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# Carbon Rent
# Lessons from the European Experience

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In everyday life, rent is associated with gain that is unjustified or acquired without effort and does not usually have a good reputation. In economics, the concept of rent does not carry this pejorative connotation. Rent mechanisms were revealed by the fathers of political economics, Adam Smith and David Ricardo. It is impossible to understand the economics of raw materials without these mechanisms. Carbon is no exception. The scarcity imposed on the emission rights of manufacturers subject to quotas has brought into being a new economic value with the status of rent: carbon rent.

This new concept will allow us to understand more fully the economic transfers resulting from the price of carbon emissions and the type of redistribution it generates among players. We will begin by studying the question in the European context before drawing broader lessons. This is not a purely theoretical exercise: reaching an international climate agreement essentially involves deciding how to mobilise and reallocate carbon rent among the various parties. It means finding a way of dividing up this rent to provide real environmental incentives and ensure fairness at the same time. This is what makes negotiating such an agreement so difficult.

## What is carbon rent?

First of all, rent is linked to scarcity. Let us take the case of oil rent . Oil is a non-renewable commodity. It is therefore marked by a certain degree of scarcity that increases over time as oil wells are gradually depleted. This scarcity is expressed by rent, which is added on to the other factors of production cost (including return on capital) to determine the price. Scarcity rent can be increased in the short term if there is an agreement among the main producers to hoard supplies. In the long term, it increases at the same pace as the scarcity of oil reserves.[*] The same scarcity mechanism underlies property rent: one square meter is worth 50,000 euros on the Champs-Elysées avenue, 1,000 euros in Aurillac in the Cantal department (Central France) and nothing in the Sahara because space is scarce in central Paris and abundant in the desert.

[*] The economist Hotelling has shown that the optimal growth rate of the price of rent must converge towards the long-term interest rate of the economy.

With its Emission Trading Scheme, Europe put an end to free carbon by introducing scarcity in the emissions rights of manufacturers. It thereby created *ex nihilo* a new scarcity rent: 2 billion tonnes of $CO_2$ that were worth nothing prior to 1st January 2005 are now worth between 20 and 50 billion euros, depending on the price of carbon emissions. This new economic value is a rent added to the production costs of $CO_2$ emitters.[†] The price of $CO_2$ is the price of this rent. If the European Union decides to increase its commitments by tightening constraints on industrialists, carbon allowances will go down and the price of carbon rent will go up. The overall value of the rent tends to rise if the impact of the price is greater than that of the quantities, which is usually the case.[‡] Conversely, if the European Union relaxes it rules, carbon rent will go down and could even disappear if the price of carbon emissions falls to zero. Over time, the volume of emission rights must be reduced and the value of the rent will therefore go up. The economy of emission permits is the story of creating and allocating this carbon rent.

A second important mechanism of rent is linked to differences in production costs. Ricardo brought this mechanism to light with regard to differences in soil fertility. Differential rent allows us to understand the rules of rent distribution among the various producers. The example of oil is a good illustration of this phenomena. At Ghawar, the world's largest oilfield located in Saudi Arabia, the cost of extracting a barrel of oil is about 2 dollars. If the price of oil is set at 100 dollars, the rent is 98 dollars per tonne extracted. In the North Sea, the cost is in the vicinity of 20 dollars and the rent drops to 80 dollars. The price at deep-sea drilling sites or for the extraction non-conventional oil is obviously higher and the rent is therefore further reduced.

The same mechanism is found in differential rent in the distribution of carbon rent among manufacturers. To produce 5,000 kWh of electricity – the average consumption of a European household – a utility company may emit, for example, 5 tonnes of $CO_2$ with a coal-fired power plant, 2.5 tonnes with a gas-fired power plant or zero tonnes from a hydroelectric dam. Let us suppose that the price of $CO_2$ is 20 euros a tonne. A power plant that switches from coal-fired production to gas-fired production obtains a differential rent of 50 euros to produce 5,000 kWh. If it switched to a zero-emissions resource such as hydraulic or nuclear energy, the differential rent would rise to 100 euros. The search for differential rent is what drives firms to reduce their emissions once a price has been set on carbon. It is environmentally virtuous. But, as we shall see, the distribution of carbon rent among the players also depends on other factors, particularly the method of allocating emission permits.

By analysing carbon rent, we can understand who is winning and who is losing in the allocation of emissions rights. It clarifies the consequences of the various methods selected for allocating those rights, particularly the choice between free allowances and purchased permits. Let us begin by examining how this process worked during the start-up phase of the European emissions trading system.

**An initial allocation favourable to companies**

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[†] This is clearly the case when allocations are purchased. In the case of free allocations, companies operating under quotas bear what economists call an "opportunity cost". The opportunity cost is the cost of giving up a gain. Once allowances become tradable and have a market value, the company that chooses to keep them is giving up income.

[‡] The marginal cost of reducing emissions is indeed growing, because emissions reductions are first made where they are least costly. In more technical terms, one would say that the curve of the short-term marginal cost is convex.

The end of free emissions is a positive step that is seldom greeted with enthusiasm by those who have to pay the bill. The activities that came under the quota system were heavy, concentrated industries often competing in an oligopoly. Familiar with lobbying techniques, when a price was set on carbon emissions, they promptly brandished the spectre of possible loss of competitiveness , or even worse, of relocation outside the E.U.. The pricing of carbon indeed had and will continue to have structuring economic repercussions. But this price can by no means be summed up as merely an additional expense weighing upon company costs!

During the 2005-2007 start-up period of the European carbon emissions market, virtually all the allowances were distributed free of charge to companies. Each year, companies could freely use their carbon rent, materialised by the $CO_2$ quotas they received, until they became compliant. When they achieved compliance, they had to pay for their emissions with the quotas. In cases where the allowances fell short, the companies' rent was not enough to cover the cost of all their emissions. However, if the allowances exceeded their needs, they kept part of the carbon rent. How should the resulting economic transfers be interpreted?

Aside from the power sector, companies profited from the sale of $CO_2$ allowances. Thus, they kept a part of the rent distributed with the quotas, totalling approximately two billion euros. In addition to this initial profit, they benefited from the impact of carbon rent on selling prices. However, in these industrial markets open to international competitors, product prices reflect the conditions of the international market. It was therefore difficult to pass on the cost of carbon emissions in the selling price. Taking into account market tensions during the period 2005-2007, it is possible that some manufacturers of major basic products such as steel or building materials partially succeeded in doing this. In these cases, they kept an additional fraction of carbon rent by having their customers finance the price of the allowances they received free of charge. It is impossible to give any indication of the size of this further potential gain.

In general, electric utilities had to by allowances: the scarcity rent distributed in the form of free allocation of $CO_2$ quotas was insufficient to ensure the repayment of the allowances when the companies became compliant. The cost of electric utilities exceeding their quotas in terms of net purchases of allowances was about two billion euros. But most of the cost was not borne by the electric power industry. It was paid for by the customers.

The structure of the electric power market is indeed quite specific. As electricity is neither stored nor well suited for transport, it is not subject to the same kind of international competition as steel or cardboard. In the past, most electric power was sold at regulated prices set by public authorities. With the arrival of market deregulation under the impetus of Brussels, an increasing percentage of electric power was traded on markets in which the breakeven price tended to correspond to the marginal cost: the cost of the last kWh in the grid. Supplying the last kWh in the grid starts up thermal power stations, which usually emit large amounts of $CO_2$. The marginal cost of electric power thus has a high carbon emissions component. Utilities companies incorporated into the prices billed to their customers some or all of the value of the quotas they received free of charge! In the end, the customers paid the scarcity rent initially distributed to electric utility companies in the form of free allowances.

During the first phase of European carbon emissions trading, the majority of companies profited from the quota system. In the non-power sector, they kept part of the scarcity rent distributed through free allowance allocation. Electric power producers were unable to pay

for all their emissions with this rent. On the other hand, they recovered most of it by incorporating the price of the carbon received free of charge into the price of the power they sold. The biggest contributors to the quota system during the first period were therefore the customers of the electric power industry who did not have access to regulated prices. Governments captured only an insignificant fraction of carbon rent by allocating virtually all allowances free of charge without taking advantage of the possibility of auctioning up to 5% of the allowances during the initial period.

**Rebalancing the initial allocation**

During the second period 2008-2012 of the European carbon market, the overall economic structure of the system has remained unchanged, but the allocation of carbon rent was modified in three ways: the cap on overall emissions was reduced by 9%; recourse to auctioning increased; and the use of Kyoto credits was authorised within certain limits.

Tightening the cap on emissions mechanically reduced the net transfer of value to companies resulting from the free allocation of $CO_2$ allowances. The reversal of the economic cycle in 2008 that relaxed the major industrial markets such as steel and building materials also had an effect. The emergence of unused capabilities reduced the market power of the large carbon emitters who could not longer pass on the cost of carbon emissions to their customers. In this new context, in order to keep part of the carbon rent, companies have to reduce their emissions more than their competitors so they can take advantage of the mechanism of differential rent. This incentive is positive because it drives them to curtail their emissions.

Further, during the period 2008-2012, governments have turned increasingly to auctioning. Virtually all the quotas auctioned off have been drawn from allowances formerly allocated free of charge to electric utility companies. In this second period, governments have been able to recover as much as 10% of the carbon rent previously distributed free of charge to electric power producers.

Finally, the opening of the European credit market to pay for Kyoto projects is a new form of using carbon rent. It consists of using the rent to finance emission reduction projects outside the quota system. The vast majority of the credits purchased have been those created through the Clean Development Mechanism to finance emissions reductions in developing countries. This method of using rent must be handled with dexterity: if the tap of Kyoto credits is left open indefinitely, it could destabilise the balance between supply and demand in the market by causing a drop in the price on carbon emissions and therefore reduce the volume of rent remaining in Europe. That is why the amount of imported carbon credits allowed in the European market was capped.

The transition to the third period 2013-2020 is expected to bring about a much better balance in the distribution of carbon rent. During this period, bidding on carbon allowances will no doubt become the rule in the power sector. The rules that will apply to other sectors are still uncertain, except on one point: they will surely be complicated because they will be the result of tense bargaining among the 27 member states of the European Union. In all likelihood, the majority of allowances will continue to be allocated free of charge in non-power industries between now and 2020.[§]

[§] Let us explain one point that is sometimes poorly understood. The switch to paying for allowances does not create an additional short-term incentive to reduce the emissions of existing industrial installations. Under a system of free allowances, the price of carbon emissions constitutes an opportunity cost: avoiding the

**The switch to auctioning: the hen that laid the golden eggs?**

The shift to paying for allowances is changing the distribution of carbon rent in favour of governments which will be endowed with additional financial resources. It will affect above all the power sector.

In the power sector, systematic bidding on allowances will lead to a new distribution of the scarcity introduced by the price on carbon emissions. The carbon rent that until now has been kept by the companies using free quotas will be transferred to the states, which will receive the auction proceeds. For the power sector alone, this transfer could represent 20 billion euros per year starting in 2013.

A portion of carbon rent will remain with electric power companies according to the differential rent mechanism. It will be distributed among the producers supplying power from installations emitting zero or low amounts of $CO_2$ that sell their electricity at market prices. In France and Sweden, where 90% of electricity is produced without any carbon emissions, a substantial fraction of carbon rent will remain in the hands of electric power companies. In Germany and the United Kingdom, where power generation results in distinctly higher carbon emissions, the state will receive most of the rent, at the expense of the local electric utilities.

In the power sector, industrialists who invest in new generation capabilities will also have to buy allowances to offset the corresponding emissions. This point is absolutely essential in terms of economic incentives. It corrects one of the major weaknesses seen in the European quota system during the first two periods of its operations: the system of national reserves set up for "newcomers". These reserves give each national government the possibility of allocating free allowances to new installations. To put it plainly, a portion of carbon rent will be used to subsidise investments in plants that emit greenhouse gases. That is hardly the way to prepare the transition to a carbon-free economy! Starting in 2013, electric utilities that invest in new power plants operating on gas or coal will pay for all of their allowances, which will provide sizeable differential rent to those that invest in renewable or nuclear energy. This new incentive is altogether desirable to reduce energy system emissions.

In sectors other than electricity generation, free allowances for investment projects will be reduced and better supervised by the Commission. This will boost the incentive to invest in new plants with low $CO_2$ emissions levels. It is a step in the right direction, but it is difficult to measure its scope as long as the definitive rules are not yet known in detail.

Having begun with a system in which the state surrendered virtually all carbon rent to manufacturers, from 2013 onwards European governments will recover a large portion of the rent created by restricting emissions rights thanks to the sale of allowances. Carbon rent will give them new financial resources that can be used to correct any undesirable redistribution effects of the system or to promote research and development of innovative technologies such as underground carbon capture and storage.

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emission of one tonne of $CO_2$ releases a quota that has a market value. If the plants do not curb their emissions, they have to give up the income from their allowances and therefore bear an opportunity cost. If the companies that own installations operating below their quotas were to engage in a semblance of business calculation, the emergence of the value of carbon will give them all the required incentive to reduce their emissions in the short term under a system of free allowances.

Outside the European Union, some of the public proceeds from carbon rent could be used to finance priority initiatives at the international level, such as action against tropical deforestation or aid to finance climate change adaptation in the least advanced countries. The international stakes of European carbon rent management are indeed of utmost importance. In this regard, let us look at how the concept of carbon rent helps to explain the weaknesses of the Kyoto Protocol and above all, why it is difficult to change.

**Allocation of carbon rent under Kyoto**

The Kyoto Protocol puts limits on the greenhouse gas emissions of the developed countries. Emission rights are distributed free of charge to each country based on its 1990 emissions, plus or minus a certain percentage. The total number of allowances to be distributed is 18 billion tonnes of $CO_2$ equivalent per year between 2008 and 2012 (including12 billion in the United States alone). The mechanism for allocating emission rights is based on the principles of free allowances and "grandfathering" used to allocate $CO_2$ quotas in European industry during the first period of the market. These principles have the same economic consequences, but potentially on a much larger scale, given the volume of emissions concerned.

Let us suppose that the Kyoto commitments had been sufficient to assign a real price to the Kyoto units that could be traded between countries. The countries that benefited from over-allocation, mainly Russia and Ukraine, would have received extremely high guaranteed rents. That is a well-known fact. But the developed countries in Annex I, which are indeed subject to constraints, receive free emission rights for their quotas. These rights provide a rent. And the amount is proportionate to the volume of emissions. With the price of $CO_2$ at 10 euros per tonne, annual carbon rent would in fact reach 180 billion euros for the countries in Annex I as a whole!

These free emission rights make any enlargement of the system to include developing countries extremely problematic. Upon initial analysis, the Kyoto Protocol is very advantageous for developing countries that are not under constraints and can access the carbon market through the Clean Development Mechanism. But the free allocation of rights allows high-emitting wealthy countries to build a very comfortable carbon rent as soon as the actual price of Kyoto units reaches a significant level in the international carbon emissions market. It is therefore to the advantage of the developing countries *not* to enter the system. To be more precise, it is in their interest to hurry up and increase their emissions so they can negotiate larger allowances and consequently have access to a greater portion of carbon rent when they do sign the convention. And that is exactly what they are doing!

Is there any way to escape this blockage by eliminating the allocation of free emission permits to the various countries? Such a scheme would imply setting up a supranational public authority to implement the economic instruments of climate conventions in the name of universal interest. Concretely, this authority would determine a global emissions cap that could not be exceeded. Once it has defined this ceiling, it would sell emission rights to the countries participating in the convention. The developed countries would buy an average of three times as many per capita emission rights as the developing countries, due to the total amount of their emissions. The overall proceeds from the sale of emission rights would be returned to the countries on a yet-to-be-defined apportionment basis. The proceeds would also be allocated to support useful initiatives to combat climate change such as financing research

on green technologies or programmes intended to strengthen the ability of the least advanced countries to adapt to climate change.

There is no likelihood that such a scheme will be implemented in the real world. Firstly, because there is no existing supranational body able to set up and then manage such a system. Secondly, because the wealthy countries are not ready to assume the burden of financial transfers without conditions to developing countries in the case of auctioning the emission rights of countries committed under the international convention.

If neither free rights nor full payment of carbon emissions are real options, we could try and find a reasonable compromise. Let us go back to the average per capita emission target of 2.5 tonnes of $CO_2$ equivalent by 2050 proposed in Chapter 2 to limit the risk of climate change. We could allocate free emission rights to each country on the basis of this unit amount multiplied by the country's population. Beyond that threshold, the countries would have to buy their emission rights, with the total limit on the number of rights sold diminishing year by year to 2.5 equivalent tonnes per capita by 2050. This system involves buying with a "deductible". Starting with a deductible of 2.5 tonnes however, seems very costly for countries that have high per capita initial emissions levels. Consequently, the various countries would have to reach an agreement on a higher deductible to be able to launch the system. The concrete conditions required to implement such a system are even harder to ensure than in the preceding case.

**An alternative target scheme**

An alternative route consists in abandoning the "grandfathering" method of allocating emission rights to countries in favour of a simple rule: rights are to be allocated in proportion to the number of inhabitants of each country. For example, the scheme would start at 7.5 tonnes of per capita $CO_2$ equivalent, which correspond to average per capita emissions on the planet today. The countries below that level would sell a net portion of their rights and those above that level would buy only the portion of their emissions that exceed the world average. The initial global cap would be equal to 2005 emissions and then gradually diminish. As the 2050 deadline approaches, we would come closer to the target amount of 2.5 tonnes of $CO_2$ equivalent.

This system consists of distributing carbon rent based on an egalitarian principle. From the standpoint of the redistribution it would generate, it is equivalent to the principle of the universal carbon tax redistributed per capita that we discussed in the Introduction. Such redistribution would be on a massive scale. Let us suppose that the price of the Kyoto unit reaches 10 euros per tonne. A citizen of India currently emits 2.5 tonnes of $CO_2$ equivalent annually for an emission right of 7.5 tonnes according to the mechanism of egalitarian carbon rent distribution. Each Indian could therefore sell 5 tonnes of $CO_2$ equivalent per year in the international market, which would mean a net foreign exchange gain of 55 billion euros for the country. A citizen of the United States emits the equivalent of 23 tonnes of $CO_2$. Under this new system, each American would have to buy 15.5 tonnes of $CO_2$ per year in the international market, representing a net foreign exchange loss of 46.5 billion euros for the country. It is not hard to figure out which country would support the principle of egalitarian distribution of carbon rent in international negotiations!

While this scheme looks attractive on paper, it has no chance of being quickly introduced in the real world. From a technical point of view, we are far from having the information

required to lay the foundations for such a system. There are real technical problems involved, primarily linked to highly uncertain accounting of agricultural and forest emissions. These problems are aggravated in many developing countries by the lack of infrastructures to produce rigorous estimates of greenhouse gas emission. Furthermore, the organisations set up by the Climate Convention do not have the prerogatives or the resources to set up such a system at the international level.

However, the greatest obstacle to the introduction of such a system is political: just as the developing countries will not agree to a Kyoto-type constraining system for the reasons we indicated earlier, the developed countries will not agree to egalitarian allocation of emission rights resulting in large financial transfers based on very vague statistical grounds, without any guarantee as to how the transferred amounts are ultimately used.

Thus, the mechanism of egalitarian allocation of emission rights will long remain an ideal, but unobtainable, scheme. The Copenhagen conference will not be a "Revolution," shaking up all the rules. We are not going to wake up the next day in a world in which each human being is endowed with the same right to emit greenhouse gases. Nevertheless, this scheme constitutes a benchmark model that should be able to guide our progress in collective action against climate change.

**Should carbon rent be used to pay for carbon sinks?**

Generally speaking, rent is compensation attached to an asset. For example, property rent compensates landowners and enables them to maintain their land. Until now, carbon rent was divided up among those who emit greenhouse gases into the atmosphere. It was not concerned with the owners of carbon stored in the earth or in the biosphere. Could this be a potential avenue for action that should be explored?

Carbon rent was created to protect a shared asset – the atmosphere – against the accumulation of anthropic emissions. The atmosphere is one of the reservoirs among which carbon dioxide is constantly circulating. We must stop filling up this reservoir if we want to prevent climate risk. The emission permit market system was designed with a particular reservoir in mind: a long-term target of atmospheric concentration of greenhouse gases established based on climatology studies. Emissions caps were derived from these studies, ultimately arriving at the market price of $CO_2$. The caps have been allocated to the various carbon emitters according to various methods.

We might wonder whether this system provides sufficient incentives to the owners and users of carbon sinks on the Earth. The largest one – the oceans – is a global public asset, like the atmosphere. But other reservoirs are owned or operated either privately or by governments that own the mineral resources and have no intention of sharing them. This is especially true of forest carbon sinks, but also of oil wells, gas wells and coal mines. Carbon rent could be used to compensate these players for maintaining the sinks by storing as much carbon in them as possible.

At the international level, for example, there is a project supported by a coalition of rainforest countries to compensate anti-deforestation initiatives using carbon finance mechanisms. If such a mechanism is created, it will involve using a portion of carbon rent to pay for sequestering forest carbon dioxide in the trees. In Europe, several projects intended to capture $CO_2$ coming out of factory chimneys and store it underground are expected to be financed

starting in 2013, thanks to the price of carbon: a new use of carbon rent to compensate carbon storage, this time underground. In regards to oil operations, one might also imagine in the future that the owners of non-conventional oil wells will be compensated by carbon rent to give up the production of these new energy resources to keep the carbon stored in the earth.

The use of carbon rent to compensate the storage of carbon in terrestrial carbon sinks, which at present has barely been explored, will no doubt give rise to initial experiments during the next decade. If they are successful, the experiment will undoubtedly lead to the emergence of a new carbon sink economy tomorrow.

**Conclusion: the strategic management of carbon rent**

By capping the $CO_2$ emissions of its industries, the European Union has created a new kind of scarcity rent: a carbon rent that amounts to tens of billions of euros per year. At the outset, the priority was to get manufactures to accept restrictions on the right to emit by allowing them to use this rent. The growing use of auctioning is changing the distribution of rent in favour of governments. Domestically, it gives them additional resources for action. Abroad, it opens up the possibility of progress in international climate negotiations.

Europe has already mobilised a portion of its carbon rent to establish the international emissions reduction market through the Clean Development Mechanism. But at the international level, European carbon rent is limited as the EU ETS covers less than 5% of global emissions. This is notoriously insufficient to ensure the continuing development of the international carbon market. One of the largest uncertainties is to know when and how the United States could increase the value of the international carbon rent by setting up its own cap-and-trade scheme.