Different paths to net-zero: Assessing the effectiveness of diverse climate mitigation approaches

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In the historic 2015 Paris Agreement, virtually the entire world signed up to the goal of limiting global temperature increases to 1.5-2C above preindustrial levels. Since then, more than 130 countries have set ambitious greenhouse gas emission (GHG) reduction targets to reach net zero GHG emissions by around mid-century.

However, this is where the similarities end, as the detailed targets and policies countries have so far implemented, or plan to implement, to meet those targets differ greatly.

One thing is clear: at the aggregate level, countries' near-term ambition and policies are insufficient to bring global GHG emissions on track to meet the Paris temperature goals or to reach net zero emissions by mid-century. Without major policy changes, we may be heading for warming of 3C or more. This would be catastrophic, especially for the poorest and most vulnerable. To avoid the Paris temperature goals slipping permanently out of reach, GHG emissions would have to decline by 25-50 percent below recent levels by 2030, requiring a significant acceleration in emission reductions and drastic policy changes.

The current energy crisis adds to these challenges as it has exposed links and short-term trade-offs between safeguarding energy security and climate goals. The search for alternative

sources of energy to oil and gas from Russia has shifted relative prices and, in some countries, increased the use of more polluting fossil fuels, such as coal, at least temporarily. At the same time, the crisis could become a major accelerator of the clean energy transition over the longer-term. For that to happen, international cooperation remains critical to ensure energy security and overcome policymakers' concerns that other countries may not do their fair share in cutting emissions and relatedly that their industries might lose competitiveness. Aligning energy security with climate goals requires stronger international co-operation underpinned by a shared understanding of the impact of the diverse mitigation policy approaches countries are pursing.

To curtail emissions, countries might use carbon pricing – either via carbon taxes or emissions trading schemes – or other price-based incentives like tradeable emissions standards, feebates and feed-in tariffs for renewable electricity. Or they might use non-pricing instruments such as regulations and green investment and technology subsidies. In fact, countries typically use a combination of these measures, according to their individual circumstances. Identifying the individual and combined effects of the many measures composing countries' mitigation policy mixes is challenging.

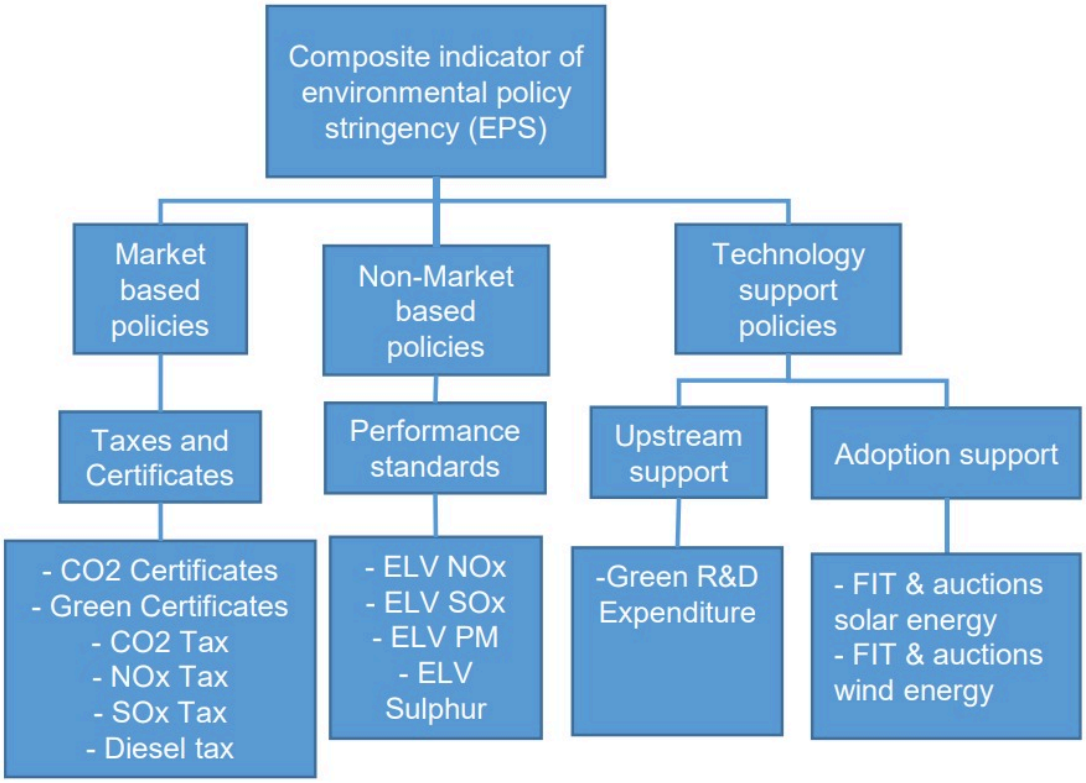
In a new report, the IMF and OECD have joined forces to support the German G7 Presidency on these issues. The report focuses on three key areas to improve the comparison of the impacts of different mitigation policy approaches on emissions and the broader economy:

• **Stocktaking of mitigation policies.** Identifying and documenting countries' diverse policy approaches requires systematically collecting information on a larger set of mitigation policies in more countries and sectors, and at a more granular level, than is currently possible. Such information, covering price-based and non-price-based policies, will provide much additional information for policy

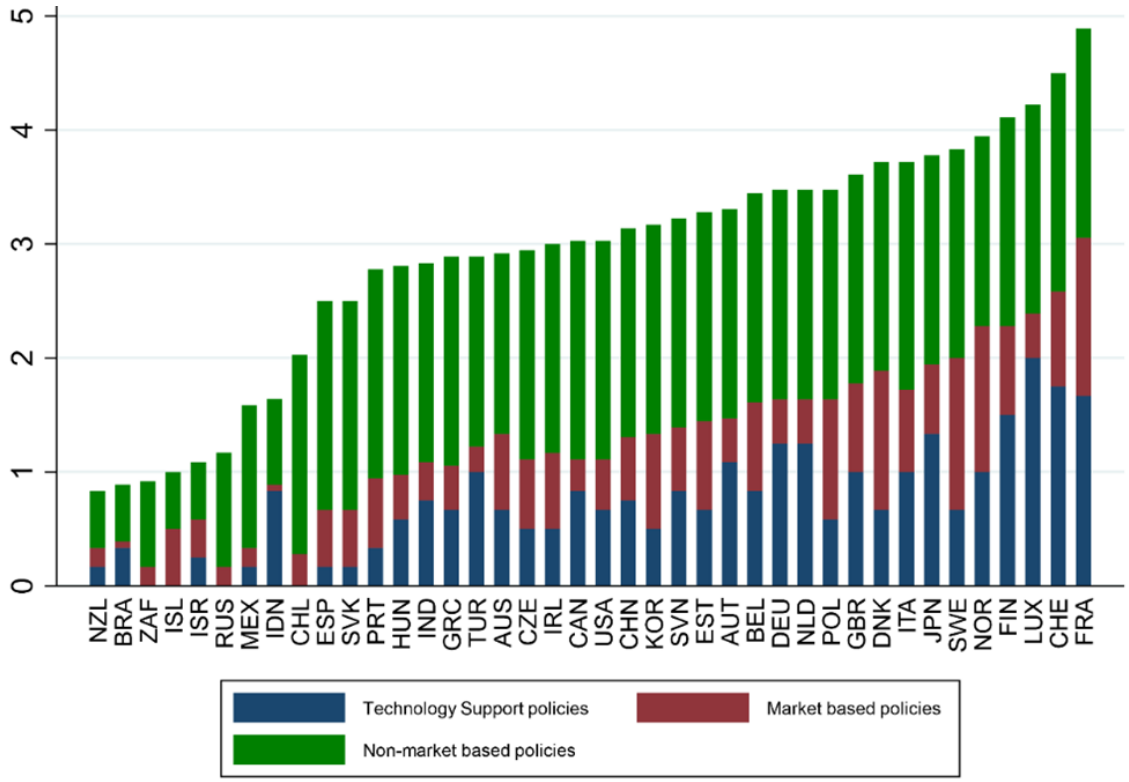
makers and will be key to estimating the emission reduction effects of policies in a consistent way across countries and sectors. Such a stocktaking can build on and go beyond the inputs from already available stocktakes such as OECD's Effective Carbon Rates, Taxing Energy Use, International Programme for Action on Climate (IPAC), and Environmental Policy Stringency index (Figure 1). A new stocktake can provide more detailed information on the emission coverage and enlarging the set of mitigation policies being covered.

Figure 1. OECD Environmental Policy Stringency and stocktaking of climate change policies

A. The 2021 Environmental Policy Stringency Index



B. EPS sub-indicators across countries, 2020

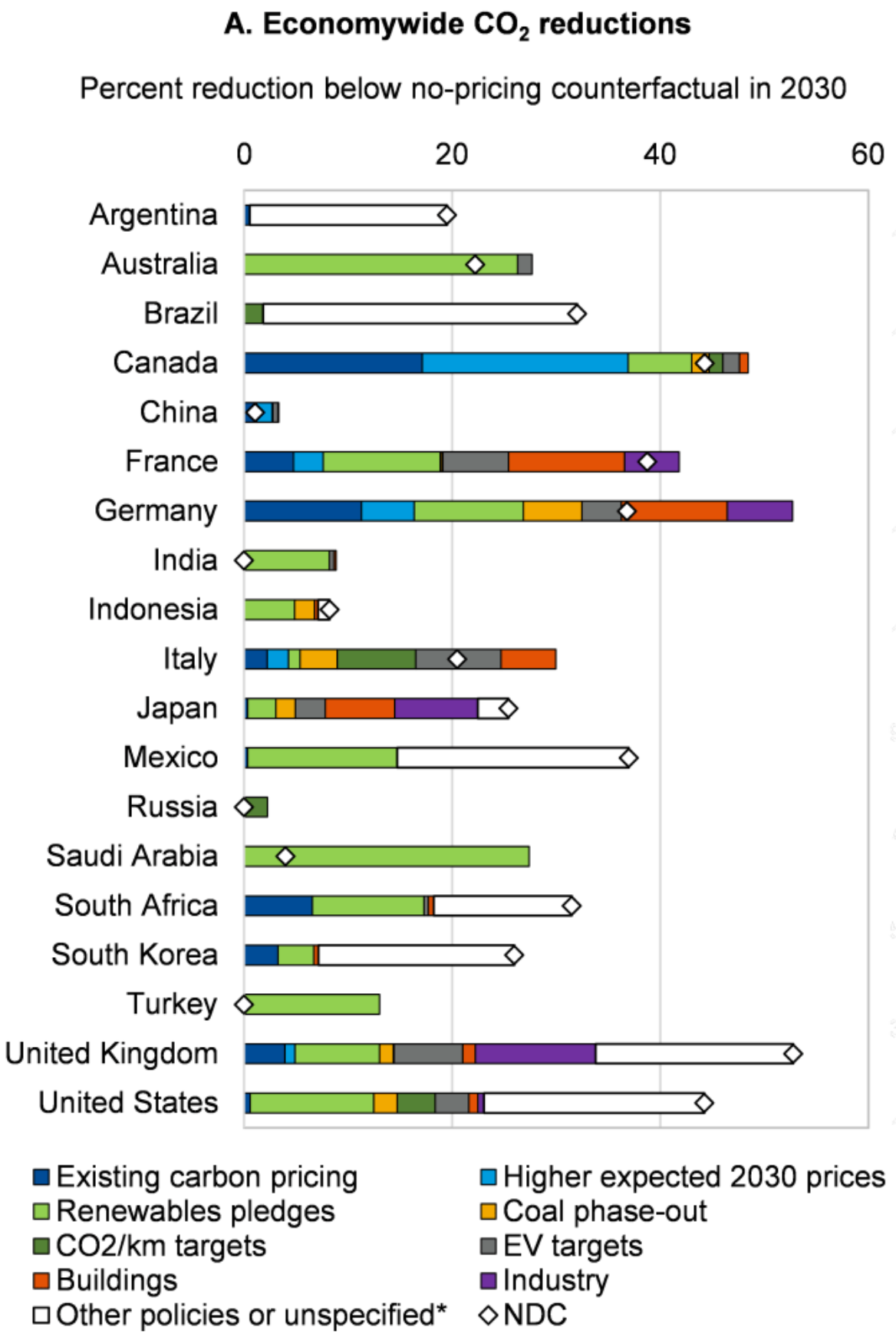


Note: Panel A shows the aggregation structure of the updated EPS index (referred to as "EPS21"). ELV is short for Emission Limit Value. Panel B shows the contribution of the policy components to the EPS across countries for the year 2020. The blue bars show the contribution of non-market based policies to the EPS. The red bars show the contribution of market based policies. The green bars show the contribution of technology support policies. Data for Colombia, Costa Rica, Latvia and Lithuania were not available.
Source: OECD.

• **Agreeing on and implementing a clear methodology for estimating the impact of policies on emissions.** This would strengthen countries' capacity to monitor progress towards climate change targets and improve the comparability of reporting such progress. Figure 2 shows a stylized example for such policy comparisons, applied to G20 economies. Different policy combinations currently planned for 2030 are mapped onto a common base of emissions reductions. These policies can then be compared to a common metric (such as the "carbon price equivalent", which is the carbon price that would achieve the same overall mitigation effect as a package of other policies). As shown in the chart, countries differ strongly both in the mix of policies and in their overall

effectiveness, with most countries’ stated policies still falling short of their Nationally Determined Contributions, let alone their longer-term net-zero targets.

Figure 2. Estimated economywide CO2 reductions



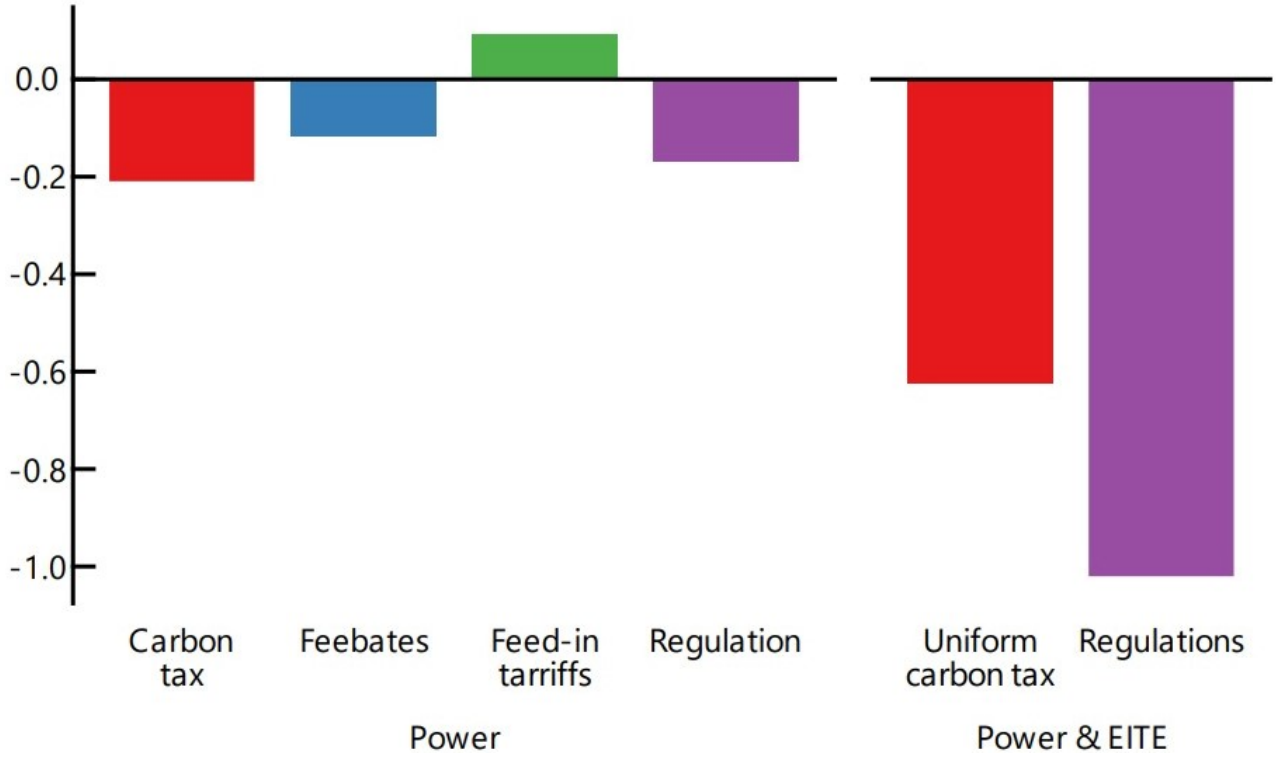
Source: IMF staff using the Climate Policy Assessment Tool.

• **Assessing the broader economic effects of different climate policies, including cross-country spillovers.** Understanding

these effects would help to design policy approaches that allay concerns about competitiveness, carbon leakage, and burden sharing of global mitigation efforts. Figure 3 shows for example that different climate policies by the G7 countries, in the electricity sector (on the left) or in both the electricity and energy intensive and trade exposed sectors (on the right), are associated with different impacts on their international trade shares (i.e. they have different competitiveness effects). In the electricity sector, different policies have relatively similar effects, except feed-in subsidies that would reduce emissions while avoiding losses in trade shares. Feed-in subsidies policy, however, would cause comparatively higher GDP costs because of the need to finance the subsidy by raising taxes. In the energy intensive and trade exposed industries, policy makes a major difference: regulation affords firms less flexibility than a carbon price and model simulations suggest this results in a significant negative effect on trade shares of hard-to-decarbonize industries, contrary to carbon pricing.

Figure 3. Effect of pricing and non-pricing climate policies on the international trade share of energy intensive and trade exposed industries in G7 countries

Percentage point deviation from baseline in 2030



Note: EITIE denotes energy intensive and trade exposed industries.
Source: IMF staff using IMF-ENV model.

The methodologies discussed in this new paper are still work-in-progress but they provide a sound framework for comparing mitigation efforts and a roadmap to advance work supporting international policy co-operation initiatives. These could include: the Climate Club established by Germany's G7 Presidency; the International Carbon Price Floor proposal put forward by IMF staff; the OECD's Inclusive Forum on Carbon Mitigation Approaches (which will undertake stocktaking, mapping and estimating the effectiveness of mitigation policies); the UNFCCC's Enhanced Transparency Framework; carbon border adjustment mechanisms and other mitigation initiatives discussed in international fora.