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Introducing stringent taxation to stop climate change

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Germany has made a commitment to reduce its greenhouse gas emissions to 55 percent of the 1990 level by 2030 and to be carbon-neutral by 2050. The chief economists of the Savings Banks Finance Group recommend the introduction of a stringent tax regime because time is of the essence. A tax regime is the best solution in the short term. If globally binding negotiated solutions permit, the tax regime can, in due course, be replaced by a global emission trading scheme. The key elements of a stringent taxation solution are:

- → Symmetry: This means, for instance, that companies which emit carbon dioxide will pay taxes, while companies which absorb carbon dioxide will receive a subsidy, i.e. they will pay a negative tax.
- → The resulting distribution effects should be counteracted by using the tax revenue for the purpose of redistribution.
- → A governmental regulatory policy that is based on prohibitions is not an efficient solution because of the associated information problems.

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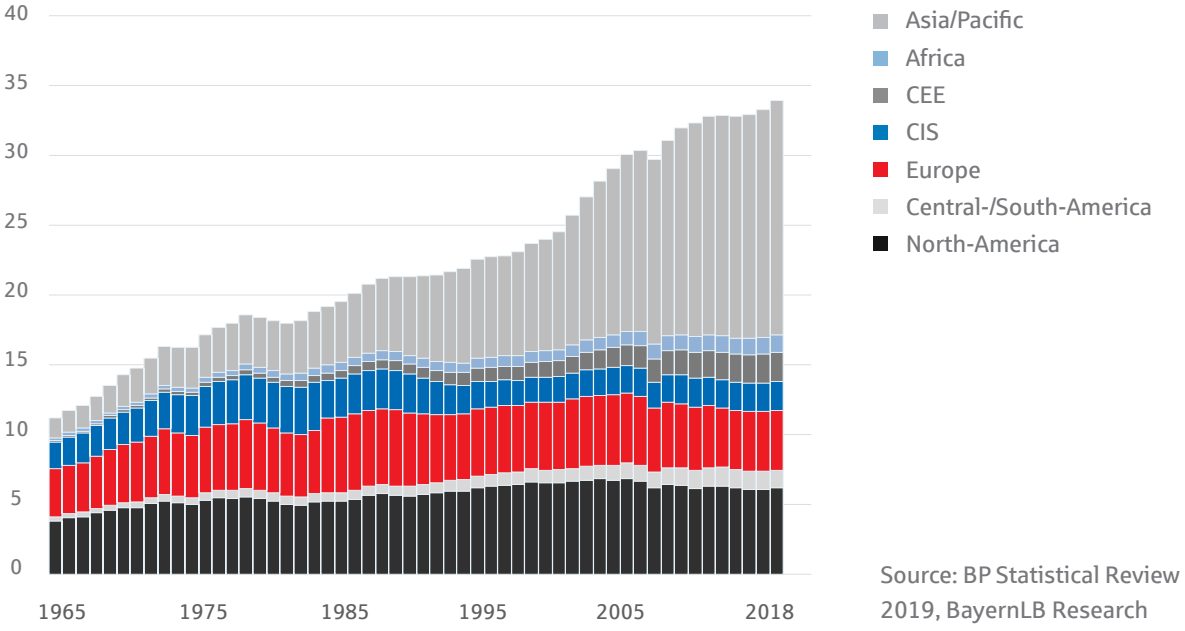
Time is running out

Climate change is also man-made; this has been substantiated by scientific evidence, and it is also widely accepted in the public today. Despite an economic slowdown, global carbon emissions amounted to 34 gigatonnes (33,891 billion tonnes) in 2018. According to NASA, the total volume of carbon dioxide in the atmosphere has increased by approx. 35 percent since pre-industrial times. And emission rates will tend to move upward, rather than level off. In 2018, for instance, global emissions increased by 0.6 gigatonnes year-on-year, i.e. by 2.0 percent – the highest rate in seven years.

No signs of reduction: Carbon emissions in billion tonnes,
by region, annual figures



Source: BP Statistical Review 2019, BayernLB Research

In addition, there is a risk that the man-made greenhouse effect might be compounded by natural processes. When permafrost soil thaws, for instance, it releases not only carbon dioxide but also methane, which is 28 times more potent as a greenhouse gas than carbon dioxide. Permafrost soils account for approx. one-quarter of the northern hemisphere's land surface. In addition, wetlands (swamps, etc.) might dry up due to longer dry periods, hot spells, and direct human interventions, so that the significant carbon volumes bound in the wetlands might be additionally released. In the long term, climate change might take on a life of its own due to these pro-cyclical effects.

Today, it is practically certain that the international community will not be able to meet the 2 degrees Celsius target laid down in the Paris Agreement. The national plans that have been submitted are not ambitious enough for this purpose. Based on the current plans, the world is heading towards a temperature rise of more than 3 degrees Celsius by the year 2100. However, if the reduction of emissions continues to be as slow as it has been so far, Germany will not be able to meet its own targets in this emission reduction plan.

The German government's targets up to 2020 and 2030 as well as achievement of targets

	Target 2020	Target 2030	Status 2016	Target-Traffic-lights
Renewable Energy Sources (RES)				
RES share of gross electricity consumption	35%	50%	38%*	
RES share of gross final energy consumption	18%		14.8%	
RES share of heat consumption	14%		13.2%	
Greenhouse Gas Emissions				
Reduction of carbon emissions (vs. 1990)	-40%	-55%	-27.5**%	
Efficiency and Consumption				
Heating requirements buildings (vs. 2008)	-20%		-6.3%	
Primary energy consumption (vs. 2008)	-20%		-6.5%	
Final energy consumption transport (vs. 2005)	-10%		+4.2%	
Final energy productivity (2008-2050) p. a.	+2.1%		+1.1%	

Source: German Ministry for Economic Affairs and Energy, 6th Monitoring Report

* 2018 estimates **2017 figures

Even in a "2 degrees Celsius world", the economic cost can be expected to be significant. This will not only affect people living in low-altitude coastal regions or along rivers. Higher temperatures at the poles will more frequently lead to "Omega block" weather patterns, so that people worldwide will suffer from the effects of climate change. An Omega block is characterised by an area of high pressure which is flan-

ked by two lows on either side. This constellation is very stable and in 2018 led to the hot and extremely dry summer in Europe. This weather pattern is likely to occur more frequently as the mean annual temperature increases. As a result, the challenges – for Germany's farmers, for instance – will increase significantly. Last but not least, the incidence of heat strokes, ischaemic strokes and myocardial infarctions will rise during particularly hot summers. It is therefore desirable and necessary to limit climate change.

The goal is to lower carbon emissions to 55 percent of the 1990 level by 2030 and to reduce it to zero by the year 2050. "Zero" means that the volume of carbon emissions should be equal to the amount of carbon absorbed from the atmosphere. The goal is to reduce carbon emissions and to remove from the atmosphere carbon that has already been released – i.e. to achieve negative emissions – by stopping avoidable carbon emissions and by making use of technological innovations. Today, it is already possible to achieve negative emissions cost-effectively. In the construction sector, for instance, carbon dioxide can be bound in olivine and used as filler in buildings. In the chemical industry, there are processes for using carbon dioxide as a raw material for products. Furthermore, negative emissions can be generated by means of afforestation. The afforestation of non-agricultural land and the long-term conservation and creation of wetlands would also help to counteract the decline in biodiversity. "The Global Tree Restoration Potential" is the title of a study conducted by the Swiss Federal Institute of Technology (ETH) in Zurich, which has shown that afforestation can help to bind two-thirds of current man-made carbon dioxide emissions – without having to abandon any agricultural areas. All this shows that the current failure to achieve the targets is not due to the lack of technical feasibility.

Using various possibilities to reduce carbon dioxide emissions

Ways to achieve the targets

In principle, there are three means to achieve the emission reduction targets: voluntary measures, incentives, and the regulatory ("hands-on") approach. All three should be aimed at reducing the emissions of greenhouse gases and, at the same time, achieving the highest possible level of prosperity. This follows from the link between climate change and economic growth, which Joseph Heath explained in "Caring about Climate Change Implies Caring about Economic Growth". In this publication, he argues that the benefit for future generations needs to be chosen as the target variable to have a good justification for combating climate change. This benefit is maximised by a combi-

nation of preserved nature and high income. For this reason, we would do future generations a disservice if we were to devastate the Earth or ruin the economy.

Climate policy has so far been a traditional "open access problem", which occurs whenever a resource is shared by several individuals and where all of the individuals can consume as much as they like. In such a situation, the resource is overexploited because every individual – irrespective of whether this is a government, an enterprise or a person – will receive the entire additional benefit provided by consuming another unit, however, without bearing the entire cost. With this in mind, all of us share the Earth's atmosphere, and everyone can release as much carbon dioxide as they like. For an individual State, it is beneficial not to pay any attention to sustainability in connection with its carbon dioxide emissions because the consequential environmental costs are borne jointly by all (including future generations). And even within a State, no-one will readily accept the costs associated with the energy transition and the achievement of the emission reduction targets. The voluntary approach will therefore fail, as predicted by game theory. The fact that it is beneficial for all individuals to persist in their pattern of behaviour will lead to an inefficient condition for all. Hence, there is a need either for institutions that incentivise the desirable behaviour or for a governmental player that does everything on its own "hands-on".

Carbon dioxide emission: A traditional negative externality

Would government be able to manage climate change by imposing requirements and prohibitions? In this respect, there are two issues: inefficiency and fairness. Various legal requirements have already been enacted in the past to improve air quality, such as the European Union's fleet consumption targets for the automotive industry designed to reduce carbon dioxide emissions. The advantage is that this provides a clear basis for investment decisions by both industry and private individuals. However, this "hands-on" approach is hampered by information problems. Which sector should be regulated, and to what extent? If State-decreed emission reduction programmes are not efficient, it is difficult to argue that they are fair.

The third and most promising way is to apply incentive-based or incentive-compatible governance. With this approach, it is in the consumers' and enterprises' own interest to do what helps to achieve the overarching goal. Markets are allegedly very suitable for this approach. With regard to carbon dioxide, however, so called externalities need to be taken into account. These are unintended third-party effects – both negative and positive – due to the actions of individuals or enterprises, which are not factored into pricing. The carbon dioxide emissions released by a coal-fired power station, for instance, create a negative

externality for future generations. Conversely, carbon dioxide bound by a chemical company in polymers, methanol or similar products creates a positive externality. This is due to the fact that the coal-fired power station does not have to bear the consequential costs of climate change (leaving aside the EU emission trading scheme for a moment) and that the chemical company is not compensated for reducing the consequential cost of climate change. For this reason, releasing carbon dioxide to the atmospheres "all too often" pays off, while economic activities that bind carbon dioxide are not rewarded for their contribution to the socially desirable reduction of carbon dioxide emissions. There are two solutions to this problem: (1) a tax (according to Arthur Cecil Pigou), and (2) an emission trading scheme (according to Ronald Coase).

From a neoclassical perspective – i.e. if players are rational, if there is a general absence of bubbles, and if financial markets are efficient (including at least medium information efficiency) – the only difference between the solutions proposed by Coase and by Pigou is the question of whether the State sets the quantity or the price. If the State sets the quantity, allowances that entitle their holders to emit a certain quantity of carbon dioxide will be auctioned off. According to theory, the price would settle at the level of the marginal social costs for the additional emission of one unit of carbon dioxide. Knowing these costs, it does not make sense for any player to buy too few or too many allowances, hoping for a more favourable offer or higher prices later on. To avoid the penalty for illegal emissions, an enterprise always has the option to buy allowances or to reduce emissions, if necessary by cutting production. Enterprises will choose the most efficient solution, i.e. they will weigh up the costs of an allowance against the loss of profit due to (at worst) the loss of production, etc. The penalty for carbon dioxide emissions that are not covered by allowances is therefore the upper limit for the price of an allowance. If a suitable upper limit is chosen and consistently applied, a system of tradeable allowances can guarantee that the emission reduction targets will be met.

By comparison, if a tax is introduced, the State sets the price which will lead to an emission volume at which the marginal costs of avoiding an additional unit of carbon dioxide emissions are equal to the tax to be paid. Since the key target variable for mitigating climate change is not the price, but the quantity of carbon dioxide emissions, one might think that a system of tradeable allowances is the superior solution. Contrary to theory, however, players are restricted in terms of information in reality, and they do not act rationally. In reality, the solution involving allowances shows some weaknesses. Speculations by financial market players, short-sightedness of enterprises, and incom-

plete information can lead to market inefficiency. It is conceivable, for instance, that a player might stock up on an excessively large number of allowances, which would lead to an upward price distortion. This would immediately lead to unnecessary losses of economic output. It is also conceivable that an excessively high number of allowances might be bought for strategic reasons, perhaps to eliminate a competitor from the market, or even to throw the economy of a given country out of kilter. These two strategic risks could be successfully cushioned by a larger – e.g. global – market. If globally binding negotiated solutions permit, it may make sense in due course to introduce a global system of allowances.

Introducing a stringent tax regime now

The key elements of a stringent tax solution should primarily be symmetry, a climatically sustainable use of the net revenues, and a wise distribution policy. Symmetry means, for instance, that companies which emit carbon dioxide will pay taxes, while companies which absorb carbon dioxide will receive a subsidy, i.e. they will pay a negative tax. Should the tax be assessed at too low a level as a first step, it will be adjusted as a second step in order to achieve the intended incentive effect. The resulting distribution effects can subsequently be counteracted through the use of the tax revenue.

Why should a tax be symmetrical? As noted above, there are profit-making activities that bind carbon dioxide. Suppose that company C produces mattresses using foam made of carbon dioxide (i.e. which absorbs carbon dioxide) and calculates the price that it should charge for these mattresses. A negative tax (i.e. a subsidy) would enable company C to sell more mattresses than in a situation in which no tax credits are granted for negative emissions. A company that generates negative carbon dioxide emissions would then receive a positive amount. We advocate a symmetrical design in order not to abandon the potential for carbon-dioxide-binding economic activities.

Promoting sustainable business models with a carbon dioxide tax

The incentive effect to be achieved is of paramount importance in a stringent tax solution. The symmetrical design of the tax, alone, will inspire business models that lead to negative emissions. Earmarking – which was characteristic of the ecological tax reform implemented in Germany at the turn of the millennium – should be avoided because it would thwart the purpose of the incentive.

The principal criticism of a tax is that the State can only estimate the price it needs to set to achieve a certain quantitative target. However, this problem is more serious in theory than in practice because, in addition to research findings, experience has already been gathered with carbon dioxide taxes in several countries, including Switzerland (approx. EUR 86 per tonne, Source: Schweizerisches Bundesamt für Umwelt), the United Kingdom (approx. EUR 20, in addition to EU allowances, Source: Guardian 2 April 2015), and Sweden (approx. EUR 112, Source: Government website Sweden).

It is therefore possible to make an informed estimate and to adjust the tariff as required to ensure that the tax can also be passed on in the current environment of low interest rates and low inflation and to fulfil its steering effect. It can be expected that the "right" price will be found relatively quickly, i.e. the price at which the emission reduction target is achieved without subsequent negative emissions. Nevertheless, the tax scenario is characterised by the fact that, depending on the degree to which the incentive effect is achieved, the tax rates will have to be revised. It is therefore very important for the acceptance of the tax that this characteristic is communicated from the beginning to ensure that the climate policy will not lose credibility when an adjustment of the tax rate actually becomes necessary.

Although the incentive effect is crucial for a carbon tax, public acceptance is of prime importance, as well. Undesirable distribution effects of a carbon tax might seriously compromise acceptance. The revenue collected from the carbon tax should therefore be used to mitigate undesirable distribution effects. The available tax revenue could, for instance, be credited to a country's population as a per-capita lump sum. However, the problem is that not all citizens can freely decide on carbon dioxide emissions. To ensure the public's acceptance, commuters who have no access to local public transport should, for instance, be offered adequate compensation. Otherwise, general distribution conflicts would be intensified, similar to the developments seen in France. Another option would be to combine the introduction of the carbon tax with the abolition of other charges. Conceivable options include the renewables levy and the electricity tax, which are designed to shift the energy mix in Germany from fossil to renewable and more climate-friendly energy sources, or the air travel levy in the transport sector, which is payable per passenger and whose amount varies depending on the distance travelled.

Mitigate undesirable distribution effects with a wise distribution policy

Stimulating the current political debate

Climate change is a major political challenge in the early 21st century. The public at large is now also aware of the fact that this is a pressing issue. Diverging interests between countries and generations make it particularly difficult to internalise this externality. The existence of internationally binding commitments has now created a new situation, in which the quantitative emission reduction target is predetermined exogenously and the "only" thing that needs be done is to find an efficient and socially acceptable way to achieve this target.

We believe that carbon neutrality will be technically and economically feasible by 2050. A stringent tax solution whose cornerstone is its steering effect will likely be a particularly effective incentive-compatible system. If the taxation leads to undesirable distribution effects, the revenue collected from the carbon tax can be used to mitigate these effects. However, the revenue should not be earmarked. The question of the acceptance of a carbon tax plays a key role. We must not lose sight of distribution effects, not only in the long term, but also in the short term.

Disclaimer

The present position paper of the Chief Economists does not necessarily correspond to the attitude of the DekaBank or the attitude of the respective Landesbanken and Savings Banks.

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