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Thieß Petersen and Thomas Rausch

## Carbon needs a price – and proactive economic policy measures

**Greenhouse gas emissions must be reduced if climate change is to be slowed. Charging a higher price for emissions is an effective way to achieve that goal. Making emissions more expensive reduces emissions-generating activities and increases incentives to develop and use low-emission technologies. To avoid social hardship, however, proactive economic policy measures are also required, especially in the areas of social welfare, industrial production and innovation, and foreign trade.**

The release of greenhouse gases into the atmosphere leads to global warming and climate change. This results in several negative effects. Among the most important are a rise in sea levels, a greater risk of flooding and, consequently, damage from floodwaters; more extreme weather (heat waves, droughts, storms, etc.); and undesirable impacts on ecological systems (e.g. mass extinction of animal and plant species). This, in turn, results in negative consequences for human beings, including:

- Melting glaciers lead to reduced water supplies. This affects agriculture and food production, which also suffer from advancing desertification. In addition, it becomes more difficult to ensure

adequate provision of drinking water for human consumption.

- As global warming continues, heat-related illnesses and deaths increase, especially cardiovascular ailments. The higher frequency of hurricanes and tornados means greater destruction of homes, production facilities and infrastructure, as well as human injuries and deaths.
- Water shortages, storms, floods and a higher average global temperature result in smaller harvests, which threaten food supplies for the world's growing population – especially in the Global South.

- Other consequences include a greater number of forest fires, more insects and, as a result, the spread of insect-borne illnesses (e. g. malaria, Lyme disease), along with more acidic oceans due to increased concentrations of carbon dioxide (CO<sub>2</sub>), which negatively impacts fish stocks.

The excessive level of greenhouse gas emissions can largely be traced back to one factor, namely that the costs associated with the negative consequences of emissions are not included in market prices. Thus, consumers and companies pay too little for the activities that generate greenhouse gas emissions, relative to the overall economic costs. When prices are too low, overuse occurs – and the total volume of emissions is too high. On its own, the market cannot correct this situation, which is therefore called market failure.

Correcting market failure requires government intervention. A number of tools could potentially be deployed here. One is putting a price on the negative impacts that the global community suffers from the release of one ton of CO<sub>2</sub> into the atmosphere.

CO<sub>2</sub> is a synonym for all the greenhouse gases caused by humanity that are harmful to the environment. If, for example, one ton of CO<sub>2</sub> emitted in Germany in the year 2020 leads to global damages amounting to €195 – the value calculated by the German Environment Agency at the end of 2020 (see Bünger and Matthey 2020: 8) – then a tax of €195 would be imposed on one ton of CO<sub>2</sub>.

Alternatively, emissions can also be reduced if the state sets a national annual limit on the volume of emissions and issues certificates for that amount. People engaging in activities that generate emissions may only do so if they are in possession of enough certificates, which are auctioned off again every year. Theoretically, under ideal conditions the price of a certificate for one ton of CO<sub>2</sub>, as set at auction, would correspond to the amount of the tax imposed

on one ton of emissions (see Petersen 2021: 47 – 50).

### **What higher carbon prices achieve**

When the price of carbon rises in a country, there are a number of economic and environmental consequences.

In the short term, a higher carbon price leads to a reduction in the demand for and supply of carbon-containing products and activities in that country. When the state engages in carbon pricing, it raises prices for consumers. The volume of goods and services they demand falls as a result. The net price that businesses receive also declines, since they can usually only pass along part of the tax (or the price of emissions certificates) to consumers. When net prices fall, companies reduce the quantity of goods they offer. In addition, the amount of goods produced by the national economy declines, since domestically manufactured goods that generate emissions are less competitive internationally and are exported less. Production, real gross domestic product (GDP), employment and income all decline in the country as a result. At the same time, the volume of emissions generated during production sinks, i.e. the country's "territorial emissions" fall.

Countries react to higher prices for CO<sub>2</sub> emissions by adapting their production technologies. This leads to technological advances, i.e. to greater resource and energy efficiency. That makes it possible to manufacture a given amount of goods with fewer resources – and, therefore, fewer emissions.

Yet technological changes take time. They require research and development, along with investments to adapt production capacities. Technological advances leading to lower-emission products and production processes therefore occur in the medium term. Ideally, this means that real GDP increases, but fewer emissions are needed to produce that GDP. The growth that results is therefore called sustainable growth or "green growth."

### Undesirable side effects of higher carbon prices

A higher carbon price can have four main undesirable side effects. The first three relate to the country that imposes it. The fourth relates to the volume of global emissions.

First, increasing the price of greenhouse gas emissions can lead to social tensions. For lower-income households in particular, a sharp rise in prices for energy and emissions-generating consumer goods leads to a noticeable loss of purchasing power. Higher-income households can more easily sustain such a loss. Social inequality could increase as a result.

Second, in certain economic sectors, businesses and the people they employ will face disadvantages in the form of lower incomes and even job losses. This mainly applies to sectors with a high capital intensity, because greater use of capital means greater energy consumption, which leads to higher greenhouse gas emissions. If consumers are not willing to pay the higher product prices that result, then production will decline, factories will close and workers will find themselves without jobs.

Third, if the country raises its carbon price unilaterally, it risks becoming less competitive internationally. If other countries put a lower price on greenhouse gas emissions or none at all, there will be an economic incentive to relocate emissions-intensive activities to those countries. This shift reduces domestic production, employment and income.

Fourth, this cross-border migration of production can result in what is known as “carbon leakage.” This term is used to describe what happens when the unilateral introduction of a price on greenhouse gases (or an increase in the existing price) in one country causes economic activities to be displaced to another. That means these activities migrate from countries with stringent climate policies to those with less demanding emissions requirements (see Borsky 2020: 3 f.). Ultimately, this can even result in an increase in global emissions. A higher carbon price can lead

to such a situation if the production technologies used abroad are more harmful to the environment than those in the country that raised its carbon price, and if importing the goods produced abroad is associated with higher emissions.

### Social policy measures for offsetting higher carbon prices

Various measures could serve as a social policy response to an increase in the price of carbon (see Petersen 2021: 125–128):

- Payment of a set amount to all individuals (capitation payment) and businesses: For companies, this could vary, as in Switzerland, according to total payroll.
- Differentiated payments to particularly hard-hit stakeholders: For lower-income households, this would mean needs-based grants, e. g. an allowance for commuters who travel greater distances.
- Lower taxes and fees: One instrument would be reduced social insurance contributions. Private households would benefit (since their disposable income rises if at least one member of the household holds a job requiring social insurance contributions) as would businesses (since non-wage labor costs would fall, lowering production costs and boosting price competitiveness). Alternatively, other taxes could be lowered, e.g. consumption taxes, such as the tax on electricity, value added or sales tax, or even income tax.
- Reduced prices for public-sector products that lower emissions: In terms of mobility, it would be possible to expand public transport networks while simultaneously reducing fares. The state would thus be lowering the cost of mobility, which would increase the purchasing power of people using the transport system. One internationally recognized solution is the one implemented by the city of Vienna, which makes it possible for residents to

purchase a yearly ticket for the public transport system for €365 (see BUND 2017: 9).

- Another measure for preventing social hardship would be setting different prices for greenhouse gas emissions resulting from different goods (see Claeys, Tagliapietra and Zachmann 2019: 16). For lower-income private households, a lower carbon price could be put on products that are essential and difficult to substitute – above all, heat and electricity – than on products considered luxury goods, such as air travel.

### **Industrial and innovation policy measures for offsetting higher carbon prices**

For the most part, businesses drive technological progress. A higher carbon price gives them the incentive to adopt technological innovations that decrease emissions. This incentive is reinforced by the desire consumers have to use lower-emission products in order to reduce their spending on consumption. Thus, most of the technological progress needed to curtail greenhouse gas emissions can be achieved through the market and competition, if businesses and consumers face higher emissions prices imposed by the state and if they respond as outlined above. However, the full range of required technology innovations will not materialize unless the state also takes action.

So-called general-purpose technologies (GPTs) are an area in which the state must play a proactive role. GPTs are technologies that spread to many sectors of the economy and that, over time, become more effective and cheaper, facilitating the invention and manufacture of new products. Examples include air and space travel, nuclear power, the Internet and information technologies. Private companies are rarely willing to invest in GPTs, since the latter's economic viability is too uncertain. Moreover, too much time is required to take a technology to market and realize a profit (see Mazzucato 2014: 52, 85, 112).

In addition, GPTs have positive externalities, since they spill over into many other sectors. A positive externality can also be considered a market failure which requires government intervention. If economic actors bear all the costs of an activity but are not compensated for all its social benefits, their level of activity will be too low, measured against the socially optimal level.

Network effects, moreover, are characteristic of several low-emission technologies and products. For example, if people are to use electric vehicles more, they must have access to an adequate network of charging stations. Public-sector investment can be the impetus for creating this charging infrastructure, as can government support for those providing the infrastructure (see SVR 2020: 264 f.). This would be justifiable from a policy perspective, since these network effects are a positive externality that requires government support.

A final point is the use of existing physical infrastructure that initially required a major investment of capital and that can remain in service for a long time to come. Even if new lower-emission technologies are available, it might make sense from an economic viewpoint to keep using, for the foreseeable future, more emissions-intensive infrastructure that has already been paid for. That is the only way a company can reclaim its invested capital, i.e. through yearly depreciation. Without a policy response by the state, there will be no switch to the lower-emission technology that benefits society as a whole.

The unique aspects of these emissions-reducing technological advances thus necessitate that the state – in addition to introducing a price on carbon or raising the existing price – plays a more extensive, proactive role in promoting low-emission technologies in the economy as a whole. Various measures are possible here, including:

- Government-funded basic research that provides a foundation, first and foremost, for promoting new GPTs.



- Payment of subsidies for technologies or production processes with positive externalities.
- Government investment that provides the public infrastructure needed to use new technologies.
- Long-term commitments by the state to purchase the innovative products and services based on climate-friendly technologies that businesses want to introduce. This gives companies greater planning security and a higher expected return on investment.
- To promote innovation in the private sector, the state can lower innovation-related business taxes or increase the options for claiming depreciation.
- Finally, a vertical industrial policy is also conceivable, which the state could use to promote industries and sectors that are considered particularly relevant for transitioning to a green economy.

### Foreign trade measures for offsetting higher carbon prices

If a country goes it alone in introducing a carbon price that is higher than the one generally found elsewhere in the world, it provides a competitive advantage to companies from countries with a low carbon price that produce emissions-generating products. This has two main economic effects:

1. Emissions-generating products from abroad become more attractive for domestic consumers. Countries with low carbon prices can increase their exports as a result. This boosts production, GDP and employment in these countries.
2. Emissions-generating products from abroad also become more attractive for consumers in third markets – i.e. those markets importing products from countries with a high carbon price and from those with a low carbon price. Countries with less stringent climate policies can therefore increase their exports, boosting real GDP abroad.

In addition to these economic effects, there are ecological consequences: While the higher carbon price causes emissions to decline on the territory of the country raising its price, it also leads to a rise in the volume of emissions released in the rest of the world – the phenomenon of carbon leakage described above.

Thus, the volume of global emissions can only be reduced to a limited extent when one country unilaterally imposes a high price on carbon. The reason is that large differences in carbon prices make carbon leakage all the more attractive – reduced emissions in one country are offset by greater emissions in countries with lower carbon prices. For ecological reasons, a higher carbon price must therefore be accompanied by offsetting measures in the area of foreign trade.

These measures can be realized through a carbon border adjustment mechanism (CBAM), such as the one the European Union plans to introduce. There are two key instruments that can be deployed to offset the loss of price competitiveness (see Petersen 2021: 137–139). Initially at least, however, the EU will be relying only on the first:

1. Products that are imported from abroad are subject to an emissions duty or a carbon tariff in the EU. The amount of this tariff is based on the volume of emissions caused by the manufacture of these products abroad. That means all products sold in the EU are subject to the same EU emissions price – regardless of whether the product originates in the EU or in a non-member state.
2. Goods exported by European firms are exempt from the carbon price charged in the EU. That means the EU's carbon price does not increase export prices, allowing companies based in the EU to retain their international price competitiveness.

If a carbon tariff is imposed and exporting companies are exempted from paying the domestic carbon price, a full border adjustment has been achieved. This has two main consequences. First, foreign sellers reduce their

offerings in the EU since they are less competitive there. Conversely, European companies increase their production and make up for some of the emissions-generating products would otherwise be imported from abroad. The EU's territorial emissions increase, while emissions in the rest of the world decrease. Second, since they are no longer subject to Europe's carbon price, European companies can again export more to other countries.

### Economic policy recommendations

Due to their ambitious climate goals, developed countries in particular will continue to set more stringent emissions targets. An economic and social policy response will therefore gain in importance. Which economic advantages the state will grant as part of this response and which disadvantages it will offset is a question of macroeconomic preferences and value judgements – and, therefore, cannot be answered in mathematical or theoretical terms alone. In a democracy, this crucial decision can only be made through a policy discussion involving society as a whole. We would therefore like to offer three points for consideration as this discussion unfolds:

1. Environmental and economic policy arguments should not be pitted against each other. In the long term, a good climate policy is also a good economic policy, since a healthy economic system cannot exist without a healthy ecosystem. Successful economic policy will therefore depend on developing a positive vision of a sustainable economy, one that many people in society share as the vision of a desirable future. This is a key prerequisite if the majority is to lend its support to transformative measures that are difficult but necessary.
2. Mitigating individual social hardships is at least as important for ensuring acceptance by society as a whole. Higher carbon prices threaten to exacerbate existing social inequalities because they hit poorer and smaller households particularly hard. To prevent social cohesion from eroding further

– and to avoid paving the way for populists and demagogues in the next economic crisis – higher carbon prices should be coupled with social policy measures which compensate those population segments that are disproportionately affected.

3. The international level should play more than just a secondary role, in terms of climate protection measures and the economic policies that reinforce those measures. The coming Climate Change Conference in Glasgow will rightly focus on both topics, calling for environmental cooperation and economic support. Developed countries, which are primarily responsible for the globe's excessive CO<sub>2</sub> emissions, have pledged \$100 billion to developing countries in order to fund measures for reducing emissions and adapting processes. It would be a major success for the conference if the participants were to agree on concrete steps for implementing that pledge, while forging a coalition of high-emission states willing to advance the idea of a climate club comprising as many members as possible.

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## Publication Details

Bertelsmann Stiftung  
Carl-Bertelsmann-Straße 256  
D-33311 Gütersloh

Armando Garcia Schmidt  
Telephone: +49 5241 81-81543  
[armando.garciaschmidt@bertelsmann-stiftung.de](mailto:armando.garciaschmidt@bertelsmann-stiftung.de)

Dr. Thieß Petersen  
Telephone: +49 5241 81-81218  
[thiess.petersen@bertelsmann-stiftung.de](mailto:thiess.petersen@bertelsmann-stiftung.de)

Eric Thode  
Telephone: +49 5241 81-81581  
[eric.thode@bertelsmann-stiftung.de](mailto:eric.thode@bertelsmann-stiftung.de)

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## Author | Contact

**Dr. Thieß Petersen**  
Megatrends Program  
Bertelsmann Stiftung  
[thiess.petersen@bertelsmann-stiftung.de](mailto:thiess.petersen@bertelsmann-stiftung.de)  
Telephone: +49 5241 81-81218

**Thomas Rausch**  
Megatrends Program  
Bertelsmann Stiftung  
[thomas.rausch@bertelsmann-stiftung.de](mailto:thomas.rausch@bertelsmann-stiftung.de)  
Telephone: +49 5241 81-813300

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