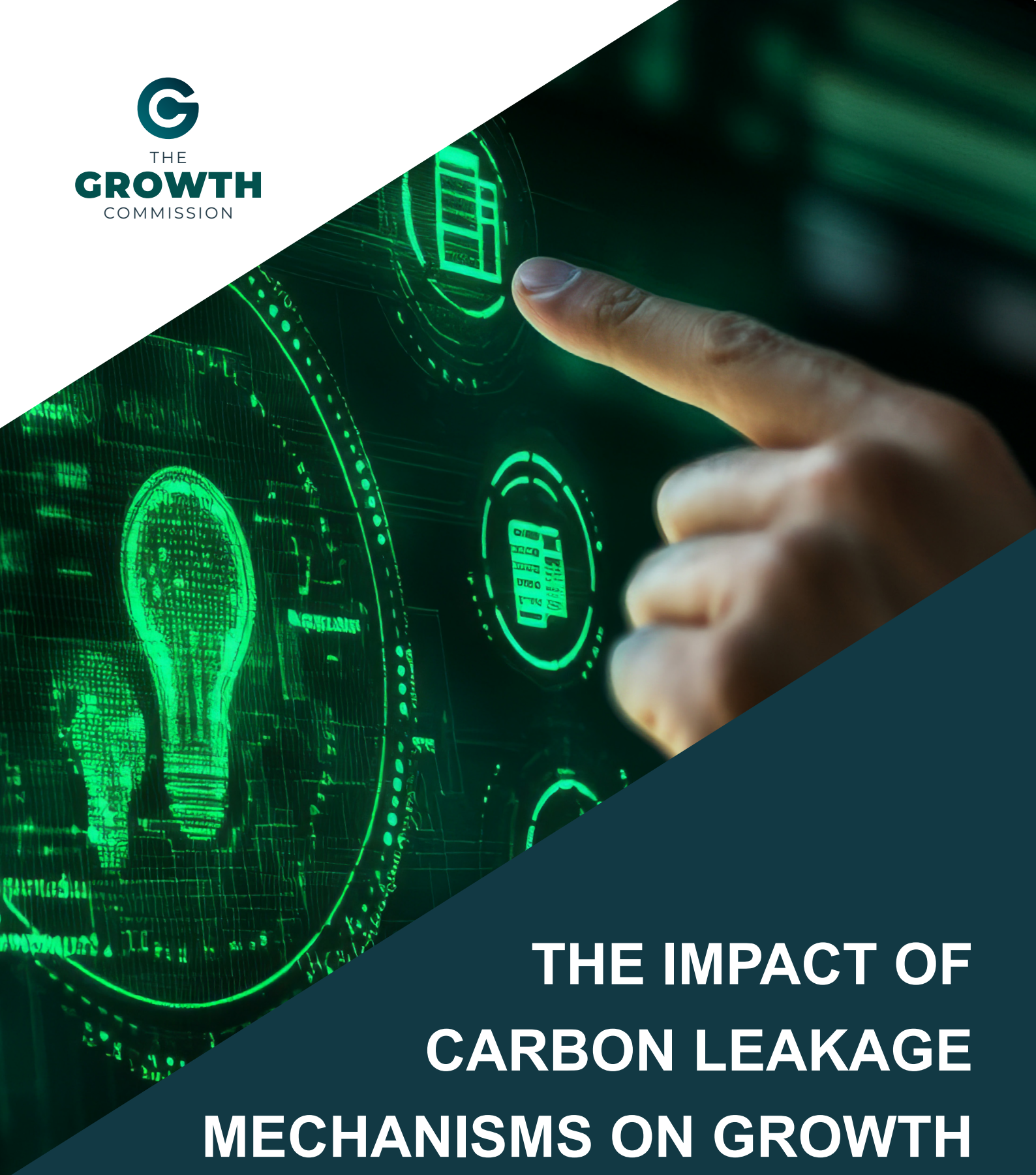

# THE IMPACT OF CARBON LEAKAGE MECHANISMS ON GROWTH

SHANKER A. SINGHAM

OCTOBER 2024

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# The Growth Commission

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## 2024

## 1. Executive Summary

This paper evaluates the cost from a GDP per capita perspective of the UK following the European Carbon Border Adjustment Mechanism, as has been suggested by both the current and previous UK governments, and about which there has been a lengthy consultation. While the previous UK government did make an attempt to project the cost to the UK economy of adopting the CBAM, we believe it substantially underestimated the cost. Given the high costs that our modelling suggests, it is important to ask what alternatives exist, and to cost those. We make no assertions about the effectiveness of these different proposals in addressing carbon leakage issues, still less about their ability to meaningfully reduce carbon emissions and therefore impact climate change. It is for policymakers to decide how the regulatory purpose is best achieved.

We see our role as to provide a robust economic impact assessment which includes dynamic effects. We have also not considered in this analysis the impact of other climate change policies such as subsidies for particular sectors and tax credits as part of the EU Green New Deal which the UK may adopt as part of its overall climate change approach. We have also not considered the potential impact if the UK were to follow the European Emissions Trading Scheme (ETS) as opposed to retaining its own ETS.

We use the ACMD Model which the Growth Commission uses to evaluate the impact of trade and domestic regulatory policies by reference to their impact on the three core pillars that generate economic growth: open trade, competition and property rights protection. This ground-breaking econometric model correlates movement in these pillars with GDP per capita.

The study finds that UK adoption of the CBAM could lead to GDP per capita losses of between roughly £150 and £300 even if supply chains stay as they are. Implicit within the UK's independent trade policy is the possibility for supply chains to realign around the lowest cost producers, and so we have modelled the impact of CBAM if supply chains were able to realign. Given that low-cost producers tend to be developing countries, the economic impacts in this case are much higher, between £210 and £650 of losses for each UK person.

We have also modelled the impact of other ways of dealing with climate change which have been proposed. We model the UK government's Trade and Agriculture Commission proposal which we find to be considerably less costly in terms of GDP per capita impact. Finally we model the impact of a new and very different approach to climate change and carbon leakage, the so-called Climate and Freedom Accord (CFA). We find that far from lowering GDP per capita, the CFA has the capacity to increase GDP per capita by over £1,000. At a time when GDP per capita has been sluggish in G7 countries, including the UK, the importance of an approach that generates GDP per capita growth should not be underestimated.

The impact on developing countries of a CBAM is potentially severe. Given the current geopolitical risks of a bifurcation of supply chains into G7 and BRICS markets, government must be alive to the threat that tariffs enacted primarily on the products of developing countries may not lead to improved carbon emissions positions, but may drive them towards large BRICS markets operating very differently from the G7.

The resultant impact on global welfare should be a serious concern. It is beyond the scope of this paper to attempt to calculate the global welfare impacts of such an eventuality, but these would clearly dwarf the losses we do suggest.

## 2. Purpose of this Paper

The purpose of this paper is to evaluate the potential impact on GDP per capita of the UK adopting the European Carbon Border Tax Adjustment Mechanism (CBAM).

In order to do this we identify what problem adoption of the EU CBAM is trying to solve, and then we will evaluate its potential GDP per capita impact using the ACMD Model (see below) which is a new economic model we are using to correlate GDP per capita impacts as a result of changes to policy across the pillars of International Competition or Trade (IC), Domestic Competition (DC) and Property Rights protection (PR) which we know have strongly correlative effects on GDP per capita. We will then look at alternative methods of solving the problem EU CBAM is seeking to solve and evaluate their impacts, also using the ACMD Model.

The purpose of this paper is not to evaluate whether the UK adoption of EU CBAM will reduce carbon emissions globally or even whether it will lead to less “carbon leakage”, but rather the economic impacts of its adoption. Policymakers can then decide whether the cost is justified by its stated purpose.

We will also apply the ACMD model to a range of alternatives to the CBAM, including a new proposal which takes a very different approach. Rather that raising trade barriers for high emission imports, the Climate & Freedom Accord (CFA), as it is called, removes barriers to trade and investment flows to drive accelerated decarbonising innovation.

Finally, we will look at the wider geostrategic and geopolitical impacts of the adoption of the EU CBAM in the UK which cannot be quantified in GDP per capita terms, but will have profound effects on international economic policy and related national security.

## 3. Problem Statement

Many countries have adopted approaches to dealing with “carbon leakage”.

The EU believes that carbon leakage occurs when companies relocate their production to countries with less strict climate policies, undermining the EU’s efforts to reduce greenhouse gas emissions.
If countries have laws and policies that ban certain technologies on net zero grounds, then domestic producers are likely to complain if imports using these same technologies are able to enter the domestic market at lower cost.

The fear is that the attempts by some countries to deal with climate change could simply shift production to countries that do not take adequate steps to deal with climate change.

Many different methods to deal with this issue could be applied, but one has been adopted by the EU, and is now being actively considered by the UK and other countries. This is the Carbon Border Adjustment Mechanism (“CBAM”).

UK industry in particular is concerned that production methods in other countries may be more carbon-intensive and less costly.

This could lead to increases in market share in the UK of these products not as a result of efficiency, but due to the reduced costs resulting from the higher emission production process which is banned in the UK or other import market.

## 3.1 Does EU CBAM solve the problem?

The **European Carbon Border Adjustment Mechanism (CBAM)** is a climate policy tool introduced by the European Union (EU) to prevent "carbon leakage". CBAM applies to imported goods like cement, steel, aluminium, fertilisers and electricity from countries outside the EU. The mechanism requires importers to buy carbon certificates reflecting the carbon price that would have been paid if the goods had been produced under the EU's Emissions Trading System (ETS). This ensures that foreign producers are subject to similar carbon costs as EU-based producers.

## 3.2 Key points of CBAM

- **Start date:** Gradual implementation began in 2023, with full application set for 2026.
- **Objective:** Level the playing field for EU industries and incentivise non-EU countries to adopt stricter climate policies.
- **Scope:** Targets industries at risk of carbon leakage due to their high emissions intensity and exposure to international trade.

The EU CBAM is intended to cover all products currently covered by the ETS by 2030, and complete phase-out of free allowances is expected by 2034.

The UK is considering adopting the same approach to carbon leakage as the EU does. This means that the UK would have the same CBAM tariff applicable to carbon-intensive products in the areas in scope and the same approach to the evaluation and calculation of the tariff.

The UK's version of the CBAM would ultimately apply to all UK products covered by the ETS. The current UK approach is to lessen the burden on some UK producers by giving them free ETS allowances to produce carbon-intensive goods (and so be on the same competitive playing field as producers in other countries unburdened by restrictions), while maintaining the overall ETS mechanism for others. This will change over time, as these free allowances become gradually phased out during 2027.

In order to deal with this transition, the CBAM is intended to take away the benefit that foreign producers of the products in scope have as a result of being able to use carbon-intensive techniques for their production.

The EU's CBAM will lead to the imposition of a tariff on the imports of these competing products and in addition to ensuring UK products produced using lower emissions production processes are protected from foreign competition, this will also result in the blocking of foreign competition whose cost base may not be lower than UK competitors. Hence if other countries have a carbon price then the CBAM tariff will be reduced accordingly. It should be noted that the projections of the UK's

carbon price based on a range (low sensitivity assuming high fossil fuel prices and low economic growth versus high sensitivity with low fossil fuel prices and high economic growth) are estimated to be between £106 per tonne of CO2 emitted and £171 per tonne of CO2 emitted by 2039 (the UK's current carbon price is £80/tCO2e)[1]. In order for countries to avoid UK CBAM tariffs at this time, they would have to match UK carbon prices.

## 4. International Trade Approach to Tariffs based on Process and Production Methods (PPMs)

It has been an axiomatic principle in international trade, and specifically in the GATT/WTO system, that countries should not discriminate on the basis of method of production, but only on the ultimate goods themselves. There is an important reason for this. Once you start to discriminate on the basis of production method, it opens the door for any efficient production method to be subject to challenge from incumbents who do not want to face competition. That said, WTO cases more recently have opened the door to discrimination based on production methods in areas like the application of the public morals defence under Article XX (b) of the GATT 1994 (see for example the EU-Seals case[2]).

Article XX(b) is a general defence that allows countries to enact policies that "are necessary to protect human, animal or plant life or health". Similarly, GATT Article XX(g) allows countries a defence in the case of measures that are designed to conserve exhaustible natural resources[3]. It will be difficult to make out this defence as long as free ETS allowances exist alongside the CBAM itself. That said, such mechanisms should be seen to be the exception and not the rule. However, accounting for PPMs cannot be applied extraterritorially, cannot discriminate between countries and cannot be protective of domestic industry (i.e. must also apply to domestic industry).

Since the issue is one of competition, it is relevant to ask whether the EU CBAM deals with the competition that arises from the production method cost reduction or whether it goes beyond this. A well-tailored solution would remove only that part of the cost reduction attributable to the difference in cost brought about by the emissions-intensive production method and the production method required of UK firms. It would seem that a general tariff which is based simply on a carbon pricing mechanism cannot differentiate between distortive practices and non-distortive ones and cannot assess whether the particular distortion actually has an effect on competition.

## 5. Cost of CBAM

We have used the Anti-Competitive Market Distortions ("ACMD") Singham-Rangan-Bradley ("SRB") -γ model to evaluate the impact of CBAM (referred to as the "ACMD Model"). We apply the ACMD Model by evaluating the potential impact on the UK's pillar scores in key areas, which enables us to evaluate GDP per capita impact. We can then apply an attenuation factor based on the degree of UK economy impacted, taking into account the forward effects, not only the specific areas impacted.

The ACMD Model looks at effects in country of policies adopted by that country. It does not take into account the potential impact of those policies on the country's external trade policy (except for the effects of that policies on a country's own trade openness).

An example of this would be legal services access in India where the UK is currently negotiating a trade deal. The application of CBAM on Indian exports would make it less likely that their negotiators would concede to UK demands on legal and financial services. Thus, since 81% of the UK economy by gross value added (GVA) is services, the international trade effect on the UK will be significant.

In evaluating the total effect, we would need to consider how the services sector could be impacted because CBAM will make it less likely that the UK will get services liberalisation for UK services exporters in other markets. The markets in the Gulf Cooperation Council (GCC) and India could be examples, given that the UK is negotiating better market access for its services sector in these markets right now.

# 6. Introduction to ACMD Model

Anti-Competitive Market Distortions, or ACMDs, refer to government-imposed restrictions on competition.

Singham has written extensively about market distortions for over twenty years.[4] Singham also dealt with the issue extensively in his 2007 book, A General Theory of Trade and Competition: Trade Liberalisation and Competitive Markets (CMP 2007). Formally, Abbott and Singham[5] have defined ACMDs as those that "involve government actions that empower certain private interests to obtain or retain artificial competitive advantages over their rivals be they foreign or domestic."

Singham also discussed market distortions in a working paper for the Council on Foreign Relations, *Freeing the Global Market by Curbing Regulatory Distortions*[6]. This paper included an inventory of distortions and explained why they have a pernicious impact on international trade.

Having identified that ACMDs present a pernicious problem in international trade, the lack of a quantum of the impact of these distortions made it very difficult to evaluate the scale of the problem. It was therefore necessary to research different ways of evaluating the harm posed by ACMDs. Singham and Rangan embarked on this exercise with a series of papers from 2014.[7] Singham and Rangan also published two papers introducing the economic analysis of ACMDs in 2016 for the Legatum Institute.[8] That work is the precursor to this paper and the modifications and adaptations to the model used.

It is only by fully understanding the metrics of anti-competitive market distortions that we can really evaluate their impact. ACMDs can damage international trade flows as well as distorting markets in ways that reduce competition and destroy wealth out of the economy. Hence ACMDs are just as relevant to the international trade agenda as they are to the domestic regulatory agenda.

Policymakers would greatly benefit from understanding the cost of ACMDs and how they relate to domestic regulatory promulgation. The OECD, in its regulatory toolkit and competition assessment, has advised policymakers to promulgate regulation in ways that are the least anti-competitive possible consistent with a publicly stated, legitimate regulatory goal. Many countries include this sort of competition assessment in the ways they promulgate regulations, including taking into account the views of competition agencies. However, absent a robust metric to measure distortion, it is difficult for governments to properly evaluate the harm caused by certain types of regulation, and it is also impossible for publics to fully understand the impact of regulation so that they can properly weigh the costs and benefits of regulation and determine if the harm is justified by the importance of the regulatory objectives.

ACMDs can be particularly harmful (as distinct from private anti-competitive behaviour) as they are imposed by the government. Therefore, they enjoy state-backed power, and the force of law. Consequently, they may be impervious to attenuation by ordinary market processes. One example of an ACMD is as follows:

Consider a market, where firms generate a certain level of pollution. Now suppose that the government orders all firms to cut down on pollution by the same amount. However, suppose there is no cap-and-trade system in place, whereby firms with high costs of reducing pollution can buy permits from other firms at a price lower than its cost of reducing pollution. In such a case, a high-cost firm may have access to low-cost pollution reduction technology and a low-cost firm may be handicapped by not having such access. In that case, a low-cost firm may likely exit and the resulting reduction in the competition may be even more detrimental to consumer welfare. In this less competitive market, the welfare benefit from reduced pollution could be offset by the welfare cost of reduced competition. This distortion can be termed as an ACMD.

Economists have long recognised the prevalence and pernicious consequences of ACMDs. The complexity and breadth of this issue, however, have made it an especially diffcult one for policymakers to tackle. In this report, we attempt to break down the impact of ACMDs on productivity. We then attempt to examine the impact of reducing ACMDs in the United Kingdom, by trying to predict the impact on GDP per capita, over a fifteen-year period.

If we are able to develop metrics to measure ACMDs, there are a number of policy consequences that are of great value. These include allowing governments to tariffficate market distortions in the markets of trading partners, which allows a nuanced approach to issues like the US-China trade dispute (as opposed to the imposition of a tariff regardless of evidence of ACMDs in China). Such a policy would have the advantage of actually incentivising the party which has the ACMDs to actually lower them (and thereby benefit from the lower tariff), as well as enabling countries to signal to their trading partners that they are open to imports which are efficiently produced because of the consumer welfare gains for their economies.

Policymakers can also improve the quality of their own regulatory promulgation processes. As stated above, under the OECD Regulatory Toolkit and Competition Assessment, governments should regulate in ways that are the least damaging to competition consistent with a publicly stated, legitimate regulatory goal. If policymakers had a sense of the effect of ACMDs in their own markets on their own economic output, this would be tremendously valuable in coming to better regulatory decisions. It would also be invaluable in ensuring that legislators can properly evaluate the regulatory goal and the cost of the ACMD, and make informed decisions.

Such a metric would also inform the public debate and ensure that this is actually being carried out in a manner that balances the regulatory objectives that need to be properly and clearly stated, and the cost of the ACMDs to the economy. Too often in public debate, a knee-jerk response to a perceived market failure occurs without any attempt to present, much less understand, the economic evidence.

A metric will also tell us something about the scale of the economic impact of ACMDs. In the past, it has been assumed that reduction of trade barriers is where the largest economic gains are to be found, and reduction of distortions is important but not of the same order of magnitude. A metric will enable us to evaluate this impact. A sense of the scale of this impact was developed in preliminary fashion by Cebr in 2019.[9] According to the Cebr report, imposing a distortion inside the border as opposed to at the border in an agency-based model led to a 37% reduction in output, versus an 11% reduction of output for an equivalent border measure. This suggests that the impact of ACMDs might be much higher than previously supposed.

There are a number of ways of tackling the problem. We have developed both an econometric and an agency-based model for getting a sense of quantum.

There are three major impacts of ACMDs in global markets which need to be addressed differently:

**(i)** ACMDs distort the domestic market. This purely domestic impact can be measured using a range of models we describe below.

**(ii)** ACMDs can artificially lower the costs of exporters and so damage import markets. A different set of metrics needs to be used here in order to support defensive trade tools and mechanisms.

**(iii)** ACMDs can be used as barriers to import, in effect negating market access concessions in trade agreements by making markets effectively incontestable.

In all three cases, ACMDs have a negative impact on global welfare which is why it is important that mechanisms can be found to deal with them. We will first look at ACMD distortion of the domestic market (and in the case of the agency-based model the global market), and then look at impacts on trade.

# 7. Analysing Other Studies

There have been a number of other studies that have sought to measure the impact on GDP or GDP per capita of anti-competitive regulation. In Australia, the impact of the national competition policy which included tariff reform as well as regulatory reform can be seen below. These studies are useful to consider as there is a danger that the CBAM will lock in existing supply chains, making it very difficult for new entrants to penetrate markets where the CBAM is present. If this occurs then, there will be powerful competition effects of the CBAM which our model only partially reaches, making the following an underestimate of the full impact of the CBAM.

## 7.1 ACCC Study: Forecast growth and revenue benefits from National Competition Policy change

An ex-post analysis from the Australian Government Productivity Commission had also suggested a 2.5% gain in GDP had been achieved but this was spread over a much smaller group of sectors and therefore likely considerably underestimated the actual dynamic efficiency gains.[10] The sectors included were urban water, gas, electricity, telecommunications, urban transport, ports and rail freight. The Australian study also considered distributional effects and found that the economic gains were well spread out

| Item | Description |
|---|---|
| **Growth** | |
| Real GDP | 5.5% |
| Real consumption | $ billion pa |
| Real wages | 3% |
| Employment | 30,000 more jobs |
| **Revenue** | |
| Commonwealth | $5.9 billion |
| States, Territories, local government | $3.0 billion |

across all income brackets. It also connected the improvement in trade openness with the improvement in competition in key sectors achieved not only through private competition law implementation, but by a pro-competitive approach to regulation: in other words, a reduction in ACMDs.

A recent study by Singla of the University of Goethe reveals that 31-37% of market share gain for incumbents is attributable to U.S. federal regulation.[12] In other words, incumbents lobby for anti-competitive regulation to exclude rivals very successfully. A study of European regulation by ECIPE suggest that 3-4% of GDP gains are possible by reducing ACMDs.[13] CBAM can operate in a similar way to ensure market power for incumbent producers of CBMA products.

The Growth Commission in its papers 2 and 3 identified a range of different studies that examine the impact on GDP per capita of anti-competitive regulation.[14] Increasingly many researchers are finding that these impacts are significant – ranging between 3% and 7% of GDP per capita losses due to ACMDs. These metrics put the notion that ACMDs are primarily a developing world problem completely out of court. They also highlight the importance of policymakers addressing them seriously.

## 8. Introduction to the Specific Pillars of the ACMD Model

We have also developed an econometric model to analyse distortions. The model which we have developed is based on the notion that the three pillars of economic development are property rights protection, domestic competition and international competition.[15] Broadly, anti-competitive government policy affects the way the market functions through one of these three pillars.

## 8.1 Property Rights

The foundation of a productive economy is property rights protection. If property rights are left unprotected, the incentive to invest, compete and innovate is lost. If the returns from effort cannot be captured, can be taken away or cannot be regained if wrongly taken away, what incentive is there to exert effort? Furubotn and Pejovich[16] describe the nature of property rights in this way:

"... property rights do not refer to relations between men and things but, rather, to the sanctioned behavioral relations among men that arise from the existence of things and pertain to their use... The prevailing system of property rights in the community, then, can be described as the set of economic and social relations defining the position of each individual with respect to the utilization of scarce resources."

The authors add in a footnote that "Roman Law, Common Law, Marx and Engels, and current legal and economic studies basically agree on this definition of property rights." In other words, the very nature of an economic transaction is defined by the right to property and this definition is not disputed.

Property rights allow four things to occur:

**(1)** investment to create the property (as in the case of intellectual property or IP and machinery);

**(2)** investment to make the property more productive (as in the case of land, machinery and IP);

**(3)** exploitation to get the maximum productivity out of it (as in the case of land, machinery, IP etc.); and

**(4)** transfer of property to another who might be able to do a better job of the first three instead of the current owner of the property (as in the case of land, machinery and IP).

All these lead to increased productivity, higher incomes, and thus wealth and prosperity. So, a lack of property rights protection effectively undermines the ability of economic agents to operate effectively. It also undermines the process of competition, because property rights are what firms compete with. In developing countries in particular, establishing and enforcing property rights plays a significant role in creating the preconditions for growth[17,18]. Therefore, all other factors influencing economic outcomes depend on the level and quality of property rights protection. We account for the fact that the effect of domestic competition and international competition on other factors depends on the level of property rights in our model and will discuss how we capture this in the next section.

The Property Rights Protection indicator is constructed as follows: intellectual property rights are themselves a type of property rights and are a crucial aspect of economic development.[19] Including this measure as a part of a property rights protection indicator was obvious and necessary. The other six subcategories are each different ways in which policy can ensure that the effort of agents cannot be wrongfully expropriated, that when a person's rights are violated the process for righting that wrong is not prohibitively expensive,[20] and that the legal system itself has integrity. The subcategories of the Property Rights Protection indicator follow the Heritage Foundation Index of Economic Freedom's criteria for grading countries in terms of Property Rights Protection[21].

## 8.2 Domestic Competition

Domestic competition plays a significant role in the effciency of both domestic and foreign firms. Competition among firms encourages innovation and upgrading of production processes, as well as positive externalities in local markets.[22] Each of these features of competition has a positive impact on welfare, which justifies its inclusion as part of this index.

Typically, the term "competition policy" refers to regulations – and the enforcement of regulations – concerning restraint on competition created by private parties. Our Domestic Competition indicator is, instead, meant to capture the extent to which government policy itself restricts competitive behaviour.[23]

Timothy Muris[24] highlights the importance of understanding and correcting restrictive government actions – not just private restrictions. He compares these two sources of competitive restrictions to the forks in a stream and states that "protecting competition by focusing solely on private restraints is like trying to stop the water flow... by blocking only one channel." Muris goes on to say that creating a system which prevents anti-competitive behaviour by firms but allows a government to dictate the same anti-competitive outcome that would have resulted from private action has not eliminated the problem; "it has simply dictated the form that the problem will take." Domestic competition here refers to the domestic policies affecting the way in which firms make decisions and interact with one another.

Any policy which limits profit-maximising firms' ability to make their own decisions will reduce the score for Domestic Competition for a country.[25] If a policy reduces the ability of some subset of firms to make their own decisions while not restricting others in the same way, then the Domestic Policy score will be reduced. However, this does not mean that a country with no regulations controlling the decisions of firms will receive the highest score. The goal of this index and the scores it generates is to allow comparisons between countries regarding the degree to which policy is welfare-maximising. If welfare is to be maximised, then some government regulation may be appropriate in many contexts. For example, if a market can be characterised as a natural monopoly, appropriately tailored government regulation may be crucial for welfare maximisation.[26]

If there are true market failures that are not being handled adequately through purely private action (severe adverse health effects from pollution, a shortage of funds for post-secondary education, harmfully discriminatory practices etc.), then government regulation may be necessary.[27] These antitrust or industrial organisation types of regulations are part of the Domestic Competition score. No judgment is made as far as the exact specification of the regulation. Instead, the effectiveness of antitrust policy and the cost of adhering to different policies are the measures used.

The Domestic Competition score is higher when firms are able to make their own decisions because we are trying to evaluate how well domestic policies promote competitive behaviour. It is constructed as follows: competitive behaviour refers to the behaviour firms exhibit in a particular market which will maximise welfare within the market. Therefore, the Domestic Competition score is higher when policies respond to market failures and antitrust violations effciently but otherwise do not interfere with or dictate firm behaviour. This is because the behaviour of profit-maximising firms – faced with demand from the market, the decisions of competitors, no market failures and no antitrust violations – will produce and charge a price which generates the welfare-maximising equilibrium.

That is, once any market failures are corrected for, firms will behave in a way which maximises welfare.

Of course, in practice it is often very diffcult or impossible to fully correct a market failure. However, some countries will do a better job than others in choosing and implementing policies that effectively respond to market failures. The closer a country is to actually eliminating a market failure, the closer it will be to moving a market toward its welfare-maximising equilibrium.[28]

The Domestic Competition indicator is defined by infrastructure[29] and the policies concerning how firms make decisions. Infrastructure and the effciency with which it is built have serious implications for the competitiveness of a country. Reliable, well-maintained infrastructure is a crucial component of effcient markets. Here, infrastructure reflects each type of infrastructure in an economy.

Labour regulations are defined by how free firms are to hire and fire employees, as well as how firms are then allowed to utilise those workers. Restrictions on the hiring and firing process or deployment of labour decisions will reduce the score for Domestic Competition. The less flexible policy makes the labour force, the higher the cost of production will be, because firms will have to work around or suffer the restriction of each policy.

Regulatory promulgation process refers to how laws are created. If the government is allowed to make decisions based on favouritism and the process is not transparent, ACMDs can be created at will. There will be no need to disguise them as market failures, or if they are disguised, they will be very diffcult to recognise.

Industrial organisation policies refer to the regulations to which firms must adhere in order to participate in a market and how antitrust deals with anti-competitive behaviour when it arises. All of these areas impact a firm's ability to make their own profit-maximising decisions.

## 8.3 International Competition

International Competition refers to the degree to which a country allows foreign firms to access its domestic market and the degree to which it allows domestic firms to access foreign markets. Any restriction on the free flow of trade which is not the correction to a market failure will reduce the score for International Competition. Greater access to a wider variety of goods benefits consumers and greater access to less expensive or higher quality inputs benefits firms. Also, exposing firms to potentially more effcient foreign firms promotes innovation. All of these forces combine to generate gains in welfare.[30]

International Competition refers to how open a country is to interacting with foreign markets (a measure of the openness of its trade policy). The policies which reduce the score here are those that make it more costly or burdensome to transact internationally.

The indicator is constructed as follows: tariffs and procedural burden directly affect the flow of goods; financial restrictions affect the flow of capital. The freedom of foreigners to visit is a measure reflecting the general openness of the economy to outsiders visiting. A policy which restricts visitation by foreigners would make it more diffcult for foreign firms to have a presence in an economy.

If any of these categories is restrictive, it will be more diffcult for trade to occur. The Washington Consensus[31] also noted the importance of eliminating distortionary trade policies applied differently in different areas.[32] Import liberalisation is seen as particularly important because it eliminates the export disadvantage created by restricted access to less expensive imported intermediate goods. This type of ACMD is exactly what we are trying to capture with our International Competition index.

## 8.4 Combined Effects

An important point to be made is that if one of these three areas is improved while the other two are left in a poor condition, the impact on productivity will be reduced or reversed. For example, if Domestic Competition is improved by making it faster and less costly for domestic firms to start a business but property rights are left unprotected and international competition is prevented, the impact on productivity will likely be zero because firms will still be uncertain about entering the market (because their property can be expropriated, for example) and will not need to compete as fiercely as they would in the face of foreign competition.

Each of the three categories has an impact on how an improvement in the other categories will be realised in terms of productivity. As stated previously, without property rights protection, agents cannot act in their own economic interests. This means that without property rights protection, improvements in the other two categories will have no effect on the determinants of productivity.

Domestic competition determines the structure of a domestic market which determines the equilibrium of each domestic market. If firms are not allowed to decide how they will behave. then imported foreign goods will enter an ineffcient market and face ineffcient constraints on their position in that market. It is possible that distorted domestic competition may help or hurt foreign firms. Similarly, international competition policies can prevent foreign firms from entering the domestic market, or may prevent domestic firms from reaching foreign markets. In either case, the total effect in the long run will be a reduction of welfare.[33] Also, improving each of these three areas simultaneously will have a combined effect. If a country can correct the ACMDs in every area, it can move towards its optimal welfare level. Leaving ACMDs uncorrected in any area will negatively affect the benefits from correcting other ACMDs.

In the case of CBAM, there is clearly a potential feedback loop between the IC and DC pillars which have not been included in our estimates. For example, tariff barriers promote anti-competitive supply chains which increase the risk of monopoly and market power in a vicious cycle, with knock-on effects throughout the economy.

# 9. UK Economy Potentially Impacted by Adoption of EU CBAM

It is difficult to predict exactly how the CBAM will be applied, were the UK to adopt it. We have proposed two approaches that are based on current UK supply chains, and UK supply chains if they were able to use the changing trade and regulatory environment to shift to the most economically viable and cost-effective supply chains.

The first approach assumes that supply chains will orient to the most cost-effective and cheapest, and therefore assumes a UK trade and regulatory policy that delivers the context for such supply chain decisions. The second approach assume that historic supply chains, admittedly formed against the backdrop of UK membership of the EU, remain in place. The second approach is more aligned with the calculations which the UK Treasury has made with regard to potential adoption of an EU-style CBAM. The second approach also assumes that the CBAM will always be restricted to products that form the current supply chain. As noted, that supply chain developed while the UK was part of the EU so it is likely that many of the products which came into the UK tariff-free and without process would change origin in the event of having process (and potentially having CBAM tariffs).

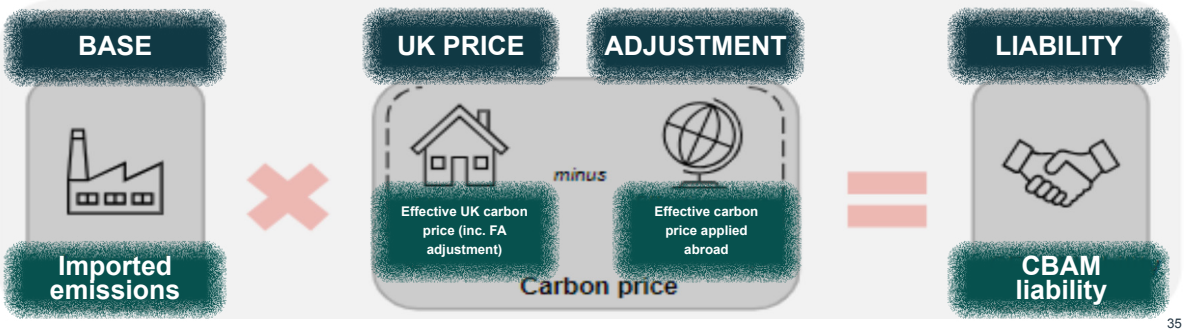
## 9.1 Assuming Current Supply Chains Remain in Place[34]

The UK CBAM is a targeted tariff which will apply to the following emission-intensive industrial goods imported to the UK:

- Aluminium
- Ceramics
- Cement
- Fertiliser
- Glass
- Hydrogen
- Iron and steel

To prevent leakage, the UK government will apply a liability through the CBAM on a country-by-country basis. This liability will depend on the carbon dioxide (CO2) emissions intensity of the imported good, and the difference between the carbon price applied from the country of origin (if any) and the price if the good had been produced in the UK (see Figure 1).

**Figure 1: The CBAM approach**




*Source: Department for Energy Security and Net Zero*[35]

We aim to assess the impact of a UK CBAM on overall import tariffs, with the ultimate goal of estimating the scheme's potential effect on domestic GDP per capita. We will begin by outlining the data sources and their relevance, followed by a detailed explanation of the applied methodology and a discussion of the findings.

To create our modelling, we collected country-level data on the carbon emission intensity of exports for each specified industrial good, current carbon pricing and the proportion of UK imports by country to create a weighted average tariff for each good.

## 9.2 Data on Carbon Emissions Intensity

The data on carbon emission intensity was collected using the World Bank's methodology based on a dataset developed by Chepeliev and Corong (2022) and Chepeliev et al. (2022) which provides greenhouse gas emission intensity (measured by kilograms of CO2 per U.S. dollar) embodied in exports by sector and by scope.[36] We use the emission intensity from both Scope 1 (direct emissions from production) and Scope 2 (indirect emissions produced from electricity generation) for cement and fertiliser and the emission intensity from Scope 1 for iron and steel and aluminium.

We are assuming that the UK CBAM would operate similarly to the EU CBAM legislation, whereby the CBAM covers both scopes from the outset for cement and fertilisers, but initially only direct emissions (Scope 1) for iron and steel and aluminium.

It should be noted that data is unavailable for ceramics, glass and hydrogen. In the cases of ceramics and glass, we have utilised the average carbon emission intensity of the available industrial goods. For hydrogen, we have employed the emission intensity data of electricity as a proxy, given their shared characteristic as energy carriers.

The dataset aggregates sectors, which can lead to discrepancies in emission intensities due to variations in commodity composition. For sectors such as aluminium and cement, this issue has been addressed by separating the CBAM-specific products.

## 9.3 Data on Carbon Pricing Data

Measured in euros per tonne of CO2 emitted, the carbon pricing data originates from a report published by PwC in 2023.[37] The report contains estimates of average carbon prices from across major trading partners, including the EU, China and the U.S. These estimates were based off the responses from over 180 members of the International Emissions Trading Association. As this data was denominated in euros, we converted these prices to current US$ prices (as of 19/08/24). Where there was no data available, we have assumed that there is no carbon pricing in place.

## 9.4 UK Import Data

To calculate the percentage of UK imports for each industrial good by country, we first gathered the commodity codes within scope of the UK CBAM from Annex A (page 57) of the UK government's consultation paper.[38 39]

We then entered the associated product codes onto Trade Map to gather the monetary amount imported from each of the UK's partner countries in 2023. Where necessary, product codes under the same industrial good were aggregated before calculating the percentage.

To overcome the data limitations on cement imports (HS2523), where HMRC had suppressed country-specific import details (accounting for nearly 90% of the total), we utilised mirror data.

This approach involved examining the export data from other countries to the UK, enabling us to trace approximately 94% of the 4.6 million tonnes imported in 2023. By using this method, we were able to estimate the value-based distribution of UK cement imports by country with a higher degree of accuracy.

## 9.5 Application of ACMD Model

In addition to the data related to CBAM, we utilised the ACMD Model as described above to assess the impact of the scheme on GDP per capita. Within the model, the component subject to influence was the International Competition Index. The weightings of the index are as follows:

| SUB COMPONENT | SOURCE | WEIGHTS |
|---|---|---|
| LPI timeless indicator | Logistics Performance Index | 11% |
| LPI international shipment indicator | Logistics Performance Index | 36% |
| LPI customs indicator | Logistics Performance Index | 10% |
| Trade Freedom score | Index of Economic Freedom | 29% |
| Freedom of foreigners to visit | Human Freedom Index | 8% |
| Freedom to own foreign currency | Human Freedom Index | 4% |
| Capital controls | Human Freedom Index | 1% |

The sub-component of interest here is the Trade Freedom score, a composite measure of the extent of tariff and non-tariff barriers that affect imports and exports of goods and services. The Trade Freedom score is based on two inputs, the trade-weighted average tariff rate and a qualitative evaluation of non-tariff barriers (NTBs).

## 9.6 Trade-Weighted Tariff Calculation

The weighted average tariffs are based on the formula from Figure 1.

With the data collected, we calculate the difference in carbon pricing between each exporting country and the UK and multiply this difference by the carbon emission intensity of the good exported from said country.

Within the carbon pricing, we created two scenarios.

The first scenario holds the UK carbon price at the average carbon price of **$87.43/kgCO2e**, which is below the EU ETS of $93.14/kgCO2e. This scenario is based on PwC's estimates for current UK pricing.

The second scenario assumes that all markets raise their carbon pricing, but the UK raises its carbon pricing proportionally higher than other markets, in the case that the UK reduces it free allowances more aggressively.

This second scenario uses the estimated market carbon values between 2026 and 2030 by the Department of Energy Security and Net Zero as proxy.[40] In Scenario 2, the UK carbon price is of **$119.73/kgCO2e**, above the EU estimate of $110.36/kgCO2e.

The formula from Figure 1 therefore produced the percentage tariff required to maintain carbon pricing parity between the UK and the exporting country for each good, for both scenarios. This percentage was divided by 1,000 to account for the difference in measurement between emission intensity data and carbon pricing.

These percentages were then weighted by the percentage of UK imports of the associated good originating from the exporting country.

Those countries with an increase in tariff were then aggregated (those which saw a decrease were discounted as it would instead be the case that the rise in tariff would be 0).

By including the trade weights, the effects of the CBAM depend significantly on the imported good. For example, the top five importers of cement to the UK are:

- Ireland
- Spain
- Portugal
- Germany
- Greece

These countries supplied 4.1 million tonnes to the UK in 2023, representing almost 90% of the total 4.6 million tonnes of cement (HS2523) imported. These countries are covered in the EU ETS and under the first scenario would not be levied any additional tariffs due to CBAM.

Meanwhile, the top five importers of ceramics to the UK are:

- China
- Spain
- Italy
- India
- Turkey

Here, three of the five importers come from outside the EU. Furthermore, China alone is responsible for 19% of UK ceramics imports. In this case, the CBAM will have a relatively stronger impact on imports, raising the ceramic tariff on China by 21 percentage points to 25.67%.

The industrial goods covered by CBAM make up approximately 4% of UK imports, similar to the finding in the UK government's consultation paper.[41] The weighted tariff of each good was then multiplied by its share of total UK imports to produce the total increase on UK import tariffs for both scenarios. The results were as follows:

| TRADE-WEIGHTED TARIFF | SCENARIO 1 | SCENARIO 2 |
|---|---|---|
| Aluminium | 0.49% | 0.71% |
| Cement | 1.11% | 7.10% |
| Fertiliser | 2.81% | 4.08% |
| Iron and steel | 1.63% | 2.30% |
| Ceramics | 8.72% | 12.47% |
| Glass | 7.67% | 11.00% |
| Hydrogen | 0.62% | 3.01% |

| | SCENARIO 1 | SCENARIO 2 |
|---|---|---|
| Overall increase in UK import tariffs | 0.095% | 0.140% |

As the tariffs were trade-weighted and only those countries with lower carbon pricing would be affected, the results are heavily influenced by China. Indeed, across both ceramics and glass, half of the increase in trade-weighted tariffs are driven by the rise in Chinese tariffs.

## 9.7 IC Pillar Score

With the percentage increase in import tariffs, we were able to input this into the Trade Freedom score. The equation is as follows:

$$Trade\ Freedom_i = \frac{100(Tariff_{max} - Tariff_i)}{Tariff_{max} - Tariff_{min}} - NTB_i$$

Where $Tariff_{max}$ is the maximum tariff applied to a partner country; $Tariff_{min}$ is the minimum applied; $NTB_i$ is the qualitative assessment of non-trade barriers faced by country $i$.

Alongside the increase in tariff, we also estimate a rise in non-trade barriers associated with the implementation of a UK CBAM. According to the Trade Freedom score's methodology, non-tariff measures calculated by the WTO are also considered. Such measures include administration costs, as well as domestic charges incurred by purchasing imports which have an additional tariff levied. Both of these measures can be justified when considering the CBAM. As such, within Scenario 1 we have included a relatively smaller rise in the NTB, to about half of the increase in NTB for the UK between 2016 and 2021. For Scenario 2, we have added the full increase over that period.

With both the tariffs and NTBs determined, we obtained results for the new International Competition (IC) score for the UK across both scenarios. **The resulting decrease in the Trade Freedom score in Scenario 1 is 0.14 and 0.28 in Scenario 2.**

| | Increase in overall tariff (percentage points) | NTB pre-CBAM | NTB post-CBAM | TF score pre-CBAM (1-7) | **TF score Index post-CBAM** |
|---|---|---|---|---|---|
| Scenario 1 | 0.095 | 9.1 | 11.3 | 6.2 | **6.0** |
| Scenario 2 | 0.140 | 9.1 | 13.5 | 6.2 | **5.9** |

Within the ACMD model, the equation relating the International Competition Index and GDP per capita is follows:

$$\ln(GDP\ per\ capita)_{it} = \beta_0 + \beta_1 International\ Competition_{it} + \boldsymbol{X_{it}'\gamma} + \nu_t + \lambda_i + \epsilon_{it}$$

Where a one unit reduction in International Competition is associated with a 0.0758% decrease in GDP per capita.

Using this equation, we found the following results for the two scenarios:

| | **Effect on UK GDP per capita** | **Loss of GDP per capita (In nominal 2023 prices)** |
|---|---|---|
| Scenario 1 | -0.32% | £124.12 |
| Scenario 2 | -0.62% | £243.05 |

These results align with the conclusions of the aforementioned UK government consultation paper (p.43).[42] But this does not include other impacts that can be discovered from the ACMD Model.

## 9.8 Impact of DC Pillar Score

The Domestic Competition Index is made up of the following subcomponents:

| **Sub index** | **Source** | **Weight** |
|---|---|---|
| **Labour Freedom score**<br><br>- Minimum wage<br>- Associational right<br>- Paid annual leave<br>- Notice period for redundancy dismissal<br>- Severance pay for redundancy dismissal<br>- Labour productivity<br>- Labour force participation rate<br>- Restrictions on overtime work<br>- Redundancy dismissal permited by law | Index of Economic Freedom | 25.0% |
| **Business Freedom score**<br><br>- Access to electricity<br>- Business environment risk<br>- Regulatory quality<br>- Women's economic inclusion | Index of Economic Freedom | 25.0% |

| | | |
|---|---|---|
| **Financial Freedom score**<br><br>- The extent of government regulation of financial services<br>- The degree of state intervention in banks and other financial firms through direct and indirect ownership<br>- Government influence on the allocation of credit<br>- The extent of financial and capital market development<br>- Openness to foreign competition | Index of Economic Freedom | 6.3% |
| Electricity cost | WB Doing Business | 3.1% |
| Electricity time | WB Doing Business | 3.1% |
| Quality of roads 1-7 | Global Competitiveness Index | 3.1% |
| Quality of ports 1-5 | Logistics Performance Index | 3.1% |
| Mobile telephone subscription | Global Competitiveness Index | 3.1% |
| Individuals using internet % | Global Competitiveness Index | 3.1% |
| **Government Integrity score**<br><br>- Perceptions of corruption<br>- Bribery risk<br>- Control of corruption | Index of Economic Freedom | 25.0% |

One potential channel through which CBAM could impact the Domestic Competition Index is through electricity prices (as highlighted above). The introduction of the CBAM could lead to increased costs in electricity generation through several indirect channels. For example, if the prices of imported steel, aluminium and cement rise due to the CBAM, the cost of building and maintaining power plants — especially those that require substantial amounts of these materials — could increase.

Additionally, as hydrogen becomes more integrated into the energy mix, particularly for electricity generation, any rise in the price of imported hydrogen could translate into higher operational costs for power plants that rely on this fuel. These factors could cumulatively contribute to an increase in the overall cost of electricity generation in the UK, particularly if infrastructure upgrades are needed to meet the country's decarbonisation goals.

However, the extent of these cost increases is expected to be limited. The primary inputs for electricity generation, such as natural gas, nuclear fuel and renewables, are not directly affected by the CBAM, meaning the core fuel costs will remain largely unaffected. Moreover, any increase in capital expenditure due to higher material costs would be spread over the long lifespan of power plant infrastructure, diluting the impact on annual electricity generation costs.

Therefore, while there may be some upward pressure on electricity generation costs due to the CBAM, the overall impact is expected to be modest. That said, it is likely that demand for energy as a result of AI, distributed ledger technology and the need to back up renewables with baseload will increase dramatically. Anything that raises the cost of electricity will therefore have a disproportionate impact.

To model the potential effects, we extend the analysis to two scenarios that reflect possible increases in electricity costs: a 2.9% rise in the first scenario and a 5.1% increase in the second. These figures represent a simple average of the tariff increases across the affected product categories calculated in the earlier section (Table on page 19). Accordingly, we assume that the Electricity Cost subcomponent of the Domestic Competition (DC) Index decreases in proportion to these price increases.

The ACMD Model suggests that a unit increase in the DC Index of the UK is associated with a 13.3% rise in GDP per capita. Based on this relationship, the projected impacts on GDP per capita from the changes in electricity costs under the two scenarios are as follows: Scenario 1, with a 2.9% increase in electricity prices, would result in a 0.006-point reduction in the DC Index and a corresponding 0.08% decrease in GDP per capita. Scenario 2, with a 5.1% increase in electricity prices, would lead to a 0.010-point drop in the DCI, translating to a 0.13% decline in GDP per capita.

The results for the two scenarios are given in the following table:

| | **Scenario 1** | **Scenario 2** |
|---|---|---|
| Change in price of electricity | +2.9% | +5.1% |
| Change in DC index | -0.006 | -0.011 |
| Change in GDP per capita | =0.08% | -0.15% |

**The overall impact on GDP per capita resulting from the CBAM through the international and domestic competition channels will be approximately £301.24 (-0.77%) in Scenario 2. In Scenario 1, the impact of the CBAM will be a loss of £156.98 per person (-0.40%).**

# 10. Impact if Supply Chain Re-Orientation is Considered

It should be noted that the above calculation is based on an assumption that supply chains stay the same. Clearly that will not be the case if the CBAM does not apply and locks in supply chains to their current EU model. Because the UK was in the EU with no tariffs or customs process inside the bloc, but tariffs and process for imports from outside the bloc, supply chains would have been drawn into the EU bloc while the UK maintained membership. The advantage of the UK being outside the EU is that supply chains can now reorient to the lowest cost and most efficient supply.

While supply chains take time to reorient, the ACMD model is a state-to-state model so we can compare the differences between a hypothetically different supply chain which takes advantage of the cheapest possible producers. This also takes into account the impact of the UK's independent trade policy where it is negotiating trade deals with a number of countries lowering tariffs for these products with them. Where these producers are from developing countries where carbon intensity of production is high, and there is no carbon pricing mechanism, the CBAM will prevent these benefits from being realised. Therefore this second model considers what those benefits might be to the UK economy.

We therefore make the following critical assumptions: the countries to which supply chains will reorient are those cheaper suppliers from developing countries where no carbon pricing mechanism applies, and therefore the tariff applied under CBAM will be at the top end of the range. We have preserved a broad modelling approach on the basis that it is not possible to know precisely how these supply chains might reorient and which supplier countries might over time supplant the present high-cost suppliers, in the absence of CBAM We include elsewhere in this paper information about the differential costs of suppliers of CBAM in scope products and it can readily be seen that the differences between EU and non-EU suppliers is significant (see footnote 59).

It is also to be noted that there will likely be significant potential other trade impacts of the CBAM with respect to those developing countries with which the UK is presently in trade negotiations (or has separate trade agreements) as tariff benefits given might be undercut by CBAM and because attempts to secure services liberalisation might be thwarted if defensive market access issues are made more difficult to resolve because of the presence and application of the CBAM. This could have a significant effect on UK services opportunities going forward (which is a substantial part of the overall UK economy). We take this into consideration when determining the attenuation factor (see below).

CBAM would impose an across-the-board tariff on six sectors (initially). Under the ACMD Model, tariff barriers constitute a weighted percentage of the overall International Competition pillar score. The tariff variables of the International Competition pillar is 29%. We will therefore assume that GDP per capita movements attributable to tariffs are 29% of the total change in pillar score.

Given that 10% of the UK economy is manufacturing, but that services will be affected as discussed above, we propose an attenuation factor of 30%. We think this figure is quite conservative given the potential for both knock-on effects and expansion of the CBAM in the future to other sectors as the European Commission is currently contemplating. We noted that it is on record that the EU intends all products covered by the ETS to be in scope for CBAM, and if the UK were to mirror the EU CBAM all of the UK ETS products would similarly be in scope.

We have also lowered the DC pillar score to reflect concerns about lack of competition resulting from enhanced market power if potential competitors are removed from the UK market. Although the PR pillar score could also be implicated, we have assumed that it is not for the purpose of this calculation. Thus there is a risk that our evaluation underestimates the overall cost of the policy to the UK's GDP per capita. Since we do not know the exact tariff proposed, we have modelled a range of potential tariffs.

We have assumed a range where the tariff proposed is 10 and 25 percentage point levels, according to the following table. The reduction in IC scores is an assumption we have made based on a comparison of relatively open and relatively closed economies and their different scores in the IC pillar. For example, the highest scoring country during the 2010-2019 time period was Hong Kong at 6 and the lowest was Cameroon with 3. We have assumed that the imposition of a 10% tariff is about half of this difference, whereas the imposition of a 25% tariff is close to this difference. The DC decline is much more limited, although we have increased it to take account of the risk that the CBAM will harden incumbent market power advantage.

| Tariff Proposed | IC Score Change | DC Score Change | PR Score Change |
|---|---|---|---|
| 10 | -1.5 | -0.5 | 0 |
| 25 | -2.5 | -1.0 | 0 |

We expect that as the tariff goes up, there will be a roughly exponential increase in the negative impact on IC scores. The DC score will only be affected significantly when the tariff proposed is sufficiently high to impact supply chains, leading to possible areas where enhanced market power or even monopoly power might be conferred. We see changes in DC pillar scores in the business freedom and electricity cost/time sub pillars amounting to 31.1%.

We know that a one-point reduction in IC scores equates of between 0% and 7.6% GDP per capita reduction, and a one point reduction in DC scores equates to roughly between 11.1% and 13.3% reduction in GDP per capita scores for the UK. We have also applied the 29% weighting referred to above for the IC pillar.

| Tariff Proposed | Negative GDP per capita impact/IC | Negative GDP per capita impact/IC | Total GDP per capita impact/state to state[43] | Approximate cost per UK person (before attenuation) |
|---|---|---|---|---|
| 10 | 1.653 | 0.462 | 2.115 | £700 |
| 25 | -2.5 | 3.794 | 6.549 | £2,177 |

This is on the basis that all of the UK economy is affected by CBAM. We now apply an attenuation factor to reflect what we believe to be the actual scale of the UK economy affected. As noted, the attenuation factor is 30%. **This means a cost of £210 - £653** depending on the level of the tariff per UK person per year. This attenuation factor recognises the significant second order effects because the immediate CBAM products affected are critical inputs for a number of other sectors. We have also taken into consideration the potential impact of many more products which are in the EU CBAM pipeline (42 products – ultimately everything to which the ETS may apply) which the UK will have to follow if it is following CBAM.

# 11. Summary of Both Scenarios

There is a significant cost to the UK citizen in either of these scenarios but the impact of CBAM in terms of locking in current supply chains that are heavily based on G7 (and predominantly EU) suppliers is perhaps the greatest impact. It will prevent the UK's supply chains from resetting to find the lowest cost suppliers. We have not considered the potential anti-competitive harm caused by suppliers raising prices, because they know UK consumers are now limited in their choices. The second scenario picks up some of these effects.

Unsurprisingly, the impact of the calculation assuming supply chains will reorient is larger (by a factor of between 2 and 3) than the calculation based on supply chains remaining as they are.

# 12. Sector Specific Outcomes[44]

We now turn to some sector specific effects based on the direct effects of CBAM on key sectors. There are significant potential costs increases in all these sectors as illustrated below. This is another way of looking at where the potential costs could apply across the supply chain and thus supports the approximations in the application of the ACMD model to a scenario where supply chains reorient.

## Example 1. Steel

The average UK ETS auction price in July 2024 was £41.78 per tonne of CO2 equivalent and steel production emits 2.32 tonnes of CO2e per tonne of steel produced using Basic Oxygen Furnace (BOF)[45], therefore the CBAM applied to a tonne of imported steel would be £96.93 less any ETS paid in the country of production. If the steel was produced from recycled steel using an Electric Arc Furnace (Scrap-EAF) then the CO2e emissions per tonne would fall to 0.67 tonnes of CO2e per tonne of steel.

In 2023, the UK imported 905,374 tonnes of HS7210 Flat-rolled products of iron or non-alloy steel > 600mm. The UK's largest import supplier was Vietnam, supplying 155,505 tonnes with an average price of £751 per tonne.[46] Vietnam does not yet have an ETS but plans to pilot a carbon trading exchange from 2025. If this steel was new steel made by BOF, then the UK's proposed CBAM would add 13% to the price, if it was recycled scrap EAF steel, the CBAM would add 4% to the price.

In 2023, steel imported from Turkey in HS7213 Bars and Rods of iron or non-alloy steel had an average landed price of £594 per tonne[47] and steel imported from Turkey in HS7216 Angles, shapes and sections of iron and non-alloy steel, had an average import price of £766 per tonne.[48] Both HS codes are covered by the UK's proposed CBAM. As Turkey has yet to implement its proposed Emissions Trading Scheme, the UK CBAM would add 16% and 13% to the average import price if the steel is made by BOF. If these imported steel products were made with scrap EAF, then the UK CBAM cost would be £27.99 per tonne, respectively 5% and 4% of the average import prices per tonne.

### Example 2. Cement

Similarly, cement production emits 0.86 tonnes of CO2e per tonne of cement.[49] At the UK average July 2024 ETS auction price of £41.78 per tonne of CO2e, the CBAM charge on imported cement would be £35.93 per tonne less any ETS paid in the country of production. Algerian cement clinkers (HS252310) can be imported for an average cost of £65 per tonne[50] but adding the full CBAM would increase the price by 55%. Egyptian cement (HS252390) was imported in 2023 with an average price of £68 per tonne,[51] the CBAM would add 53% to the price.

### Example 3. Glass

Glass emissions are 0.57 tonnes of CO2e per tonne[52] and so the UK CBAM would be £23.81 per tonne. This would add 8% to the average imported cost of HS7005 float glass from Malaysia at £311 or 7% to imported float glass from Turkey at £355.[53]

### Example 4. Ceramic Products - Bricks, Roofing and Floor Tiles

Brick production emits 0.48 tonnes of CO2e per tonne of bricks[54] and the CBAM would add £20.05 per tonne to imported bricks, about 7% to the average price of bricks (HS6901) imported from Turkey at £293 per tonne or 7% to the imported price of bricks from India at £307 per tonne.[55]

Ceramic roof tiles (HS6905) produce 2.2 tonnes of CO2e per tonne. The CBAM cost would add £96.93 per tonne to imported roof tiles. For tiles imported from Sri Lanka for £414 per tonne, the CBAM would have added 22.2% to the import price.[56]

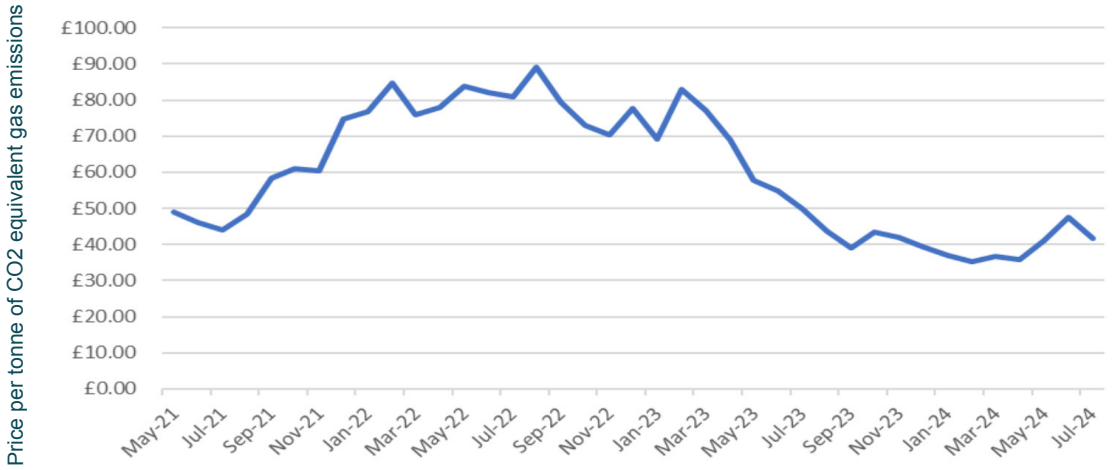
Ceramic flags, paving, hearth or wall tiles (HS6907) were imported from India for an average price of £266 per tonne.[57] Production of ceramic floor tiles produces 14.4 kg of CO2 per square metre.[58] Every millimetre thickness of a ceramic tile weighs 1.75kg per square metre. Using an average thickness of 9mm, ceramic floor tiles would weigh 15.75kg per square metre and produce 0.9143 tonnes of CO2e per tonne. This would add a CBAM of 14% to imported floor tiles from India.

## 13. Increased Construction Costs

Steel, glass, bricks and cement are the basic building blocks of houses and multi-storey buildings whether for residential or commercial use. It is unlikely that the proposed CBAM would be less than 1% on imports for the building industry. And these prices do not include the additional administration cost of recording the import supplier of all imported materials.

Additionally, the present average monthly ETS auction price of £41.78 is at close to its lowest level since inception. Using the highest monthly average auction price, £89.05, reached in August 2022, the CBAM costs would have been £206.60 per tonne of BOF steel and £59.66 per tonne of ARF steel, £76.58 per tonne for cement, £50.76 per tonne for glass and £48.74 per tonne for bricks. The volatility of the UK's ETS auction price can be seen in the graph below. This will add another problem for building material importers, as products imported when the ETS price was high could be undercut by goods imported by other companies when the ETS was lower.

**Monthly Average ETS Auction Price**




*source: https://www.gov.uk/government/publications/taking-part-in-the-uk-emissions-trading-scheme-markets/cost-containment-mechanism-ccm-trigger-prices-and-average-monthly-prices-full-table*

Importantly, these costs are just the tax imposed on imports; the administrative costs to the importers would also be passed on to customers as well. Importers may try to escape the CBAM by exclusively importing goods from EU countries, but EU countries tend to be more expensive producers, so any saving on CBAM would be paid in higher priced goods.[59] And either way, importers will still have to keep accurate records on import suppliers and manufacturers for six years in order to prove to the Treasury that the goods had indeed already paid for their carbon emissions in the country of origin.

Some importers might do this just to simplify their record keeping as the UK is proposing to apply a CBAM on both complex goods and on the precursor goods used to make them.

How would these additional costs affect the construction industry?

The CBAM cost on the average new build UK free-standing, 3-bedroom house of 1,500 sq ft, if that house were made entirely of materials imported from countries without an ETS and assuming the UK has stopped free allowances and subsidies for domestic producers, would be at least £3,572 on the basic building material costs[60] without considering any appliances or heating equipment, floor coverings other than bathroom tiles, wall and floor insulation or plasterboard. And this would be a minimum cost as the government has also proposed adding an additional Carbon Price Support (CPS) tax on electricity used to produce the imported raw materials. The UK's CPS is presently £18 per tonne of CO2 equivalent (CO2e).

Obviously there are many other dimensions and materials that could be used to build houses. But all of the materials used in this example will be subject to the proposed CBAM if they are produced in countries without an ETS or if their ETS has a lower carbon price than the UK. In the example above, the additional CBAM cost of £3,572 would add at least 1.16% to the average UK family home price of £307,000.

There will be a similar food cost increase as a result of CBAM being applied to fertiliser and second-order costs added to imported foods grown using fertilisers, diesel-powered farm machinery and transported in refrigerated vehicles or ships.

# 14. Other Impacts

We have thus far focused on the economic and productivity costs to the UK's GDP per capita of the CBAM. However, there are a number of other areas in geoeconomic policy and geopolitics where the introduction of things like the CBAM will have important effects. We review some of these below.

## 14.1 Impact on Electricity Accessibility and Cost in Developing Countries

The impact of using the carbon intensity of electricity generated on the national electricity grid will push developing countries to move away from fossil fuels if they are to avoid paying large CBAM tariffs. The problem for developing countries is that 730 million of the world's people currently have no access to electricity and 1.13 billion people have access but cannot afford electricity because of high cost. This group is also adversely affected by electricity that is not reliable.[61] According to the UNDP data, while progress has been made for access (75% access in 2000, 90% by 2020), the number of people who are not using electricity (because of cost or intermittency/unreliability) is 60% greater than the number without access, and little progress seems to be being made to shift these numbers.

Anything which increases costs or decreases reliability will therefore be very damaging to this cohort who live primarily in developing countries. Already India is responding to the CBAM threat by seeking to reduce the dependence of its grid on coal-fired power stations. Supporters of CBAM policy might argue that this is exactly what is needed. However the consequences to millions of Indian citizens will be severe.

As energy costs in developing countries go up, the pressure on people becomes more and more severe, and the threat of civil unrest becomes real. While it might be argued that the West can sustain higher energy costs without unduly burdening its citizens (although recent concerns expressed about the ten per cent increase in the UK's energy price cap suggest otherwise), this cannot be said of the billions of people living in the developing world. Their voice will pressure governments to do all in their power to reduce the cost of energy. If this means that CBAM-type costs cannot be avoided, industries in these countries will increasingly look to other BRICS markets to replace what they would be losing in the G7. Whether those exports can be absorbed by the BRICS markets will depend on their growth rates.

## 14.2 Implications for Tariff Policy

There are implications for UK tariff policy if it follows the EU CBAM system. For these six products initially and any others into the future (including the 42 which are in the pipeline), the UK would be ceding its ability to negotiate its own external tariff to the EU.

The UK has just completed the formal ratification process for its Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) accession (with Peru as the sixth of the CPTPP countries to formally ratify, which is the minimum needed for accession to be completed fully). Ultimately, all products subject to the UK ETS would have to be within scope of a UK CBAM that follows the EU version. This effectively removes a large range of products from the UK's tariff policy.

The UK would be giving countries tariff concessions with one hand, and UK CBAM would be taking them away with the other (at least for products in scope). These countries would question the value of negotiating with the UK and would necessarily prioritise negotiations with the EU. Given that the UK is presently in negotiations with India and the GCC, these countries might focus their attention more on their EU negotiations.

### 14.3 Impact on Developing Countries' Economies

It is important to evaluate the impact of CBAM on developing countries in wider economic development terms. We have discussed in the earlier section the impact of developing countries altering the way they produce electricity in order to avoid CBAM charges. We will now consider the impact of CBAM charges assuming they cannot make these changes.

As noted above, the CBAM will once fully operational be based on both direct carbon costs as well as indirect costs. This will have a significant impact on developing countries, since indirect cost evaluation allows the EU (or UK if it adopts the EU CBAM approach) to calculate the carbon impact of a particular product based on the manner in which the electricity used in its production was produced. So if a developing country like Bangladesh which has started producing steel (since 2015) uses coal-fired power stations in its electricity mix, then that could be factored into the carbon cost of the steel produced.

In order to avoid these tariffs, countries will have to match the net zero ambition of the EU on their electricity grids. There is also a danger of distortion since the EU is committed to supporting the least-developed countries' (LDCs) transition to green energy, which means the vast majority of developing country producers will face pressure from LDC producers who will have lower costs of entry into the EU or UK market. This will operate like a reverse tariff erosion where market access between LDCs and other developing countries will be different as a result of the EU or UK CBAM. Since the majority of the world's poor live in larger developing countries as opposed to LDCs, this could have negative impacts on development and increase poverty around the world.

## 15. Are there alternatives to EU CBAM?

There are many alternatives to solve the problem above which have not been addressed by the UK government at all, still less have their costs to the overall economy been separately evaluated to inform policy choices.

### 15.1 Trade and Agriculture Commission ("TAC")

The TAC proposed a way of tackling the trade and competition effects of climate change on production methods.[62]

The TAC proposals are important as these were agreed by the TAC as a whole, comprising members of the farming community and environmental NGOs. The TAC has additional weight as a body established by the government to consider the impact of UK trade policy on the agricultural sector.

Farmers had identified similar “carbon leakage” concerns as underpin the adoption of the CBAM. Solutions to that concern, as agreed by the farming community and environmental NGOs, therefore have potential application to the wider CBAM and carbon leakage debate.

In essence, the TAC proposal articulated a mechanism to deal with carbon leakage concerns expressed by the National Farmers Union and environmental NGOs by viewing deviations from agreed climate change agreements as market distortions which might (or might not) have anti-competitive effects.

If an affected firm or industry could show the deviation from an international agreement (the distortion), that it is anti-competitive in a relevant product and geographic market, and causation and damage, then a tariffication of that distortion can be granted. This would be administered by the UK Trade Remedy Authority. Since the tariff in this case would be specifically targeted at removing the cost advantage of the ACMD, then it would not have a negative effect on the ACMD Model International Competition Pillar Score.

Only Libya, Bolivia and Greenland have not agreed net zero targets, so if other countries are taking actions that are inconsistent with these targets, a case for distortion could be made out.

Given the limited impact of this on the UK economy, and the fact that any tariffication is dealing with a very specific distortion as opposed to the general approach of the CBAM, we think its impact on GDP per capita would be small. Importantly, smaller developing countries that have little effect on global trade would not be affected, enabling their economies to grow and thrive.

We have applied an attenuation coefficient of 0.05 as because the CBAM is a forensic tool, it will implicate much less of the UK economy than the CBAM. The tables for the TAC proposal are as follows:

| Tariffication | IC Score Change | DC Score Change | PR Score Change |
|---|---|---|---|
| 5 | 0.10 | 0 | 0 |
| 10 | 0.25 | 0.5 | 0 |
| 25 | 1.5 | 1.0 | 0 |

| Tariffication | Negative GDP per capita impact/IC/% | Negative GDP per capita impact/DC/% | Total GDP per capita impact/state to state/% | Negative GDP per capita impact/annualised/% | Approximate cost per UK person/per year/Total |
|---|---|---|---|---|---|
| 5 | 0.76 | 0 | 0.76 | 0.076 | £24 |
| 10 | 1.90 | 6 | 7.90 | 0.790 | £257 |
| 25 | 11.40 | 12 | 23.4 | 2.340 | £762 |

The ACMD tariffication mechanism, however, works very differently from a generalised CBAM, and therefore the attenuation coefficient (reflecting the amount of the UK economy affected) is likely to be much lower than for the CBAM. We have assumed that the only defendant country against which the ACMD mechanism is likely to be used is China (otherwise anti-competitive effect will be hard to prove). We therefore assume an attenuation coefficient of 0.05, suggesting potential cost of £1 (negligible) for a 5% ACMD tariff through to £32 for a 25% tariffication.

Application of the TAC ACMD tariff is unlikely to implicate the smaller developing country producers (as anti-competitive effect would be harder to establish until their exports became much, much larger). This mechanism is also much less concerning to countries with which the UK is negotiating FTAs as it is more targeted and therefore would have less of a potential impact on UK services export opportunities.

The TAC recommendations are also critical to ensuring geopolitical stability. This approach can be defended on the basis that its mechanism is much more targeted than CBAM, and therefore will be more positively received by developing countries. The mechanism also enables adversely affected parties to raise issues themselves, which does not engage significant government time, is more immune to political influences and ensures through the adversarial process better empirical evidence to be adduced.

## 15.2 Climate and Freedom Accord

### 15.2.1 The Climate & Freedom Accord: Strategies and Proposals

The Climate & Freedom Accord (CFA) – a collaboratively-designed straw proposal for an international free market agreement on climate and sustainable development – emerged out of a series of policy innovation workshops convened, since 2016, by members of what is now known as the Climate & Freedom International Coalition. This fellowship of think-tanks, scholars, journalists and policymakers developed a different approach to climate change, focusing more on the innovation needed to develop new technologies within a broadly free trade framework.

The CFA approach emphasises technology-neutral, positive incentive policies that expand freedom and remove the barriers, burdens and costs that governments impose on citizens, innovators and economies.

The Accord has two fundamental guiding principles. First, since technologies must improve to deliver both net zero and prosperity, innovation is the essential tool needed to solve climate change. Second, since freedom and competition have been the main driver of innovation acceleration in the last period of global economic growth (post-GATT system in 1947), then freedom and competition-based markets are the key policies needed to accelerate the innovation necessary to solve climate change.

It is well established that the most prosperous economies are the cleanest, and that core free market policies are not climate-neutral, but actually accelerate decarbonisation.

For instance, a recent study comparing competitive versus monopoly U.S. power markets finds that competitive power markets are decarbonising 66% faster than uncompetitive power markets.[63] Competitive markets drive down costs, allow new innovators easier market access and allow consumers to demand newer, cleaner, cheaper, healthier and more reliable electricity. By contrast, monopolies have no economic reason to innovate or care about consumer desires, or cut costs.

CFA tax proposals include both tax rate cuts on business and investor income, and well-understood income deductions for expenses with charitable, economic and environmental benefits.

The most innovative CFA tax proposals increase rates of return, both for all innovation and low-carbon innovation. They mostly include only supply-side tax rate cuts, because rate cuts uniquely accelerate all successful innovators by allowing them to keep more of their profit, while avoiding subsidy-related drawbacks. For instance, business income tax rate cuts will not lead to subsidy bubbles, because the underlying businesses must be profitable, without subsidies, to benefit from the tax rate cuts. Key elements include:

**(i)** Improve domestic competition.

**(ii)** Increase GDP per capita by tax cuts, fiscal policy and pro-competitive regulation. Countries at more advanced stages of economic development can be shown to pollute less and have better environmental outcomes across the board.

**(iii)** The use of Rapid Innovation Funds (RIFs). These provide private, tax-exempt debt financing. RIFs reduce the cost of new investments, to accelerate capital flow to new investments. By reducing the cost of capital, RIFs accelerate the deployment of the newest, most efficient, lowest emission technologies, built to the latest specifications. They empower developers, entrepreneurs, funds and banks to raise tax-exempt debt in any participating country, using bonds, loans, savings accounts, mutual funds etc., and invest the funds in property, plant and equipment (PP&E) and conservation investments in any Accord country.[64]

**(iv)** The countries that subscribe to this approach could come together in the form of a coalition that would agree not to apply carbon taxes or tariffs on each other's trade. Such a coalition could also agree basic principles on reducing market distortions. This could be a group of countries such as proposed for the ACMD initiative – the U.S., UK, Australia and Japan, then broadening this to CPTPP countries.

**(v)** De-monopolisation tax cuts. One interesting element of the CFA is the concept of de-monopolisation tax cuts. These are tax cuts that would be given for the sale of shares of monopolies as part of an effort to introduce competition, either through a privatisation or other sale where no capital gains tax would be payable for a two-year period.

The key elements of CFA which have been proposed are as follows:

1. Commitment to growing the economy through open trade, and competition will lead to positive improvements on the IC and DC pillars of the ACMD Model.
2. Decarbonisation and clean tax cuts. These operate in the opposite way to conventional carbon pricing. Where a carbon price operates as a negative incentive that therefore risks offshoring of emissions, decarbonisation tax cuts create a positive incentive that accelerates capital flows and innovation, increasing competitiveness and attracting investment. The CFA also suggests an intriguing idea that companies that come up with profitable zero carbon technologies without subsidisation should be eligible for a "game changer tax cut". This supply side incentive could have significant impact on innovation, and would set up the opposite scenario where often companies that invest heavily to create "game changer" technology are then subject to windfall profits taxes or antitrust enforcement.
3. A tax break on de-monopolisation is one way of countervailing the enormous power of incumbents.
4. Full expensing for environmental goods, production etc.
5. An agreement among CFA member countries that they would not raise barriers to each other, provided they were Accord members.

We have modelled several of these elements below. The summary of their impacts is in the box below.

The CFA assumes that countries will adopt zero tariffs between themselves on all goods and will commit to not raising tariffs through border adjustment mechanisms or otherwise.

The total impact of the CFA proposals on GDP per capita would be an increase of £980 (2.49%) in the lower bound scenario, rising to £1,024 (2.60%) in case of wider adoption:

- £548-£591 through an improvement in the Trade Freedom Score
- £97 through an improvement in the LPI Customs score
- £139 through improvements in electricity cost and time
- £196 through improvement in Financial Freedom

### 15.2.2 Modelling Trade Effects of IC Pillar

The implementation of the CFA is expected to have a significant positive impact on the UK's Trade Freedom score and its international competitiveness. This analysis evaluates the potential effects under two adoption scenarios.

**Scenario 1:** Adoption by key trading partners: the EU, EFTA, U.S. and Canada.

**Scenario 2:** An expanded adoption that includes the countries from Scenario 1, plus members of the CPTPP, the GCC and India.

The equation for the Trade Freedom score is as follows:

$$Trade\ Freedom_i = \frac{100(Tariff_{max} - Tariff_i)}{Tariff_{max} - Tariff_{min}} - NTB_i$$

Where $Tariff_{max}$ is the maximum tariff applied to a partner country; $Tariff_{min}$ is the minimum applied; $NTB_i$ is the qualitative assessment of non-trade barriers faced by country $i$.

Under Scenario 1, the group of countries represents 62% of the UK's imports. The elimination of tariffs would reduce the UK's Most Favoured nation (MFN) average tariff rate from 3.45% to 1.05%.

Under Scenario 2, this would concern 68% of UK imports. Under this broader coalition, the abolition of tariffs would lower the UK's MFN average tariff rate from 3.45% to 0.87%.

Alongside tariff reductions, we also estimated a decrease in non-tariff barriers (NTBs) associated with the CFA. According to the methodology used in the Trade Freedom score, NTBs, as calculated by the WTO, include administrative costs and domestic charges imposed on imports subject to tariffs. These measures are relevant to the CFA and, as such, we projected a 62% reduction in NTBs in Scenario 1, reflecting the proportion of imports from the involved countries. In Scenario 2, we assumed a 68% reduction in NTBs, aligning with the larger share of imports under the extended group of countries. We are assuming that there is a proportional decrease and that NTBs are closely linked to the volume of imports, and that reductions in tariffs lead to corresponding declines in administrative and regulatory burdens.

With the reductions in tariffs and NTBs factored in, we calculated the new International Competition (IC) score for the UK in both scenarios. The Trade Freedom score would increase by 0.63 in Scenario 1 and by 0.68 in Scenario 2.

| | Decrease in overall tariff (percentage points) | NTB pre-CFA | NTB post-CFA | IC pre-CFA | **IC Index post-CFA** | Impact to GDP per capita 2023 |
|---|---|---|---|---|---|---|
| Scenario 1 | 2.40 | 9.1 | 3.5 | 5.60 | 5.79 | £547.59 |
| Scenario 2 | 2.57 | 9.1 | 2.9 | 5.60 | 5.80 | £591.05 |

### 15.2.3 Customs Impacts

Transport costs create frictions in international trading systems that can induce inefficient outcomes by mollifying market forces. The ACDM econometric model captures this through the LPI Customs Indicator that captures the efficiency of countries' customs and border agency processes. Adoption of a CFA proposal may considerably improve the efficiency of customs agents through the removal of administrative burdens induced by tariffs and through harmonised product regulation enabled by free trade agreements.

We have proxied the likely impact as a reversal of the decrease in the UK's score that occurred between the period of 2016-2018 from 5.47 to 5.16.

| | UK score | NTB UK score under CFA | Impact to IC index | Impact to GDP per capita |
|---|---|---|---|---|
| IC Index | 5.16 | 5.47 | 0.033 | £97.48 (0.25%) |

### 15.2.4 Modelling Impact on Domestic Competition Pillar

The CFA focuses on implementing policies which aim to promote market efficiency by bolstering Domestic Competition, with many aspects being captured in the AMCD model. One way in which the CFA can impact Domestic Competition is lowering electricity prices by promoting more competitive domestic industries. The CFA sets out a guideline to effectively dissolve monopolies, by incentivising monopolies to sell their assets through tax cuts on capital gains. This policy can aid the electricity supply sector in the UK which suffers from regional monopolies. Once an incentive for monopolies to dissolve has been created, Domestic Competition should increase as these monopolies will separate into smaller firms. Research suggests that monopolies have historically charged 10% higher prices to consumers in areas with no other energy provider when compared to similar consumers in areas with more competition.[65] CFA policies promoting the dissolution of monopolies should lower the share of electricity consumers who are subject to these higher prices which arise from a lack of competition, resulting in lower average electricity costs in the UK. The UK already scores highly in electricity prices (6.98 out of 7) so we model a change to a theoretical 7.

In addition to energy cost savings, the dissolution of energy monopolies may result in a scenario where perfect competition between energy suppliers is offering more competitive timings for energy delivery. If the CFA leads to the dissolution of monopolies and fosters competition among electricity providers, this will result in inefficient firms being outcompeted by firms which are able to supply electricity in a shorter time period. If this situation of perfect competition were to arise, then we would expect the average time in working days required to install electricity to a new building to decrease. We model a scenario looking at the impact from an increase in the Time subscore to the same level as the highest performer in this category (UAE).**This leads to an increase of 0.027 in the DC index, and a subsequent increase in GDP per capita by 0.35%, equivalent to £139.32.**

| | UK score pre CFA | UK score post CFA | Change to DC index | Impact to GDP per capita/2023 |
|---|---|---|---|---|
| DC Index | 5.92 | 5.94 | 0.027 | £139.32 |

### 15.2.5 Modelling Impact on Financial Freedom Subvariable

The CFA proposal may change Financial Freedom through openness to foreign competition. The ACMD econometric model captures distortions created by regulations in banking and finance sectors through the Heritage Foundation's Financial Freedom index. Adoption of the CFA provision would see streamlined bond market rules foster cross-border investment and capital freedom. Internationally reciprocal tax-exempt debt would remove asymmetries that distort international capital flows. This would lead to efficiency gains in capital allocation, realising dead weight losses induced by present distortions. We take a scenario-based approach to model this and consider the UK's adoption of a tax-streamlined approach to a best-in-class performer such as Australia which scores highly on the index.

| | UK score | AUS score | Impact to DC index | Impact to GDP per capita/2023 |
|---|---|---|---|---|
| Financial Freedom score | 5.8 | 6.4 | 0.0375 | £196.08 |

**The total impact of the CFA proposals on GDP per capita would be an increase of £980 (2.49%) in the lower bound scenario, rising to £1,024 (2.60%) in case of wider adoption**

# 16. Conclusion

**As noted at the outset, the purpose of this paper is not to evaluate the likely success of various attempts to deal with carbon leakage and the climate change policy that leads to it.**

**We also do not comment on the likely ability of various schemes to impact climate change in a meaningful way. We are concerned in this paper only with the costs so policymakers have better ways of evaluating the toolkit of policies available to them.**

**We have shown in this paper that the GDP per capita impacts of the UK following the EU CBAM are significant.**

**At a time when the UK is struggling to grow economically, and both the ruling Labour government and the opposition Conservative Party have expressed the need for economic growth, adoption of EU CBAM would move the UK in the wrong growth direction.**

**Fortunately, for the UK and for those who seek meaningful solutions to carbon leakage and the climate change that leads to it, other options exist.**

**We have evaluated some of these and shown that there are even proposals being floated that, far from limiting economic growth, actually increase it, such as the CFA.**

**We have also noted that there are significant impacts on global security and geopolitics that are outside the scope of a narrow economic study. These factors cannot be ignored.**

# Endnotes

1 These projections are from the UK government's own projections, although they are not to be read as "forecasts". See DESNZ's Traded carbon values used for modelling purposes (2023) at https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2023

2 *European Communities – Measures Prohibiting the Importation and Marketing of Seal Products*, WT/DS400/AB/R and WT/DS401/AB/R (WTO, 22 May 2014) available at https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S006.aspx?Query=(@Symbol=%20wt/ds400/ab/r*%20not%20rw*)&Language=ENGLISH&Context=FomerScriptedSearch&languageUIChanged=true#.

3 Article XX(g) requires the measure to be made effective in conjunction with restrictions on domestic production or consumption; and satisfy the requirement of the chapeau of Article XX to the effect that it is not applied as arbitrary or unjustifiable discrimination, or as a disguised restriction on trade.

4 See for example Shanker A. Singham, "Market Access and Market Contestability: Is the Difference purely semantics?", *Brooklyn Journal of International Law*, Volume 25, Issue 2 (1999): https://brooklynworks.brooklaw.edu/bjil/vol25/iss2/24; Shanker A. Singham, "Advancing the competition and trade policy agenda: Public Sector Restraints on Trade in the Free Trade Area of the Americas", *International Antitrust Bulletin*, 4,2 (Summer 2001); Shanker A. Singham and D. Daniel Sokol, "Public Sector Restraints: Behind the Border Trade Barriers", *Texas International Law Journal*, Vol. 39, 625 (2004)

5 Alden F. Abbott and Shanker A. Singham, *"Enhancing welfare by attacking anticompetitive market distortions", Concurrences*, No. 4 (December 2011): https://ssrn.com/abstract=1977517

6 See Shanker Singham, *Freeing the Global Market: How to Boost the Economy by Curbing Regulatory Distortions*, Council for Foreign Relations (October 2012): https://www.cfr.org/sites/default/files/pdf/2012/09/CFR_WorkingPaper15_Singham.pdf

7 See Shanker Singham, Robert Bradley and U. Srinivasa Rangan, "The effect of anticompetitive market distortions (ACMDs) on Global Markets", *Concurrences* (December 2014)

8 See Shanker A. Singham, U. Srinivasa Rangan, Robert Bradley and A. Molly Kiniry, *Anti-Competitive Market Distortions and their Impact: A case study of India*, Legatum Institute (May 2016): https://img1.wsimg.com/blobby/go/bf4d316c-4c0b-4e87-8edb-350f819ee031/downloads/1cstfqts9_122710.pdf?ver=1603533215968; see also Shanker A. Singham and A. Molly Kiniry, An Introduction to Anti-Competitive Market Distortions, Legatum Institute (September 2016): https://img1.wsimg.com/blobby/go/bf4d316c-4c0b-4e87-8edb-350f819ee031/downloads/1cste45av_640953.pdf?ver=1603533215968

9 *See An Agent Based model of Trade: Market Distortions and Output*, Cebr, February 2019: https://img1.wsimg.com/blobby/go/bf4d316c-4c0b-4e87-8edb-350f819ee031/downloads/Cebr%20Market%20Distortions%20Trade%20Report.pdf?ver=1603533215968

10 Address by Mr. Rod Sims, Making markets work for increased productivity and growth: the Australian experience address, available at https://www.accc.gov.au/about-us/news/speeches/making-markets-work-for-increased-productivity-and-growth-the-australian-experience-address

11 *Review of National Competition Policy Reforms*, Australian Government Productivity Commission (28 February 2005): https://www.pc.gov.au/inquiries/completed/national-competition-policy/report/ncp.pdf

12 Shikhar Singla, *Regulatory Costs and Market Power*, LawFin Working Paper No. 47 (23 February 2023): https://ssrn.com/abstract=4368609

13 Frederik Erixon, Oscar Guinea and Oscar du Roy, *If the EU was a State in the United States: Comparing Economic Growth between EU and US States*, ECIPE (July 2023): https://ecipe.org/publications/comparing-economic-growth-between-eu-and-us-states/

14 Growth Commission papers can be found at www.growth-commission.com

15 As proposed and argued in Shanker Singham, *A General Theory of Trade and Competition: Trade Liberalisation and Competitive Markets*, Cameron May (2007), and Shanker A. Singham and Alden F. Abbott, *Trade, Competition and Domestic Regulatory Policy* (Routledge, 2023); international competition is way of describing the openness of a country's trade regime.

16 Eirik G. Furubotn and Svetozar Pejovich, "Property Rights and Economic Theory: A Survey of the Recent Literature", *Journal of Economic Literature*, Vol. 10 No. 4 (December 1972): pp. 1137-1162

17 Timothy Besley, "Property Rights and Investment Incentives: Theory and Evidence from Ghana", The *Journal of Political Economy*, Vol. 103, Issue 5 (October 1995): pp. 903-937

18 A lack of property rights protection creates what De Soto calls "dead capital" – the poor cannot leverage the assets they do accumulate, which prevents entrepreneurialism. See Hernando De Soto, *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else* (Basic, 2000)

19 For a detailed treatment of the importance of intellectual property rights, see chapter 9 of Shanker Singham, *A General Theory of Trade and Competition: Trade Liberalisation and Competitive Markets*, Cameron May (2007)

20 Either financially or through time commitments

21 That is, the Heritage Foundation describes why a country receives each level of score and this, in turn, provides a framework for the aspects of policy which we considered in building our indicator. See http://www.heritage.org/index/property-rights

22 Michael E. Porter, *The Competitive Advantage of Nations* (Free Press, 1990), as cited in Mariko Sakakibara and Michael E. Porter, "Competing at Home to Win Abroad: Evidence from Japanese Industry", *The Review of Economics and Statistics*, (May 2001), 83(2): 310-322. Positive externalities include, "... supplier availability, easier access to technology and market information, and specialized human resource development" (Sakakibara, et al. p. 310).

23 As part of our Domestic Competition indicator we include an indicator of the success of policy in limiting the ability of private entities to restrict competition through the "Effectiveness of Anti-Monopoly Policy" variable in the "Industrial Organisation Regulation" subcategory.

24 Timothy J. Muris, “Principles for a Successful Competition Agency”, *University of Chicago Law Review*, Vol. 72, No. 1 (Winter 2005): pp. 165-187, George Mason Law & Economics Research Paper No. 06-24: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=901677

25 Similarly, the Washington Consensus includes privatisation as one of the ten key areas of development because of the belief that that ”private industry is managed more effciently than state enterprises, because of the more direct incentives faced by a manager who either has a direct personal stake in the profits of an enterprise or else is accountable to those who do. At the very least, the threat of bankruptcy places a floor under the ineffciency of private enterprises, whereas many state enterprises seem to have unlimited access to subsidies.” This theory is the backbone of our Domestic Competition indicator. However, regulation of private markets is not discussed in the Washington Consensus. We correct this oversight by emphasising the importance of policies which allow firms to make their own decisions. Originally conceived in: John Williamson, ”What Washington Means by Policy Reform”, Chapter 2 from *Latin American Adjustment: How Much Has Happened?*, (April 1990) now available at http://iie.com/publications/papers/paper.cfm?ResearchID=486 See also: http://www.economicshelp.org/blog/7387/economics/washington-consensus-definition-and-criticism/ and http://www.piie.com/publications/chapters_preview/6628/02iie6628.pdf

26 When changing market characteristics, such as new technologies, eliminate natural monopoly conditions, however, maintaining government regulation may become counterproductive and welfare-inimical, and such regulation should be lifted.

27 Before the government acts, care should be taken to ensure that the private sector cannot adequately rectify the market failure at issue, and that the costs associated with government intervention are not likely to outweigh the benefits that flow from eliminating (or reducing) the market failure.

28 The welfare-maximising number and size of firms will depend on the market (type of good, substitutes, demand etc.)

29 The ideal infrastructure measures would be those that reflect the policy for awarding contracts for infrastructure projects (specifically, for building, managing or maintaining infrastructure). However, the primary data available is concerned with outcomes, with only a couple of exceptions in financial infrastructure.

30 For a description of the theory see: Claustre Bajona, Mark J. Gibson, Timothy J. Kehoe and Kim J. Ruhl, *Trade Liberalization, Growth, and Productivity*, prepared for the conference “New Directions in International Trade Theory” at the University of Nottingham in 2008: http://www.econ.umn.edu/~tkehoe/papers/BajonaGibsonKehoeRuhl.pdf
Note: These authors also highlight the fact that trade openness does not always lead to increased GDP and that the theory does not predict an increase in GDP from openness. The theory does predict greater welfare from openness, though. We will use GDP per capita as our proxy for welfare because we do not have a direct measure of welfare. There are many sources which do find a positive relationship between openness and GDP. A few examples include (as cited in Bajona et al. (2010)): J. A. Frankel and D. Romer, “Does Trade Cause Growth?”, *American Economic Review*, 89 (1999):pp. 379-399; R. Hall and C. Jones, “Why do some countries produce so much more output per worker than others?”, *Quarterly Journal of Economics* 114 (1999): pp. 83-116; Francisco Alcalá and Antonio Ciccone, “Trade and Productivity”, *Quarterly Journal of Economics*, 119 (2004): pp. 613-46

31 Williamson (1990) op. cit.

32 Though, again, no emphasis was given to the competitive environment within a country except for the stress on privatisation.

33 See Singham, Bradley and Rangan (2014) op. cit.

34 This work was conducted by economics consultancy Cebr using the ACMD Model but applying it to current trade flows.

35 From DESNZ UK Carbon Border Adjustment Mechanism factsheet at https://www.gov.uk/government/consultations/addressing-carbon-leakage-risk-to-support-decarbonisation/outcome/factsheet-uk-carbon-border-adjustment-mechanism

36 See World Bank Group Technical Note for the CBAM exposure index at https://www.worldbank.org/en/topic/trade/brief/technical-note-for-the-cbam-exposure-index

37 Details available at https://www.pwc.co.uk/services/sustainability-climate-change/insights/ieta-market-sentiment-survey.html

38 HM Treasury's *Introduction of a UK carbon border adjustment mechanism from January 2027* (*Consultation)* is available at https://assets.publishing.service.gov.uk/media/65fc11fef1d3a0001132ac6f/Introduction_of_a_UK_carbon_border_adjustment_mechanism_from_January_2027.docx.pdf

39 It is worth noting that HS6810 (which includes articles of cement such as building blocks and bricks) is not included in the commodities within scope, while HS2523 is included (Portland, aluminous, slag, super sulphate and similar hydraulic cements)

40 DESNZ's *Traded carbon values used for modelling purposes* (2023) available at https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2023/traded-carbon-values-used-for-modelling-purposes-2023

41 HM Treasury's *Introduction of a UK carbon border adjustment mechanism from January 2027 (Consultation)* op. cit.

42 ibid.

43 The model evaluates the GDP per capita from the current state to the distorted state by imposing the distortion onto the system. The rate of increase or decrease of GDP per capita will depend on the length of time policies take to be implemented.

44 Sector Specific Outcomes have been developed by Catherine McBride

45 *Sustainability performance* of the steel industry 2003-2021, World Steel Association (December 2022): https://worldsteel.org/wp-content/uploads/Sustainability-Indicators-2022-report.pdf

46 Trade Map - List of supplying markets for a product imported by United Kingdom

47 Trade Map - List of supplying markets for a product imported by United Kingdom

48 Trade Map - List of supplying markets for a product imported by United Kingdom

49 MPA Fact Sheet 18 https://cement.mineralproducts.org/MPACement/media/Cement/Publications/Fact-Sheets/FS_18_Embodied_CO2e.pdf

50 Trade Map - List of supplying markets for a product imported by United Kingdom

51 Trade Map - List of supplying markets for a product imported by United Kingdom

52 Andreas Schmitz, Jacek Kamiński, Bianca Maria Scalet and Antonio Soria, "Energy consumption and CO2 emissions of the European glass industry", *Energy Policy Volume* 39, Issue 1 (January 2011): pp 142-155, https://www.sciencedirect.com/science/article/abs/pii/S0301421510007081

53 Trade Map - List of supplying markets for a product imported by United Kingdom

54 Blaine Brownell, How Can We Reduce the Carbon Footprint of Bricks?, *Architect Magazine* (17 August 2023): https://www.architectmagazine.com/design/how-can-we-reduce-the-carbon-footprint-of-bricks_o

55 Trade Map - List of supplying markets for a product imported by United Kingdom

56 Trade Map - List of supplying markets for a product imported by United Kingdom

57 Trade Map - List of supplying markets for a product imported by United Kingdom

58 Ibtisam Abbasi, "Thorough Lifecycle Analysis of Ceramic Tiles", AZO Materials (14 March 2023): https://www.azom.com/article.aspx?ArticleID=22544

59 See full table at https://www.growth-commission.com/wp-content/uploads/2024/09/Spreadsheet-for-inclusion-in-CBAM-paper.xlsx

60 Building material assumptions: 8 tonnes of cement for foundations and for brick work; 29 tonnes of steel for rebars, beams, internal wall frames, floor and roof joists, and beading, nails, screws and bolts; 255 square metres of bricks; 80 square metres of roof tiles; 28 square metres of double-glazed windows; 30 metres of ceramic drain pipes, 18.5 metres of aluminium guttering and hoppers; 28 metres of aluminium downpipes; and 70 square metres of bathroom tiles.

61 See Brian Min, Zachary O'Keefe, Babatunde Abidoye, Kwawu Mensan Gaba, Trevor Monroe, Benjamin Stewart, Kim Baugh, Bruno Sánchez-Andrade, Nuño and Riad Meddeb, "Beyond access: 1.18 billion in energy poverty despite rising electricity access", UNDP (12 June 2024): https://data.undp.org/blog/1-18-billion-around-the-world-in-energy-poverty

62 See Trade and Agriculture Commission reports at https://www.gov.uk/government/publications/trade-and-agriculture-commission-tac

63 Wayne Winegarden, Affordable and Reliable: Creating competitive electricity markets to deliver consumers affordable, reliable, and low-emission electricity, Pacific Research Institute (September 2021): https://www.pacificresearch.org/wp-content/uploads/2021/09/ERR_EnergyCompetition_F.pdf

64 Some believe that RIFs should also fund PP&E maintenance and payroll, because maintaining an asset reduces emissions, in general, and extending the RIFs to operating costs would also reduce the expected cost of new projects.

65 See Energy Supply Probe - initial findings report, Ofgem (2008): https://www.ofgem.gov.uk/sites/default/files/docs/2008/10/energy-supply-probe---initial-findings-report.pdf

The Growth Commission is supported by The Growth Initiative Ltd, company no. 14785841.
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