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Cost Containment Mechanisms

Over time, a market-based regulatory system such as cap and trade or a carbon tax is the most cost-effective means of meeting a given climate goal for the economy as a whole (box 1.1 in chapter 1). The cost of compliance, however, will not be spread evenly throughout the economy, and some industries will find it easier than others to absorb costs or pass them along to consumers. In addition, all climate policy design involves uncertainty, such as the precise emissions trajectory required and the cost of emissions abatement both for individual firms and the economy as a whole. Cost containment mechanisms are designed to reduce the economic impact of climate legislation on certain regulated entities and provide them with flexibility in managing compliance costs.

The cost concerns, and thus the types of cost containment mechanisms considered, vary between a cap-and-trade and a carbon tax system. Under a cap-and-trade system, compliance costs are likely to be volatile, particularly during the early stages of implementation, as shown by the experience of the EU Emissions Trading Scheme (ETS).[1] And as energy prices are the primary driver of emissions allowance prices, carbon markets may experience some volatility in the long term as well. Under a carbon tax system, the price of carbon emissions is more certain, but there is still uncertainty about the initial cost of mitigation. Also, though the price of carbon emissions is clear and established under a carbon tax, concerns about

1. Given the lack of knowledge about the amount of total emissions during the first phase of the EU ETS, which was launched in 2005, carbon prices were quite volatile. During 2005, CO_2 traded at €20 to €25 per ton. Then in the spring of 2006, when EU member states published emissions inventories far below what was originally anticipated, carbon prices fell from €30 to €9 over the course of two weeks. While prices have since recovered and are back in the €20 to €25 range, fluctuations in coal and natural gas prices mean carbon prices have remained volatile.

international competitiveness and flexibility in managing compliance costs still exist.

In this chapter we discuss six mechanisms to contain carbon costs: three that are available under a cap-and-trade system (price caps, banking and borrowing allowances, and free allocation of allowances), one that is available under a carbon tax system (tax credit), and two that are available under both (offsets and exemptions). In addition, we discuss options for reducing costs other than those directly arising from climate policy as a way to alleviate competitiveness concerns. We evaluate each option using the following three metrics (table 2.1):

1. *impact on carbon-intensive industry*: What degree of protection does the mechanism provide for carbon-intensive industries that compete internationally? How does the impact vary between industries?
2. *environmental integrity*: Does the mechanism change the outlook for potential reduction of greenhouse gas emissions?
3. *economic efficiency*: How does the mechanism affect the cost of meeting emissions reduction targets for the economy as a whole?

We also discuss differences in how our five carbon-intensive industries would be affected under each cost containment mechanism. Two factors primarily determine these differences:

1. *direct vs. indirect emissions*: how much of an industry's energy needs are consumed directly in primary form (e.g., coal, oil, and natural gas) rather than indirectly in the form of heat, coke, or electricity.
2. *vulnerability to fuel switching*: the degree to which the industry relies on fuels, such as natural gas, that may see noncarbon cost increases resulting from fuel switching in other sectors in response to climate policy.

Price Caps

A cap-and-trade system has two main models for limiting the price of carbon allowances and thus the compliance cost imposed on companies. The government may make available additional, tradable allowances for purchase at a set price. Alternatively, companies that find that they are not complying with their target under a cap-and-trade system can pay a penalty in lieu of acquiring allowances.[2]

2. Most recently, an explicit price cap has been included in S 1766, proposed by Senators Jeff Bingaman and Arlen Specter. Based on recommendations from the National Commission on Energy Policy, the price cap would allow regulated entities to make "technology accelerator payments" in lieu of submitting emissions allowances. These payments would be set at US$12 in 2012 and would increase at 5 percent over inflation annually during the life of the program.

Table 2.1 Cost containment mechanisms

Mechanism	Domestic regime	Scope of coverage	Degree of protection[a]		Environmental compromise[a]	Cost	
			Corporate profits	Industrial output		Economic[b]	Fiscal[c]
Price caps	Cap and trade only	Economywide	High	High	High	Moderate/ high	Moderate
Banking and borrowing	Cap and trade only	Economywide	Low/moderate	Low/moderate	None	None	None
Free allocation	Cap and trade only	Economywide or industry-specific	High	Low/moderate	None	Low	High
Tax credits	Carbon tax only	Economywide or industry-specific	Moderate	Moderate	Low	Moderate	Low/moderate
Offsets	Cap and trade or carbon tax	Economywide	Low/moderate	Low/moderate	None	None	Low
Exemptions	Cap and trade or carbon tax	Industry-specific	High	High	Moderate	Moderate	None
Reducing noncarbon costs	Cap and trade or carbon tax	Industry-specific	Moderate	High	None	None	Low

a. Assessment of this cost containment mechanism is measured in relation to an economywide cap-and-trade (with full auction) or carbon tax regime.
b. Economic cost refers to the impact of the mechanism on the overall economic cost of emissions abatement in relation to an economywide cap-and-trade (with full auction) or carbon tax regime, in the absence of the mechanism.
c. Fiscal cost refers to the impact of the mechanism on the amount of revenue the policy would have otherwise provided for government.

From the point of view of market function, price control mechanisms are generally undesirable. As noted earlier, carbon markets are likely to be volatile. If allowance volume is increased when prices rise, later price falls are likely to be more dramatic. This acts as a powerful disincentive for companies contemplating emissions abatement investments. The existence of a policy trigger to reduce prices and increase volume creates the opportunity for traders to "game" the market. In general, markets function better with fewer opportunities for political interference.

In terms of industrial competitiveness, a price cap is a fairly blunt instrument, as it reduces compliance costs for the entire economy, not just those industries that face international competition. Direct emissions from our five carbon-intensive industries (those resulting from consumption of coal, oil, or gas inside the plant) account for less than 6 percent of total US emissions (table 1.2).

However, for products like aluminum, as well as some chemicals and types of steel, indirect emissions from the purchase of electricity account for a significant portion of overall carbon costs (table 2.2). Producers of these goods benefit more from a cost containment mechanism that includes the electric power utilities they buy electricity from than one narrowly focused on direct industrial emissions. The same goes for industries that rely on natural gas, like petrochemicals, to the extent that increased carbon costs for utilities encourages fuel switching from coal to gas (table 2.2).

From an environmental perspective, price controls are clearly problematic. Provision of additional allowances means higher greenhouse gas emissions. One of the principal arguments for adopting a cap-and-trade system rather than a more administratively simple carbon tax is that the former ensures an agreed-on environmental outcome. Accordingly, legislators wishing to ensure a specific price outcome should revisit carbon taxes as an alternative to price caps.

Borrowing and Banking Allowances

As noted earlier, price concerns often focus on price spikes and not on long-term average prices. Carbon prices are likely to be volatile, particularly during the early phases of a cap-and-trade system. Furthermore, covered firms will have different investment cycles, and the timing of decisions for optimal capital investment may not line up with the commitment periods in legislation.

Accordingly, many proposals include the possibility for companies to bank and borrow allowances under a cap-and-trade system. Banking allows companies to emit less than their cap and keep the "spare" allowances for compliance in a later commitment period. Borrowing allows

Table 2.2 Natural gas and electricity dependence in US industry (share of total energy demand), 2002 (percent)

Industry	Net electricity	Natural gas[a]
Ferrous metals	16	32
Iron and steel mills	14	32
Iron foundries	32	31
Nonferrous metals	39	34
Primary aluminum smelters	41	29
Aluminum foundries	26	70
Other nonferrous metals	34	45
Chemicals	8	82
Petrochemicals	n.a.	>90
Alkalies and chlorine	22	n.a.
Carbon black	2	23
Other inorganic chemicals	40	40
Basic organic chemicals	4	71
Plastic materials and resins	4	93
Nitrogenous fertilizers	2	97
Pharmaceuticals and medicines	31	52
Paper	9	22
Pulp mills	2	11
Paper mills, except newsprint	8	21
Newsprint mills	40	17
Paperboard mills	6	21
Nonmetallic mineral products	13	40
Glass	21	77
Cement	11	5
Lime	5	8

n.a. = not available

a. Natural gas includes natural gas liquids and liquified petroleum gas.

Source: US Department of Energy, Energy Information Administration, Manufacturing Energy Consumption Survey, 2002.

companies to overemit today in exchange for deeper cuts later. Borrowing and banking of allowances across compliance periods offer a potentially attractive method for smoothing the costs of compliance over the life of the program.

Banking is uncontroversial in most instances. Since it rewards early overcompliance, it benefits the environment and builds public trust in the system. The only prominent instance in which banking has been disallowed in a trading system has been between the first (2005–07) and second (2008–12) commitment periods of the EU ETS. This was because the Kyoto Protocol did not cover the former commitment period, but it covers the latter. Excessive banking between 2007 and 2008 might therefore have left EU countries at risk of noncompliance with their obligations under the protocol. However, this was a one-off situation: Banking is allowed between subsequent periods of the EU ETS and is almost certain to feature in US and other cap-and-trade legislation.

Borrowing is somewhat more controversial, but in principle, it is just as valid as banking: meeting an obligation over time but shifting it to sit with company investment cycles and technology availability. As long as strong and enforceable requirements to repay any borrowed allowances are included in such a program, the environmental integrity of the cap would be maintained. In fact, several federal proposals include interest on borrowed allowances, which would tighten the cumulative emissions budget of the program every time allowances are borrowed.

However, successful use of borrowing provisions requires a high degree of confidence in the ongoing determination of the government to enforce future targets. If participating companies suspect that they can lobby for weaker future targets by keeping emissions high today, they may attempt to "game" the system by borrowing heavily and counting on relief from sympathetic legislators later or on the ability to escape repayment through bankruptcy. Accordingly, borrowing has been viewed somewhat more cautiously—for instance, it is excluded from the EU ETS.

While banking and borrowing are useful cost containment mechanisms for nearly all carbon-intensive manufacturing industries, they provide the greatest benefit to industries that consume the majority of their energy in primary form (e.g., coal rather than electricity) and have the potential to manage carbon costs through efficiency improvements. Companies producing cement and certain types of steel, for example, whose direct emissions account for most of their carbon costs, would be able to significantly reduce these costs by upgrading their capital stock, provided they are given sufficient flexibility in choosing when to do so. But for industries that rely heavily on electricity or natural gas, or have little potential for efficiency improvement, banking and borrowing provide less relief.

Provided that emissions reduction targets are maintained and firms are not given the opportunity to game the system, both banking and borrowing reduce the cost of emissions abatement for the economy as a whole, not just carbon-intensive industries.

Free Allocation of Allowances

Initial free allocation of allowances in a cap-and-trade system is a complex and contentious issue but has a potential role in defraying the cost of a carbon cap on covered industries. In outlining considerations for allocating emissions allowances under S 280, Senators John McCain and Joe Lieberman list the "need to maintain the international competitiveness of United States manufacturing and avoid the additional loss of United

States manufacturing jobs."[3] The free allocation of allowances, as well as the distribution of allowance auction revenues, could both be used to mitigate the cost of a mandatory cap-and-trade system on carbon-intensive industries.

The assets thus allocated can be vast. The EU ETS in 2006 represented a total asset value of a little under $200 billion, virtually all of which was allocated for free to participating companies. Clearly, the rules for allocating such large assets can create considerable equity issues, but they also have a potential role in making investors whole. Indeed, under the proposed Australian emissions trading system, a calculation will be made as to the decline in asset value for owners of covered installations. Free allocation will then be used as a one-off compensation for this loss, after which allowances will be auctioned.

The ability of free allowances to reduce the compliance costs for carbon-intensive manufacturing varies again by the degree to which that industry relies on electricity and natural gas in meeting its energy needs. For example, while aluminum producers might receive free allowances to cover their limited direct emissions, most of their exposure to the costs imposed by climate policy would come in the form of increased electricity prices. Some proposals attempt to compensate for this by offering a surplus of free allowances that can then be sold to other sectors to help compensate for rising electricity prices.[4] In addition, if climate policy creates incentives for the power generation sector to switch from coal to natural gas, natural gas prices will likely rise for industrial users. Free emissions allowances to cover direct or indirect emissions would do little to reduce the cost of more expensive natural gas for energy-intensive manufacturing.

It is also worth noting that this approach can compensate investors but may not achieve the underlying aim of protecting output and employment levels and reducing emissions leakage. Profit-maximizing manufacturers who receive free allowances would likely raise prices to reflect the cost of purchased allowances regardless of whether they receive free allowances or not (Carbon Trust 2007) because of the opportunity cost of holding free allowances that have value in the market. In the face of inter-

3. See the Climate Stewardship and Innovation Act of 2007, S 280, 42–43, available at http://thomas.loc.gov. In previous years, the allocation of emissions allowances under federal climate change proposals has typically been punted to regulatory agencies. Although some proposals prohibited any allocations to regulated entities (Sanders-Boxer—S 209) and others required consideration of how allocations impact consumers, international competitiveness, economic efficiency, and corporate income and assets (McCain-Lieberman—S 280), legislators avoided detail in their discussion of allocations. In the 110th Congress, however, the allocation of emissions allowances has become a powerful bargaining chip for lawmakers in their attempts to garner bipartisan and business support. The Lieberman-Warner and Bingaman-Specter proposals, the two Senate efforts currently attracting the most attention, both offer detailed guidelines on how allowances should be allocated.

4. See S 2191, America's Climate Security Act of 2007, section 3904, available at http://thomas.loc.gov.

national competition, this preference for profits over market share would result in a decline in domestic production and output levels over time. Some proposals seek to guard against this incentive by linking allowance allocation to production or employment levels on an ongoing basis, rather than just grandfathering in historic production levels. Certain EU countries have tried to shape terms under which companies simply closing capacity in the European Union have to surrender their allowances, but in practice these terms are difficult to define. In addition, providing free allowances to existing producers can help keep older, dirtier domestic production processes in operation while making it more difficult for new companies to bring cleaner production processes into the market.

Two other concerns surround allocation of emissions allowances for purposes of industrial competitiveness. The first is scope. As stated earlier, direct emissions from vulnerable carbon-intensive firms account for less than 6 percent of total US emissions. While the heat and electricity these firms purchase account for another 7 percent, providing free allowances to electric power utilities is a blunt and potentially ineffective tool for managing potential increases in the price of electricity for industry. As in the price of carbon-intensive products, the price of electricity would likely be set at the marginal cost of production—and thus the marginal cost of emissions allowances for utilities. Manufacturers may see no reduction in the price of electricity even if utilities were given a fairly generous allocation of emissions allowances.

And even if prices did fall, manufacturing as a whole accounts for only one-quarter of US electricity demand. The other three-quarters of the customer base of electric power utilities in the United States is not vulnerable to competition from international trade. In addition, distributing emissions allowances free, rather than through an auction, reduces the revenue available for government to increase US industrial competitiveness through other means, such as research and development (R&D) investment or tax reductions. Certain uses of government revenue may, in fact, do more to guard against a loss of competitiveness in carbon-intensive industries than free allocation of emissions allowances (discussed further in the last section of this chapter).

Tax Credits

Under a carbon tax system, cost containment is more straightforward. If legislators wish to reduce compliance costs for certain industries, such as those exposed to international competition, they can simply reduce the carbon tax burden firms face. As is the case for free allocation under a cap-and-trade system, however, the effectiveness of this approach will vary by industry depending on how much of the increase in overall production costs associated with climate legislation is the result of a tax on direct emissions from the plant versus increased natural gas or electricity prices. For cement and some types of steel, where direct emissions account for a majority of the total carbon footprint, tax credits can provide considerable relief. For aluminum and chemicals, however, most of the cost increase would come in the form of higher electricity and natural gas prices, which a carbon tax break would do little to address.

Providing carbon tax credits for vulnerable industries comes with an environmental cost. Free allocation of emissions allowances under a cap-and-trade system may not protect against a decline in output but do maintain incentives for emissions reductions as firms are free to sell allowances they do not need on the market. Reducing the cost of polluting under a carbon tax system by way of a credit, however, also removes the incentive to reduce emissions. Reducing the burden of noncarbon taxes (like corporate or payroll taxes), however, can both address competitiveness concerns and maintain incentives to reduce emissions. This is discussed at greater length in the last section below.

Offsets

Offsets allow participants in a cap-and-trade system to implement emissions abatement measures outside the cap, whether in other jurisdictions or noncovered sectors. Credits from these activities could be surrendered for compliance purposes in lieu of emissions reductions under the cap. Under a carbon tax, firms can receive a tax credit rather than an allowance for emissions reductions achieved outside the plant. Since both allow companies to seek a wider range of abatement options, many of which would be cheaper than those available in their own facilities, they will tend to reduce costs. The potential for cost reduction is greater in industries where direct emissions account for the majority of total carbon costs borne by the firm. While electric power utilities may well take advantage of offsets to reduce costs, there is no certainty about when, or to what degree, they will pass these savings on to industrial consumers.

In addition, identifying genuine offset activities is harder than it sounds. From the climate perspective, one must be sure that the activities rewarded with credits would not have occurred anyway. As long as these emissions reductions are additional, real, and enforceable, the program's cumulative emissions and environmental efficacy would remain unchanged. Without certainty on these points, the climate suffers. The most prominent offsets program, the Clean Development Mechanism established under the Kyoto Protocol, has an executive board dedicated to ensuring that offset projects would not have occurred under a business-as-usual scenario. The difficulty in doing so has led to significant bottlenecks in the system and vocal discontent among both project developers (who feel that the system is too strict) and environmental groups (who consider it too lax).

Nevertheless, if done correctly, offsets can offer other advantages, including spreading cleaner technologies and encouraging other jurisdictions to explore low-cost abatement opportunities. Offsets in some form will very likely play a role in any future cap-and-trade system.[5]

A key question for the paper and pulp industry is how the forestry sector is treated as a potential source of offsets. Many US pulp mills could be considered nearly carbon-neutral if given a credit for the CO_2 absorbed growing the trees they use for both feedstock and fuel (assuming that the harvested areas are replanted and not turned into a parking lot).

Provided that the criteria used to evaluate the emissions reduction gained through offsets is sound, offsets can both provide some degree of industry protection and reduce overall economic costs while maintaining the environmental integrity of the policy.

Exemptions

A more aggressive option for containing costs for carbon-intensive manufacturing industries is to exclude them altogether from the list of regulated entities. At less than 6 percent of total US emissions, carving out this sector of the economy may seem like an acceptable sacrifice if it alleviates enough concern about industrial competitiveness to win support for broader climate legislation. Four principal concerns surround this approach.

First, carving out carbon-intensive manufacturing industries would create an incentive for all manufacturing firms, regardless of their actual exposure, to seek inclusion. While the definition of carbon-intensive industries that we adopt in this study incorporates the most vulnerable, several other industries are not far behind the ones included here (table 1.1), and it could be difficult to draw a firm line.

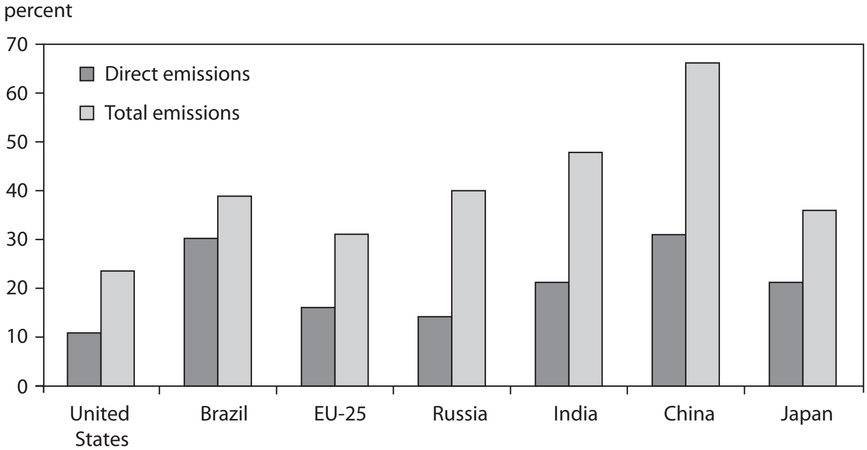
Second, carveouts for direct emissions from carbon-intensive industries do not address potential increases in the price of purchased electricity or natural gas resulting from compliance costs and fuel switching by entities, such as electric power utilities, not included in the carveout.

Third, carveouts increase compliance costs for the economy as a whole by removing some low-cost abatement options from the system.

Finally, carveouts in US policy create incentives for major trading partners to follow suit. While only 11 percent of the US total (table 1.2), direct emissions from manufacturing account for 31 percent of all emissions in

5. The Regional Greenhouse Gas Initiative (RGGI) among a group of northeastern states applies this mechanism, by allowing access to offsets from outside the RGGI states, to credits from the Kyoto Protocol mechanisms (Clean Development Mechanism and Joint Implementation) and even allowances from the EU ETS after certain price levels are reached. Furthermore, several federal proposals include provisions to allow the use of domestic and international offsets to meet upto 35 percent of compliance requirements.

Figure 2.1 Manufacturing share of total CO_2 emissions, 2005



Source: IEA (2007c).

China (figure 2.1). If indirect emissions are included, manufacturing accounts for two-thirds of the CO_2 China emits. Therefore, if carveouts are selected as a policy option, then an alternative regime, such as an international sectoral agreement, should cover industries excluded from a domestic cap-and-trade or carbon tax system, rather than exempting them altogether.

Containing Noncarbon Costs

Thus far, all the cost containment mechanisms discussed seek to reduce the direct costs of climate policy on regulated entities. Measures that increase flexibility in how individual firms comply with climate legislation, like banking and borrowing and the use of offsets, can reduce costs while maintaining the environmental integrity of the policy. Yet such measures may fail to provide enough relief to sensitive industries to alleviate competitiveness concerns. Stronger measures, like tax credits and exemptions, provide substantial relief but may shift the burden to other parts of the economy or reduce the environmental effectiveness of the program as a whole. That has led many legislators to favor free allocation of emissions allowances under a cap-and-trade system as a means of reducing compliance costs. Since it does not affect the overall emissions cap, free allocation does not reduce the environmental efficacy of the program. Free allocations compensate investors by forgoing government revenue that would have been generated if those allowances were auctioned. As firms receiving free allocation are still able to sell allowances through a domestic carbon market, the economic efficiency of a cap-and-trade system is, in theory, maintained.

While free allocation of emissions allowances compensates investors in carbon-intensive industries, it may prove ineffective in guarding against reductions in output and employment (as discussed earlier). Under a cap-and-trade system, emissions allowances will all have the same value, whether allocated for free or purchased on the market. Theoretically, profit-maximizing firms will price their goods based on this market-based allowance price, regardless of whether they received the allowances for free initially, and thus be vulnerable to a decline in market share if they face international competition (Carbon Trust 2007). Efforts to guard against this by linking allocation to output and employment levels are difficult to define and enforce and can raise the overall economic cost of the cap by keeping inefficient capital stock in operation. In addition, free allocation may not address higher electricity and natural gas costs that might arise from climate legislation. The effectiveness of free allocation in preventing industry migration and emissions leakage must be carefully investigated because its costs, in terms of forgone fiscal revenue, are quite large. In leading proposals, free allocation of allowances, particularly to the power generation industry, would be worth between $50 billion and $100 billion per year at a carbon price of $20 per ton of CO_2.

Another, and possibly more effective, way to guard against declines in output and employment is to reduce noncarbon-related costs for vulnerable industries as part of overall climate policy. Such an approach was adopted as part of the United Kingdom's climate change levy, where the economic impact of the tax is offset by a reduction in the amount employers are required to pay to the National Insurance system.[6] Under a carbon tax or cap-and-trade system in the United States, a carbon price of $20 per ton of CO_2 would create $6.5 billion per year in additional costs for the five carbon-intensive industries included in this book, though some of that cost would certainly be mitigated through efficiency improvements or passed on to downstream consumers. In comparison, health insurance alone costs the same five industries roughly $10 billion per year, while retirement expenses account for another $5 billion.[7] And these labor-related costs have increased by more than 50 percent over the past decade, creating a disincentive for firms to add employees, even in the absence of climate policy.

6. Details on the UK climate change levy are available at the website of HM Revenue & Customs at http://customs.hmrc.gov.uk.

7. Department of Labor, Bureau of Labor Statistics, National Compensation Survey and Current Employment Statistics, 2008, Washington, available at www.bls.gov. Per hour healthcare and retirement costs are based on manufacturing sectorwide averages.

Under a carbon tax system, the government could use some of the revenue generated to offset healthcare or retirement costs for carbon-intensive manufacturers. This would soften climate policy's impact on vulnerable firms without removing the incentive to reduce emissions (as occurs with carbon tax credits).

Under a cap-and-trade system, using part of the allowance auction revenue to do the same would address employment concerns more specifically than would free allocation, as companies would have an incentive to maintain or expand their workforce rather than an incentive to trade market share for profit. And compared with placing employment requirements on firms that receive free allocation of allowances that are difficult both to define and enforce, reducing labor-related costs with auction revenue may be a more economically efficient and environmentally productive way to protect vulnerable parts of the US workforce.