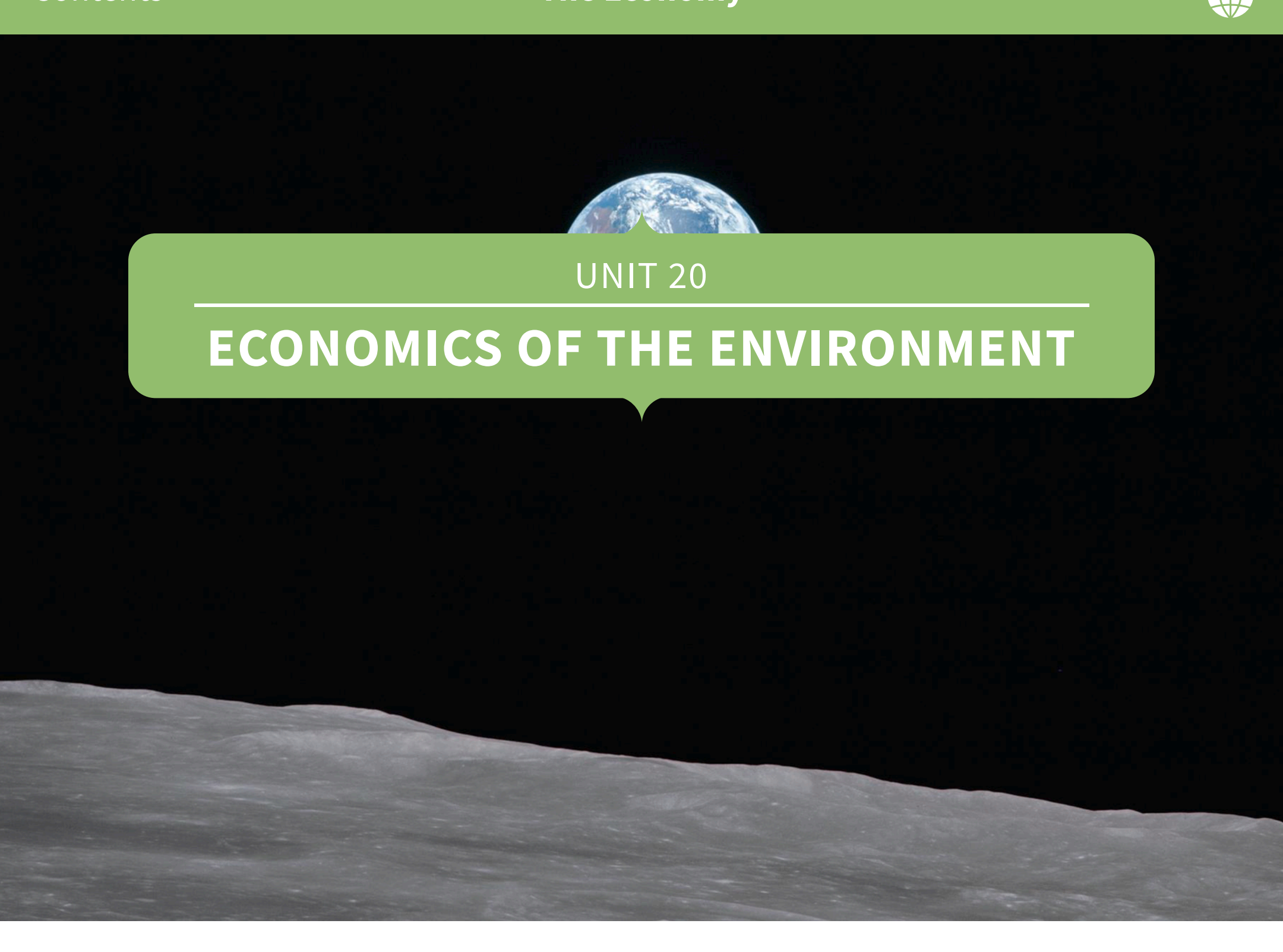


UNIT 20

ECONOMICS OF THE ENVIRONMENT

EXPAND ALL

20.5 Cap and trade environmental policies

In Unit 12, we saw possible remedies for the market failure that arose from the negative external effects of pesticide use. The range of remedies included private bargaining between the pesticide users and the fishing community whose livelihoods were threatened, taxes to make the pesticides (or the bananas produced using them) more expensive, ownership of all affected assets by a single business or other decision-making entity, and quotas or outright bans on the use of the pesticide. Some of these policies would have made it more expensive to harm the environment so as to provide incentives for greener economic decision making (**price-based policies**). Others would have made it illegal (**quantity-based policies**).

A policy called **cap and trade** is a policy that combines a legal limit on the amount of emissions with an incentive-based approach to assigning the abatement required to meet this legal limit among firms and other actors.

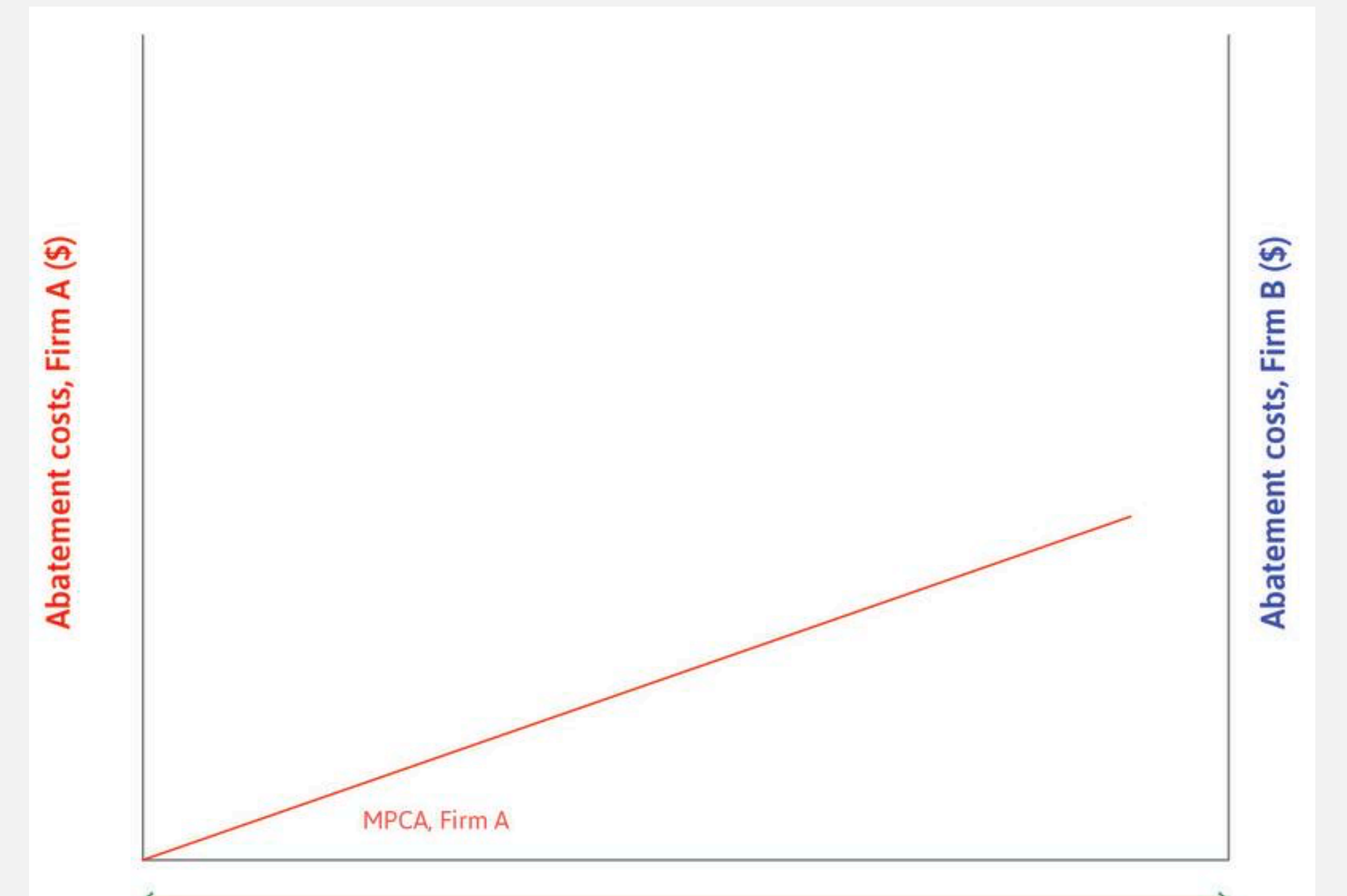
Here is the idea:

- *The government or governments set the total level of abatement required*: This is called the 'cap' and it constitutes the 'quantity' side of the policy.
- *The government creates permits*: The number of permits issued limits total emissions to the size of the cap.
- *The government allocates permits*: They can be given to the firms operating in industries emitting the pollutant, or they can be auctioned to polluting firms by the government.
- *The permits are traded*: For some firms, polluting is very profitable and abatement costly. They will buy permits from other firms. Firms that produce little pollution or have low costs of abatement may have excess permits, which they can sell. Trade occurs until the gains from trade are eliminated.
- *The firms submit permits to government to cover their emissions*: For each tonne of emissions produced, firms are required to provide one permit to the government. Ideally, government monitoring ensures that firms cannot cheat, and any firms caught violating the law are penalized with large fines.

Cap and trade policies are a way of implementing some desired level of emissions (or, equivalently, the total level of abatement required, E^*) as the ideal policymaker did in Figure 20.13.

The desired level, however decided, is shown by the length of the horizontal axis in Figure 20.16. The question addressed by cap and trade is: given that firms vary in their production technologies, how will the total amount of required abatement be divided among them? The objective of a scheme for trading permits is that the abatement should be done by the firms for which this is least costly because this saves scarce resources that can be used elsewhere.

To see how this works, go through the analysis in Figure 20.16, which shows the case where the number of permits is initially divided equally between two firms with different costs of abatement.



The marginal private cost of abatement (MPCA) of firm A
This is shown in red and measured in the usual way from the left-hand axis. It rises as its cost of abatement increases. Firm A uses a relatively low-emissions technology to produce its product.

Figure 20.16 Cap and trade: Buying and selling permits to pollute.

There are many ways in which the permits might be traded once they are issued. One is the auction-type market studied in Unit 11, in which we saw (from an experiment) that the traders quickly converged to trading at a price like P^*, which is the market-clearing price. The trading of permits achieves the desired level of abatement at the lowest resource cost to the economy. P^* is the permit price and is equal to the marginal cost of abatement in the economy.

Cap and trade: Examples of emissions trading LINK

One of the earliest cases of successful emissions trading was the sulphur dioxide (SO_2) cap and trade scheme in the US, implemented in the 1990s and intended to reduce acid rain. By 2007, annual SO_2 emissions had declined by 43% from 1990 levels, despite electricity generation from coal-fired power plants increasing more than 26% during the same period.

The European Union Emissions Trading Scheme (EU ETS), launched in 2005, is the largest CO_2 cap and trade scheme in the world, and now covers 11,000 polluting installations across the EU. National governments auction 57% of permits in the EU ETS, and the overall emission cap (that is, the amount E^* in Figure 20.16) is tightened every year. Some of the auction proceeds are used to fund low-carbon energy innovation. Similar carbon trading schemes exist in other countries and regions.

The EU ETS has been less successful than the US SO_2 scheme. Some analysts think this is due largely to the fact that the permitted level of emissions was too high (too large a cap). After the financial crisis in Europe, lower aggregate demand caused the demand for electric power to shrink and with it, firms' profit-maximizing emissions levels. With supply exceeding demand, the price of permits fell dramatically, providing little incentive for firms to undertake abatement expenditures. These effects are shown in Figure 20.17.

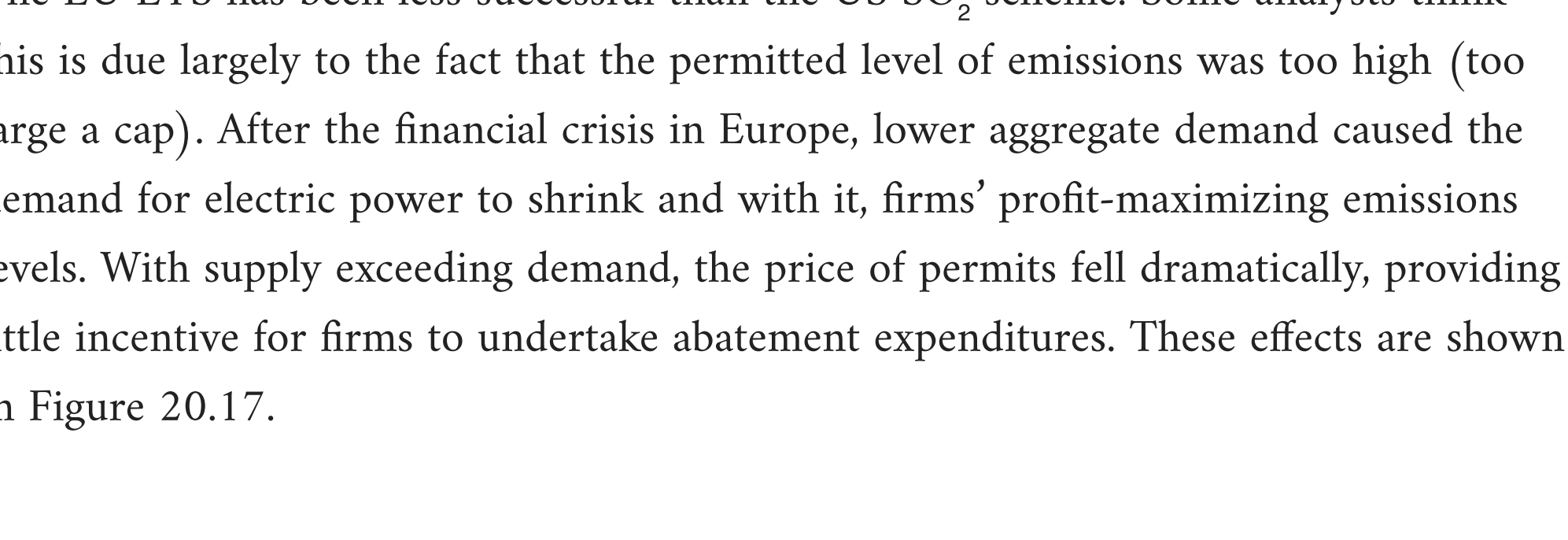


Figure 20.17 Permit prices in the European Union Emissions Trading Scheme (EU ETS).

Data provided by SendeCO$_2$ based on prices from Bloomberg Business.

This highlights a drawback of cap and trade. The price signal is not necessarily a reliable guide for future abatement investment decisions. In Germany, for example, the fall in permit prices led to several high-emitting coal power plants reopening, because dirty technology was profitable again.

But emissions trading schemes do not need to leave the market entirely free. The UK, for example, uses a carbon price floor, which sets a minimum price for British participants in the Emissions Trading Scheme. They do this to avoid the 'virtually free pollution' outcome that occurs when the permit price crashes.

The estimated total external cost of a tonne of carbon dioxide emissions differs depending on how we value future generations, as we shall see in Section 20.9. A low-end estimate in 2017 dollars is about $40 per tonne of CO_2 emissions, and it is rising fast because the greater the amount of CO_2 in the atmosphere, the higher the marginal effect on climate of adding more. The recent price of a permit on the European Union Emissions Trading Scheme (shown in Figure 20.17) is less than a fifth of this cost, so the permit plan is inducing decision-makers to internalize only a small fraction of the negative external effects.

Ideally, a tax on fossil fuels could entirely offset these external effects, with the added advantage that businesses and others would then face less uncertainty about the cost of burning carbon. A tax on carbon would raise the cost of emitting carbon in exactly the same way as having to pay for an emissions permit would do. In fact, the effect on costs would be identical if the market-determined cost of the permit were to be the same as the tax rate per tonne of emissions set by the government. The effect of the increase in costs would be higher prices of emissions-intensive goods and hence, *ceteris paribus*, demand for such goods would fall. Both the cap and trade and a carbon tax are said to be a way to 'put a price on' the external effects of carbon emissions.

How high should the price of carbon emissions be? LINK

Given that producers and users of fossil fuels are usually heavily subsidized (at very different rates from country to country) the tax or the cost of a permit would have to exceed $40. On average around the world, fossil fuel subsidies are about $15 per tonne, so an optimal tax would be $55 per tonne (to internalize the external costs and to offset the subsidy). A simpler policy would be to eliminate the subsidies and set the carbon tax at our best estimate of the external cost of burning carbon.

The pros and cons of these two policies:

- a cap and trade permit based system with a sufficiently low cap
- a carbon tax at a sufficiently high rate to offset the external costs (and subsidies, if these remain)

These have been actively debated among environmental economists, with no clear consensus other than that either is preferable to the policies being pursued in most countries. Cap and trade, however, has been more popular, perhaps because it has the advantage of flexiblity. The ability to set the carbon price, but then to control the way in which permits are allocated and traded, gives the policymaker two 'levers'. In contrast, a single tax may be politically unpopular for a policymaker to implement.

EXERCISE 20.5 ASSESSING CAP AND TRADE POLICIES

LINK

1. Explain why the green area in Figure 20.16 represents the total gains from trade. Hint: think about the first permit that Firm B buys from Firm A. How much is the most that Firm B would have been willing to pay? How much was the least that Firm A would have been willing to accept in order to part with the permit?
2. How would you explain the way a cap and trade policy works to someone who has not studied economics? How would you respond to their concerns that the policy is likely to be ineffective or unfair? Many newspapers and blogs publish 'op-eds', that is, opinion editorials from the public. A common length limit is 600 words. Find some op-eds on climate policy, and having looked at how they are written, draft your answer to this question in the form of an op-ed.

EXERCISE 20.6 A SUCCESSFUL TRADABLE EMISSIONS PERMIT PROGRAM LINK

The cap and trade sulphur dioxide permit program in the US successfully reduced emissions. The program costs were approximately one-fiftieth of the estimated benefits.

Read Robert Stavins and colleagues' views on the US sulphur dioxide cap and trade program at VOXeu.org.

1. In the view of the authors, why are cap and trade systems such powerful tools to achieve reductions in emissions?

Also read 'The SO_2 Allowance Trading System' by Richard Schmalensee and Robert Stavins of the MIT Center for Energy and Environmental Policy Research.

2. Summarize the evolution of permit prices using Figure 2 in the article.
3. How well can the price movements in permit prices be explained by the analysis in Figure 20.16?

Look again at Hayek's explanation of prices as messages (Unit 11), and the analyses of asset price bubbles (Unit 11) and housing bubbles (Unit 17).

4. Could we use similar reasoning to explain price movements in Figure 2 of the paper by Schmalensee and Stavins?

EXERCISE 20.7 WOULD A CARBON TAX REDUCE EMISSIONS MORE THAN REGULATION? LINK

In 2017, economists Martin Feldstein and Greg Mankiw (respectively economic advisors to US Presidents Ronald Reagan and George W. Bush), together with Ted Halstead, a climate campaigner, suggested in the op-ed 'A Conservative Case for Climate Action' that an ideal climate policy in the US should consist of three parts:

- A single carbon tax should replace all regulations that are aimed at reducing carbon emissions.
- Revenues collected from the tax should be refunded to American taxpayers in quarterly paychecks ('carbon dividend').
- American firms that export to countries without carbon taxes should not pay a carbon tax, while importers should face an import tax on the carbon contents of their products (a 'carbon border adjustment').

1. Explain the economic reasoning behind each part of the proposal.
2. Why do the economists think replacing regulations with a single carbon tax would be more efficient?
3. Some environmental groups oppose the carbon dividend. They argue that the money could be better spent. Do you agree? What should carbon revenues be spent on? Do you think citizens are more likely to support a carbon tax if there is a carbon dividend?
4. Why do the economists think a border carbon adjustment is necessary? What would be the effect of a domestic carbon tax without a border carbon adjustment? What incentives does it create for American companies and for foreign companies? Is it fair on firms from developing countries (who often generate a lot of electricity from high emissions coal) who export their products to the US?
5. Do you support the proposal by Feldstein, Mankiw, and Halstead. Explain why or why not. What changes would you make?