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Carbon cost pass-through in industrial sectors

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What is Pigouvian "full carbon price internalization"? Following Pigou (1920), full carbon price internalization defines a policy design in which a carbon price fully internalizes the climate externality and thereby achieves a socially efficient outcome. This involves all decision-makers—polluting industry and consumers buying intermediate and final products—facing the efficient carbon price. It also hinges on a number of other factors, notably: the carbon price is set at the social cost of carbon (or at the level of the corresponding emissions target); all competing firms face the same carbon price with no exemptions or watering down by way of free allowance allocation; and product markets are perfectly competitive. Full carbon price internalization raises the marginal cost of production, puts upward pressure on product prices, and thereby creates efficient CO_2 mitigation incentives along the value chain.

What is carbon cost pass-through and why does it matter? Following in the footsteps of Pigou, policymakers are increasingly using carbon prices to help combat climate change. However, carbon prices around the world currently differ widely in their levels and scope. Carbon cost pass-through offers a useful way to think about the state of policy at the level of an individual industrial sector. The pass-through rate captures by how much the market price of a product rises if carbon pricing raises the marginal cost of production in a sector by $1. A shared understanding of pass-through is relevant for at least two important aspects of policy design. First, pass-through measures the degree to which a carbon price signal is being transmitted along the value chain. This is becoming increasingly critical to decarbonization strategies centred around efficient use of energy and materials to achieve Paris climate objectives. Second, pass-through links to the policy discussion around the risk of carbon leakage and the free allowance allocations used to compensate for an uneven international competitive playing field.

How does international trade affect carbon cost pass-through? A robust result from economic theory is that carbon cost pass-through is reduced by the presence of less regulated competitors that are not covered by the carbon price. Empirical evidence confirms this economic intuition. In such cases, international trade means that the scope of the product market is wider than the scope of carbon policy. Empirical estimates of carbon cost pass-through vary widely across countries, time and industrial sectors (including cement, chemicals,

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glass, oil refining, steel). This heterogeneity may partly reflect differences in market structure, free allocation, and other market characteristics (such as demand and cost conditions, product differentiation, switching costs, and so on). In addition, however, existing pass-through estimates often come with substantial uncertainty, in form of wide statistical confidence intervals. On balance, the available evidence suggests that, in most cases, carbon cost pass-through for industry is likely to be "low"— probably less than 50%. This suggests that current policy likely falls well short of the Pigouvian benchmark of full carbon price internalization.

How does market structure affect carbon cost pass-through? Economic theory suggests that, all else equal, a more concentrated market with fewer competing firms will typically lead to a lower rate of carbon cost pass-through. Producers with market power then have an incentive to absorb part of a cost shock so as to maintain higher output and the associated profits. However, this result can be sensitive to the finer details of demand and cost conditions in a market. For example, if pass-through exceeds 100% then greater competition may reduce pass-through (by pushing it down towards 100%). International empirical evidence confirms that, in general, the impact of market structure is ambiguous. Some studies, notably on gasoline markets, find that competition raises cost pass-through while others, notably on cement, find the opposite.

How does free allowance allocation affect carbon cost pass-through? A one-off, unconditional lump-sum allowance allocation does not alter market outcomes including prices, relative to auctioning permits, and therefore also does not affect carbon cost pass-through. In practice, including in the EU ETS, allocations are now often output-based, in proportion to a benchmark and current production volumes. Firms therefore expect higher current production to lead to a greater allocation in future and take this into account in their decision-making. The implicit output subsidy in effect dampens the carbon price and thus mitigates the increase in the product price—even if the underlying rate of pass-through is unchanged. Allocation conditional on activity thresholds has a similar effect to output-based allocation. Over the longer term, free allowances can prevent or delay the closure of existing facilities and create incentives for investment in new production facilities. In both cases, the induced additional production will reduce the product price and dampen longer-term carbon cost pass-through.

What are the policy lessons from carbon cost pass-through for full carbon price internalization?
The trade-off at the heart of allowance allocation is that too much free allocation may lead to windfall profits while too little may raise the risk of carbon leakage. The current empirical uncertainty around the degree of carbon cost pass-through in industry makes it difficult for policymakers to navigate this trade-off. To achieve full carbon price internalization, two other policy options may therefore warrant further consideration. First, a move to full auctioning would avoid the complexities and potential distortions underlying free allocations. This could be combined with a border carbon adjustment that mirrors the domestic carbon price in international trade. Second, a climate charge on consumption can have a similar economic effect. It could be levied per ton of material sold to final consumers, using the same benchmarks underlying free allocation of allowances to production. In theory, both options can reinstate full carbon price internalization.