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Background Paper Forum Climate Economics 9

Capital Markets, Institutions and Distributional Effects: Towards Ambitious Climate Policy in Low- and Middle-Income Countries

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Preface

This background paper for the Forum Climate Economics 9 is based on current research projects from the BMBF funding priority *Economics of Climate Change*. The projects deal with challenges and chances that climate protection and the Paris Agreement entail on an international level. The present paper sheds light on barriers to the implementation of ambitious climate policy measures in low- and middle-income countries (LMICs). Often, LMICs are not in the focus of international climate negotiations. Yet, enabling their transition to zero-carbon energy systems without jeopardizing development goals is indispensable to preserve the chance to reach the global targets of the Paris Agreement. Discussing the various obstacles in this heterogeneous group of countries, we show that only to strive for sufficiently large transfers would be too simplistic. Instead, the key to successful climate policy measures often lies in creating and enhancing domestic institutions which, for instance, more effectively compensate the least well-off, enable a smooth functioning of capital markets and promote the formation of a public consensus instead of vested interests.

The Forum Climate Economics is a series of events of the *Dialogue on the Economics of Climate Change* on current topics of climate and energy policy. As a platform for intensifying the exchange between science and practice, the Dialogue accompanies the BMBF funding priority *Economics of Climate Change* with its currently 29 projects on economic aspects of climate change. This background paper is part of the activities of the theme "International Climate Policy". Six projects of the funding priority have contributed to this paper in collaboration. They organize the Forum Climate Economics 9 under the auspices of ifo Institute – Leibniz Institute for Economic Research at the University of Munich.

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CONTRIBUTING PROJECTS OF THE NETWORK ECONOMICS OF CLIMATE CHANGE

DECADE Decarbonization of Economic Development in Sub-Saharan Africa | MCC Berlin | GIGA Hamburg | RWI Essen

FoReSee Fossil Resource Markets and Climate Policy: Stranded Assets, Expectations and the Political Economy of Climate Change | ifo Institute | DIW Berlin | Humboldt University Berlin

CarPri Carbon Pricing after Paris | Kiel Institute for the World Economy | Energy Modelling Forum | Carl von Ossietzky University Oldenburg

InFairCom Incentives, Fairness and Compliance in International Environmental Agreements | ZEW Mannheim | IÖR Dresden | Bochum University of Applied Sciences | Leipzig University of Applied Sciences

SUFI Sustainable Climate Finance and its Impacts | Frankfurt School of Finance & Management | Philipps-University of Marburg

TapD²-Africa Tapping the Double Dividend: Household Energy in Developing Countries, Climate Change Mitigation and Adaptation | RWI Essen

https://www.klimadialog.de/themes/international-climate-policy/

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Content

1. INTRODUCTION

Despite the goal to stabilize global mean temperatures well below 2 °C compared to pre-industrial levels, as formulated in the Paris Agreement, global greenhouse gas emissions keep rising (disregarding the Covid-19-related dip in 2020/21). This increase is, in absolute terms, mainly driven by lower-middle-income and low-income countries, which on average have increased their emissions by 4.5 % per annum between 2016 and 2019. By contrast, the formerly dominant growth in emissions by upper-middle-income countries, including China has been more and more slowing down in the years before (Le Quéré et al., 2021). Against the background of rapid growth in population, economic output, and energy demand, many low- and middle-income countries (LMIC) are—without further and stronger emission control policies—likely to head towards a carbonization of their energy systems rather than a decarbonization (Steckel et al., 2020). Setting and ratcheting up ambitious climate targets in these countries is, therefore, key to achieving global climate targets.

Yet, throughout international climate negotiations, LMICs emphasize their right to develop their economies. In the past, this has been highly correlated with using fossil fuels. Hence, the Paris Agreement (Article 4.4) states that climate change mitigation must not interfere with sustainable development. Consequently, LMICs often focus on adaptation in their Nationally Determined Contributions (NDCs), while mitigation measures remain modest or conditional on external support. At the same time, mitigation efforts shall be made consistent with their envisaged growth paths and—related—development goals (Will, 2020, pp. 22–25). The Paris Agreement provides different instruments to cooperate and raise the ambition of LMICs, including transfers through the Green Climate Fund or flexible mechanism(s) under Article 6 Paris Agreement. Transfers are recommended to be in the order of 100 billion US Dollars per year (Decision 1/CP.21, paras. 54, 115).

Despite a generally lower level of ambition, implementing current NDCs would lead to welfare losses in LMICs that are in the same order of magnitude as those expected in high-income countries (Böhringer et al., 2021). Notably, China and India face rather small welfare losses, or even exceptional welfare gains (India) as these two countries benefit more than others from decreasing coal prices in the wake of the climate-policy-driven drop in global coal demand. By contrast, African countries would face the highest welfare losses (scenario "REF" in Figure 1) as even modest mitigation efforts are rather costly relative to their particularly low level of income.

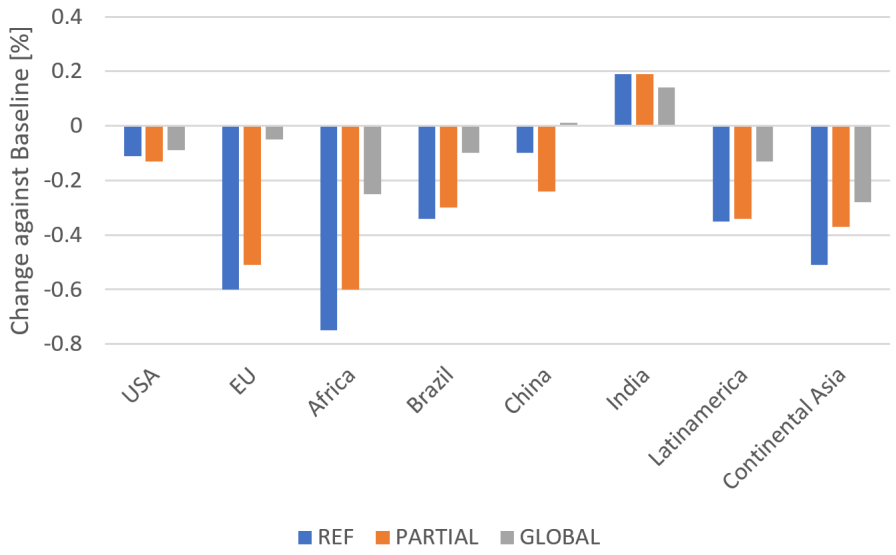

Figure 1: *Welfare losses associated with reaching NDCs in the OECD regions USA and EU, and in low- and middle-income regions, relative to a baseline scenario without NDCs. REF: Each region reaches NDC with only domestic action; PARTIAL: A global price on CO_2 emissions is installed covering only electricity and emission intensive sectors; GLOBAL: A global price on CO_2 emissions is installed covering all sectors. Simulation results from the DART model (Böhringer et al., 2021).*

Welfare losses could, in theory, be reduced by integrating countries in a global carbon market. If the carbon credits were initially allocated proportionally to the actual NDCs (as in the model behind Figure 1), then the linking of carbon markets would lead to a partial shift of emission reductions from countries with high mitigation costs to typically low-income countries with low mitigation costs. This would also imply a net sale of carbon credits from LMICs to high-income countries that would reduce the welfare costs of LMICs. The reduction in LMICs' welfare costs of carbon pricing would also be larger if the market for emission rights comprised more sectors (i.e. "GLOBAL" instead of "PARTIAL" in Figure 1).[1]

However, it seems unlikely that a globally linked carbon market will unfold anytime soon. Yet, an increasing number of countries consider domestic carbon pricing schemes, including many LMICs (Santikarn et al., 2020). In this paper, we examine particular challenges and obstacles which LMICs face in ratcheting up and enforcing their mitigation goals, e.g. through national carbon pricing schemes. Arguably, not all countries face the same challenges. Comparably affluent countries, such as China or some South-East Asian countries likely see other difficulties than countries in Latin America or Sub-Saharan Africa. For all countries, however, it should be understood

1 However, higher carbon prices after joining a common global carbon market also reduce the competitive advantage in exporting rather carbon-intensive goods and imply negative terms-of-trade (ToT) effects for lower-income countries. For India and China, the biggest sellers of allowances in the model, these negative ToT effects are more pronounced than for other LMICs in Africa or Asia. Hence, these countries' benefit from joining a common carbon market and enlarging its scope is ambiguous (cf. Figure 1 and Winkler et al., 2021).

that climate change mitigation should not interfere with other development goals, such as poverty eradication or access to clean energy, to be feasible and successful. In the following, we discuss four particular challenges for ramping up domestic climate policy in LMICs, including high capital costs, distributional effects, behavioral effects as well as political economy aspects.

2. HIGH CAPITAL COSTS

To meet their own NDCs, LMICs must transform their energy and industry sectors through large-scale investments in renewable and clean energy technologies.[2] Economic theory might suggest incentivizing clean investments by setting a domestic carbon price. However, a key barrier is often the cost of capital as renewable-energy projects are highly capital intensive: if capital costs and related perceived investment risks are high, they can render dedicated climate policies ineffective (Hirth and Steckel, 2016). That is, even if LMICs introduced costly carbon pricing, investments into an energy infrastructure based on fossil fuels, such as coal and gas, would remain more attractive. It is hence important to reduce the financing costs for renewable energies and other clean technologies in LMICs. This can be achieved by lowering the risks that investors face, related both to the policy environment and the financial markets there.

In this regard, it is good news that in OECD countries, low-carbon technologies and related markets have matured in recent decades, and their business risks are more and more understood (Kempa et al., 2021). Those financial institutions which are well capable of understanding the relevant technologies and assessing and managing risks to firms in the renewable sector reduce their cost of debt. By contrast, firms focusing on fossil fuels and non-renewable energy technologies are increasingly perceived as risky by banks. A similar development in LMICs can be fostered in various ways. First, LMICs can put forward ambitious and credible domestic climate policies that signal to lenders that the business models of clean technology firms are profitable and sustainable. Second, the international community can also de-risk investments into the energy sector in LMICs, e.g. by providing export insurances that could reduce the cost of renewable plant equipment (Steckel and Jakob, 2018).

3. DISTRIBUTIONAL EFFECTS

Implementing climate policies can be expected to impact different households differently. In the past, unmanaged fossil fuel subsidy reforms or carbon pricing reforms, e.g. in Ecuador in 2019, have led to protests and civil unrest. In contrast to high-income countries, the distributional effects of climate policies, in particular carbon pricing and fossil subsidy reforms, in LMICs are generally found to be progressive (Ohlendorf et al., 2021; Dorband et al., 2019): poor households are affected relatively less than richer ones, as they spend a much lower share of their income on carbon-intensive energy, such as fuels or electricity (Dorband et al., 2019). Nevertheless, the absolute burden on poor households can still be substantial and by itself raise the need for compensating vulnerable households through revenue recycling schemes.

2 McCollum et al. (2018) estimate that, globally, an average annual investment in the energy sector of about 3017 billion US Dollars would be necessary to reach the global temperature targets.

In addition, it needs to be acknowledged that distributional effects within income groups—driven, e.g. in Nigeria, Ghana and Uganda, by the use of motor vehicles, the ownership of fridges and more carbon-intensive consumption patterns in urban locations—are more pronounced than between income groups (Steckel et al., 2021; Ayhan et al., in prep.). That is, focusing only on the poorest households might miss out on other hardship cases. Recycling revenues or using social transfer schemes to protect the most vulnerable groups is therefore crucial for gaining public acceptance for carbon pricing and other climate policies in LMICs. Using existing social transfer schemes to this end could minimize transaction costs. For instance, the existing social transfer scheme in Ecuador ("Human Development Voucher" scheme, "BDH") could have been adapted in the context of a fossil-fuel subsidy reform that ultimately failed in 2019 due to public protests. Such a measure would have even increased household income for the poorest parts of the population (Schaffitzel et al., 2020).

Furthermore, setting up carbon pricing schemes in poor countries could also lead to unwanted interactions with other development targets. Facing rising energy prices, households in Sub-Saharan Africa frequently substitute fossil cooking fuels with traditional fuels, such as firewood or charcoal (Greve and Lay, 2021). These solid cooking fuels have tremendous negative health and development effects, especially for women, and cause around 600,000 additional deaths annually in Sub-Saharan Africa alone (World Bank, 2014). Firewood and charcoal are the main cooking fuels for more than 3 billion people and the dominant primary energy source in much of Sub-Saharan Africa (75 % excl. South Africa, IEA, 2019) and South Asia. Daily collection of fuels (such as firewood) restricts opportunities for education and employment and exacerbates pressure on local forests. Additional demand for charcoal and firewood can also lead to deforestation, which would again undermine climate change mitigation efforts (Sedano et al., 2016).

In addition, Aggarwal et al. (2021) find that, faced with higher energy prices resulting from a carbon price, Ugandan households would not only substitute clean cooking fuels with charcoal and firewood, but would also substitute within their food baskets, i.e. substitute towards lower quality food. This might lead to lower nutrition intake for the poorest parts of the population. Climate policy design needs to take into account these particularities, e.g. by exempting household use of cooking fuels (such as LPG) or through transfers to households that compensate for the additional burden of carbon pricing.

4. BEHAVIORAL BARRIERS AND MARKET FAILURES

In many LMICs, especially in Sub-Saharan Africa, emissions from agriculture and land-use change (including deforestation, often for charcoal production) are more important than emissions linked to burning fossil fuels. Reducing these emissions requires policies that are substantially different from those oriented towards fossil fuels, for instance, the roll-out of small-scale low-carbon technologies, such as improved cookstoves (ICS).

Yet, their uptake in rural areas—where they are most needed—remains low (Jeuland et al., 2021a). Despite high individual returns, such investments are often hampered by various demand-side obstacles. Besides a high discounting of costs and benefits (Mobarak et al., 2012), information asymmetries (Bonan et al., 2017;

Beltramo et al., 2015), and affordability (Bensch et al., 2015; Munyehirwe et al., 2021), their large-scale adoption, especially among lowest-income households in remote, rural areas, can also be hampered by norms and traditions (De Mel et al., 2008; Cohen and Dupas, 2010; Duflo et al., 2011; Grimm et al., 2011). In some cases, ICS are scarcely used after installation because they do not suit local household preferences and cooking habits and are expensive to maintain (Jeuland et al., 2015; Hanna et al., 2016; Burwen and Levine, 2012). On the supply side, market failures comprise highly context-dependent hurdles like liquidity constraints and the lack of information and marketing material (Jeuland et al., 2021b). But overall, these issues require more detailed research on local supply chains and rural markets for further technologies and settings.

5. POLITICAL ECONOMY FRICTIONS

Putting forward climate policies threatens investments into established fossil fuel infrastructure and could even lead to its early retirement and potential asset stranding. This suggests that countries will need to take the political influence of fossil fuel owners into account as the fossil fuel sector is known to be well connected to political decision makers. Revolving door policies between regulators and regulated utilities often facilitate fossil fuel investments, even if economic reasons are less obvious (Jakob and Steckel, forthcoming). In countries that mine and export fossil fuels, royalties are often an important channel that stabilizes established power structures (Ordonez et al., 2021; Pittel et al., 2021). Moreover, with shrinking international fossil-fuel markets, investing into domestic fossil power generation capacities is an important way to secure revenues, e.g. in Indonesia or Colombia.

Vested interests are most relevant in countries where energy markets are not liberalized, as regulatory details can have major disadvantages for renewable energies and other alternatives to fossil fuels. By contrast, in countries that have successfully phased out coal and put forward respective climate policies, liberalized markets have pushed for the most cost competitive option, e.g. natural gas or renewables (in the case of the UK, the US, and Chile) (Jakob and Steckel, forthcoming). However, liberalizing energy markets in the institutional context of many LMICs is a challenge in itself which suggests that international assistance could be helpful. Finally, the engagement of civil society, in countries where it plays a strong role, can be decisive for preventing new fossil fuel projects. For example, in Kenya, strong public opposition has hindered the construction of a new coal fired power plant in Lamu (Ayhan and Jacob, forthcoming).

6. CONCLUSION

To reach the Paris goals, it seems to be inevitable that LMICs also implement ambitious and effective climate policy measures. It is as important to avoid future lock-ins and rising emissions from land-use change as to cut current emissions. Yet, the wide variety of countries and their particular circumstances, including institutional capabilities, need to be considered. For emerging economies at middle-income levels, such as China, Brazil, or Indonesia, carbon pricing schemes are a realistic option that can lead to an effective realization of local mitigation projects and facilitate the profound transition to a capital-intensive renewable energy infrastructure. Revenues from domestic carbon pricing can further be used to alleviate distributional consequences

for most affected households or stakeholder groups, which might otherwise have the power to block those reforms. The potential for adapting existing social transfer schemes should be evaluated in this regard.

Low-income countries are facing additional obstacles to the implementation of carbon pricing and the removal of fossil-fuel subsidies. Concrete policies need to consider the high prevalence of traditional fuels in cooking choices in many low-income countries with related burdens on human health and gender equality. Fossil fuels can play a key role to alleviate negative externalities from cooking. Price reforms like removing fossil fuel subsidies or eventually introducing carbon pricing should be designed in a way that they do not interfere with policies to foster clean cooking fuels, e.g. by continuing to subsidize cooking fuels for households (such as Liquified Petroleum Gas) or by providing alternatives to high-emission technologies, such as improved cookstoves.

For all LMICs, it is important to promote conditions that make investments into low-carbon infrastructure attractive for investors, including instruments that lower investment risks and capital costs. Those could be, for instance, export guarantees for renewable plant equipment provided by high-income countries or development banks or green bonds (to be acquired by international actors such as development banks). Finally, high-income countries should share knowledge on and experience in technologies, risk assessment for renewable projects, and energy market designs.

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