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Exploring industrial competitiveness under alternative carbon policy approaches: Example of U.S. steelmaking

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Context

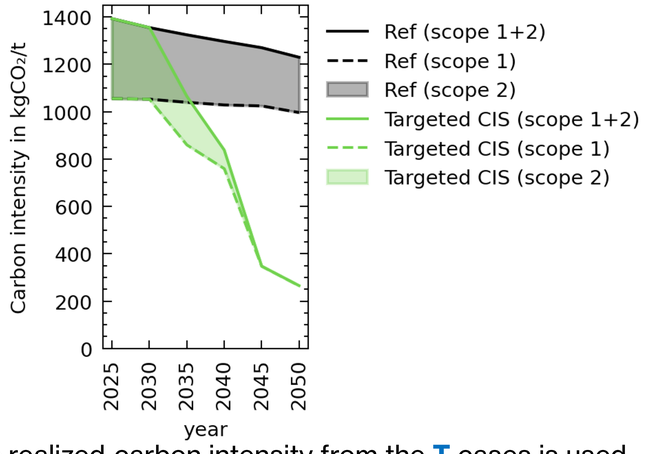
Pricing carbon in energy-intensive industries is particularly challenging because of intense competitive pressures from abroad as well as the political imperative of maintaining affordability at home.

Focusing on the US steel industry, we investigate how a **carbon tax (T)** and a **carbon intensity standard (CIS)** compare in terms of trade, production, emissions, and prices. We also augment both the T and CIS policy with a **carbon border adjustment mechanism (CBAM)**, denoted respectively as **T+** and **CIS+**. In practice, CIS+ is effectively a case in which all domestic sales of a good (regardless of origin) are covered.

To represent these policy settings, we enhance the **MIT Economic Projection and Policy Analysis (EPPA)** model, The Tax **(T and T+)** policies apply on the steel industry a carbon price of \$50/tCO$_2$ in 2035 rising to \$200/tCO$_2$ in 2050. For each policy case, the US electricity sector is also covered by the same policy.

Parametrization

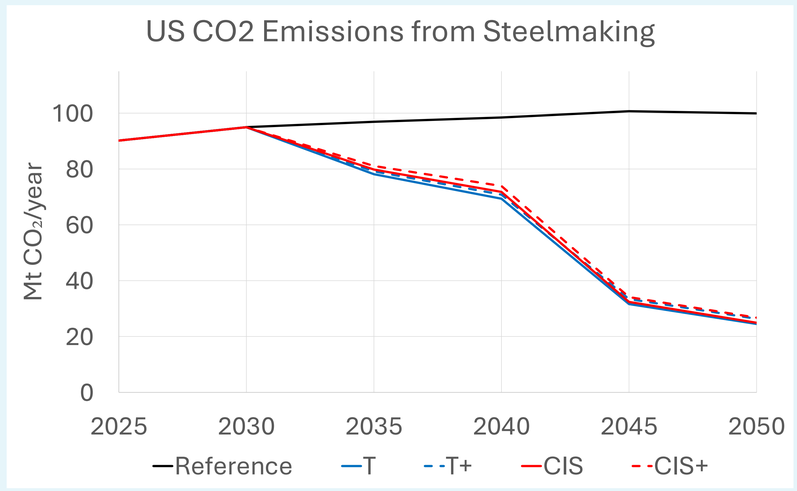
Carbon intensity (scope 1+2) of steel in USA

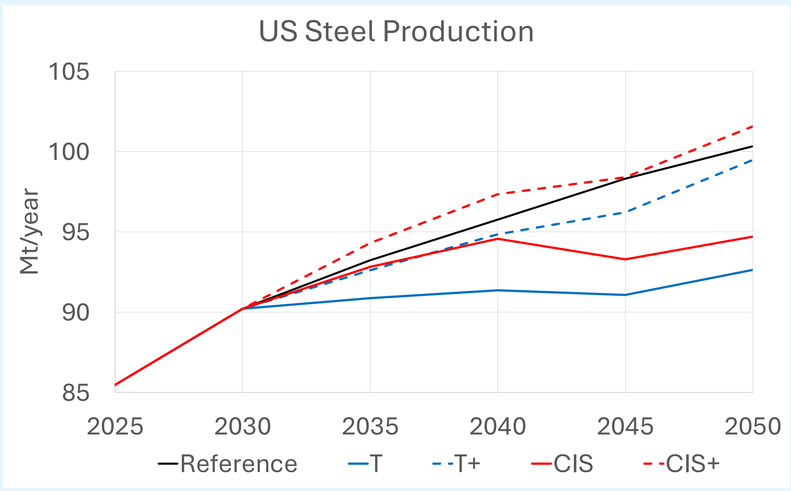


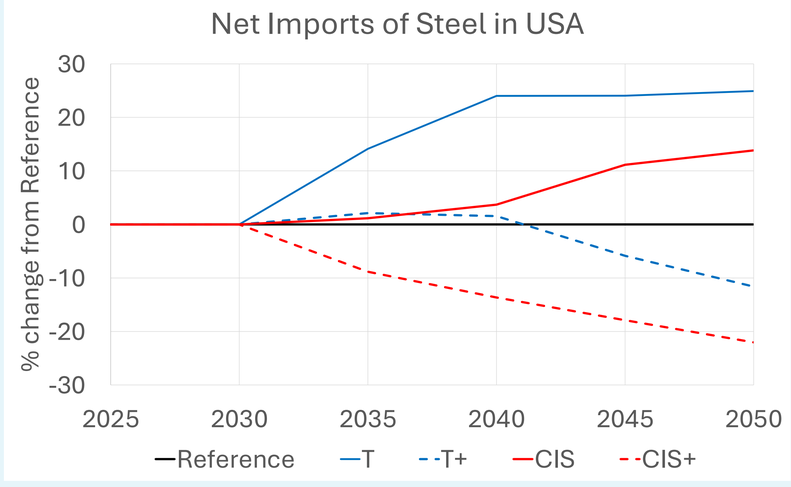
The realized carbon intensity from the **T** cases is used to set the carbon intensity targets in the **CIS** cases. The carbon intensity of steel (including scopes 1 and 2) decreases by 82% compared to 2025 levels.

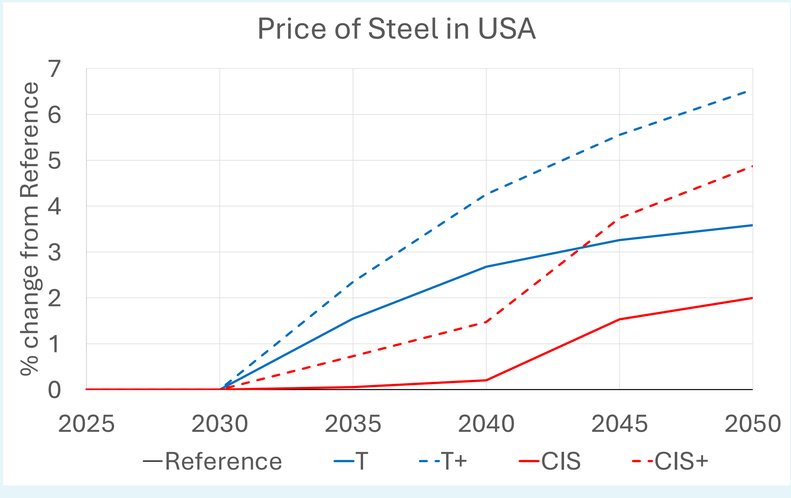
Under a carbon tax **(T or T+)**, tax revenues are redistributed in a **lump sum fashion**. In contrast, under a CIS policy **(CIS or CIS+)**, revenues are **recycled** exclusively within each covered sector on an output-basis. Incentives from output-based rebating are effectively identical to tradable intensity standards.

Results









Preliminary conclusions

Designing a national carbon policy requires balancing **environmental effectiveness, affordability** and **trade protection**:

- While the economic impacts vary across scenarios, total emissions from steelmaking remain comparable across these scenarios.
- The **CIS** and **CIS+** policies reduce the adverse effects of a carbon tax by lowering net imports, increasing production, and lowering prices relative to **T** and **T+**, respectively.
- Combining a carbon intensity standard with CBAM (scenario **CIS+**) increases US steel production relative to the Reference case.
- Adding CBAM in scenarios **T+** and **CIS+** increases domestic production while reducing total imports relative to T and CIS, respectively.
- However, domestic prices are higher with CBAM, thereby lowering total exports. Nonetheless, net imports are lower in scenarios with CBAM (**T+** and **CIS+**) compared with scenarios without CBAM (**T** or **CIS**).

Future work will investigate scenarios that extend the carbon policies to the rest of the world, including a uniform carbon-intensity target within a club of countries.

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