Combining the African Continental Free Trade Area and climate mitigation policies in Africa can result in double dividends

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Abstract

Within the broad outlines of trade and energy sector implications, this study aims to address key questions related to the implementation of the African Continental Free Trade Area (AfCFTA) and its interaction with domestic energy and climate policies. The analysis relies on the dynamic computable general equilibrium model ENVISAGE coupled to a GTAP-Power Data Base. A set of forward-looking scenarios till 2040 are evaluated, which include the AfCFTA implementation, achievement of the Nationally Determined Contributions (NDCs) by countries around the world, higher-ambition mitigation policies in Africa and more rapid energy efficiency improvements in the African countries. Results suggest that while implementation of the AfCFTA leads to a cleaner generation mix, total emissions moderately increase following an expansion in economic activity. However, joint implementation of the AfCFTA and climate mitigation policies is a win-win solution for African countries, leading to a reduction in emissions (up to 20%-25% across countries), growing exports (up to 7%-8%), increasing share of renewable electricity (up to 25 pp) and welfare gains (up to 5%) in 2040.

Introduction

Within the broad outlines of trade and energy sector implications, this study aims to address key questions related to the implementation of the African Continental Free Trade Area (AfCFTA) and its interaction with domestic energy and climate policies. First, it seeks to assess the effects of the AfCFTA implementation on the continent's macroeconomies, sectoral outcomes and trade in general to establish the AfCFTA scenario for the study. Since one focus of this study is to identify and estimate the implication of the AfCFTA on electricity demand in the continent, such a policy scenario is a good starting point. To appreciate the sources of additional energy demand within an AfCFTA scenario, therefore, the implications broadly on the macroeconomy and trade are revisited to provide a basis for the analysis of energy sector demand and investment implications. As a result, GDP and welfare effects, sectoral effects, and implications to labor demand to the energy sector and beyond are highlighted.

Second, the study assesses the effects of AfCFTA implementation on increased electricity demand, and implications for electricity generation investments across technologies, and transmission and distribution infrastructure investments. By projecting the electricity demand implications from the 2021 and 2023 levels to 2025, 2030, 2035 and 2040 periods, required investment by technology for these time periods is estimated and implications to public and private sector investment are discussed.

Third, the study aims to assess the implications of improving energy efficiency within SDG7 goals and assesses the effects of efficiency improvements on trade and environmental outcomes. Progress on energy efficiency as part of the SDG7 goals is not on a path to meeting agenda 2030 target. As a result, there is policy effort to accelerate higher energy efficiency achievement (up to 3.4% improvements per year). This study evaluates the long-term effects of increasing energy efficiency on the macroeconomy, on trade patterns and environmental outcomes.

Finally, the study examines the effects of energy transition through achieving Nationally Determined Contributions (NDCs), on emission reduction, energy mix and trade outcomes. This analysis clarifies the implications of energy transition on the long-term power generation mix and changes in export (trade) performance. This assessment highlights the synergies and trade-offs between energy transition, climate goals and trade performance across regions and countries in Africa.

Data and Methods

For the purposes of the current analysis, the extended version of the standard GTAP Data Base – GTAP-Power is utilized. The database disaggregates a single electricity and heat generation activity of the standard GTAP Data Base into 11 generation technologies, as well as electricity transmission and distribution activity. For the levelized cost of electricity generation (LCOE) estimates across technologies in the reference year, the database relies on the data from

IEA/NEA (2015). The LCOE is further updated overtime within the forward-looking scenarios reflecting reductions in generation costs for selected technologies. Country-specific data on transmission and distribution costs is incorporated into the database. In the case of African countries, the key data source for the costs of transmission and distribution (as a share of the total non-tax value of electricity and heat generation) is Trimble at al. (2016).

The GTAP-Power Data Base is aggregated into 21 regions and 36 activities. In the case of Africa, it is split into eight individual countries database (Egypt, Morocco, Ghana, Nigeria, Ethiopia, Kenya, United Republic of Tanzania and South Africa) and five composite regions (Rest of Northern Africa, Rest of Western Africa, Rest of Central Africa, Rest of Eastern Africa and Rest of Southern Africa). The GTAP-Power Data Base is coupled to the recursive dynamic and global computable general equilibrium model (CGE) ENVISAGE (van der Mensbrugghe, 2024).

First, the baseline scenario is developed using economic projections from the World Economic Outlook (WEO) combined with the GDP growth rates converge to the Shared Socioeconomic Pathways (SSP) middle-of-the-road (SSP2) scenario. A number of technological, productivity and structural assumptions are implemented in the baseline scenario to reflect the future economic and energy trends. To assess the potential implications of the trade and climate policies in Africa we explore a set of scenarios that represent various dimensions of trade (AfCFTA), climate mitigation (NDCs) and energy efficiency policies. Table 1 below outlines key characteristics of the considered scenarios.

Table 1. Scenario framework

No.	Scenario	Description
1.	**AfCFTA** (Results are also decomposed across three policy leavers)	Implementation of the AfCFTA policies and measures. These correspond to the reduction in tariffs, implementation of trade facilitation measures and reduction in non-tariff barriers (AfDB, 2019). Three leavers of policies are implemented: (a) Tariff liberalization scenario in line with AfCFTA modalities (b) NTBs on both goods and services are reduced on an MFN basis by 50 percent. (c) Implementation of TFMs on an MFN basis. Estimates of these trade barriers were obtained from de Melo and Sorgho (2019). These are halved, although capped at 10 percentage points.
2.	Nationally-determined contributions **(AfCFTA + NDC)**	AfCFTA + implementation of the mitigation policies that corresponding to unconditional Nationally Determined Contributions (NDCs). The level of corresponding efforts is translated to the carbon prices applied till 2030 (year of the NDC commitments). Post-2030 carbon prices are growing at a pre-defined rate: 7% per year for low- and middle-income countries.

No.	Scenario	Description
3.	Beyond NDC with energy efficiency **(Beyond NDC + EE)**	NDC + more rapid energy efficiency improvements in the African countries that allow to faster close the gap in energy intensity between high- and low-income economies. Additional energy efficiency improvements in Africa are 1 percentage points per year. No specific costs are associated with such changes. Carbon prices in all countries/regions are exogenous and follow the "NDC" scenario trajectories.
4.	NDC with energy efficiency **(NDC with EE)**	"emiNDCaeei" scenario but with endogenous carbon prices. Emission trajectories in all countries are exogenous and follow the NDC scenario pathways. Carbon prices are determined by the model.

Key results

Electricity generation mix becomes cleaner in the baseline, but fossil fuels still play an important role

Estimates suggest that the role of services in the African economy is expected to increase over time, while growing GDP and output would stimulate the demand for electricity and other energy carriers. Results suggest that even without targeted mitigation efforts energy supply and electricity generation mix become cleaner over time, however, fossil fuels continue playing an important role. In particular, GDP and emissions experience relative decoupling in most countries under the reference scenario but additional efforts are needed to comply with NDC-consistent climate pledges. Even prior to accounting for the impacts of AfCFTA the role of inter-African trade increases over time. At the same time, growing economic activity would require substantial expansion in investments in electricity generation, transmission and distribution (additional 28 bn USD in 2040 w.r.t. 2021 – 100% increase).

Implementation of the AfCFTA leads to a cleaner generation mix but emissions moderately increase following an expansion in economic activity

Findings suggest that the AfCFTA implementation will boost GDP and economic welfare in Africa but impacts vary substantially across countries depending on their trade openness, structure of economy geography of trade and initial level of tariffs. Following AfCFTA implementation, service sectors, such as trade, construction, and other services activities see the most substantial increase in investments. In terms of impacts on trade, AfCFTA leads to an increase in trade across African countries by up to 7% in 2040 with most of the expansion being driven by inter-African trade. Services sectors, including infrastructural activities, experience the most substantial expansion in output following the AfCFTA implementation, while electricity generation expands by around 2% in 2040 (w.r.t. baseline). Growing electricity demand from AfCFTA requires additional $14 billion investments in electricity generation between 2025 and 2040, with 55%-60% coming from the private sector as suggested by additional side estimates. In terms of the impacts of AfCFTA on the energy mix and emissions, we find that this policy leads

to a cleaner electricity generation mix in Africa, however, due to an overall increase in economic activity CO_2 emissions show a minor increase over time (by around 0.3% in 2040), though trends vary across countries.

Joint implementation of the AfCFTA and climate mitigation policies is a win-win solution

NDC-consistent Climate mitigation policies lead to the greening of electricity generation mix in Africa with major expansions coming from solar and wind generation. Despite moderate aggregate macroeconomic costs, mitigation policies also lead to an increase in the exports of selected service activities. At the same time, a joint implementation of the AfCFTA and climate mitigation policies is a win-win solution: leads to a reduction in emissions (up to 20%-25% across countries), growing exports (up to 7%-8%), increasing share of renewable electricity (up to 25 pp) and welfare gains (up to 5%) in 2040 (Figure 1).

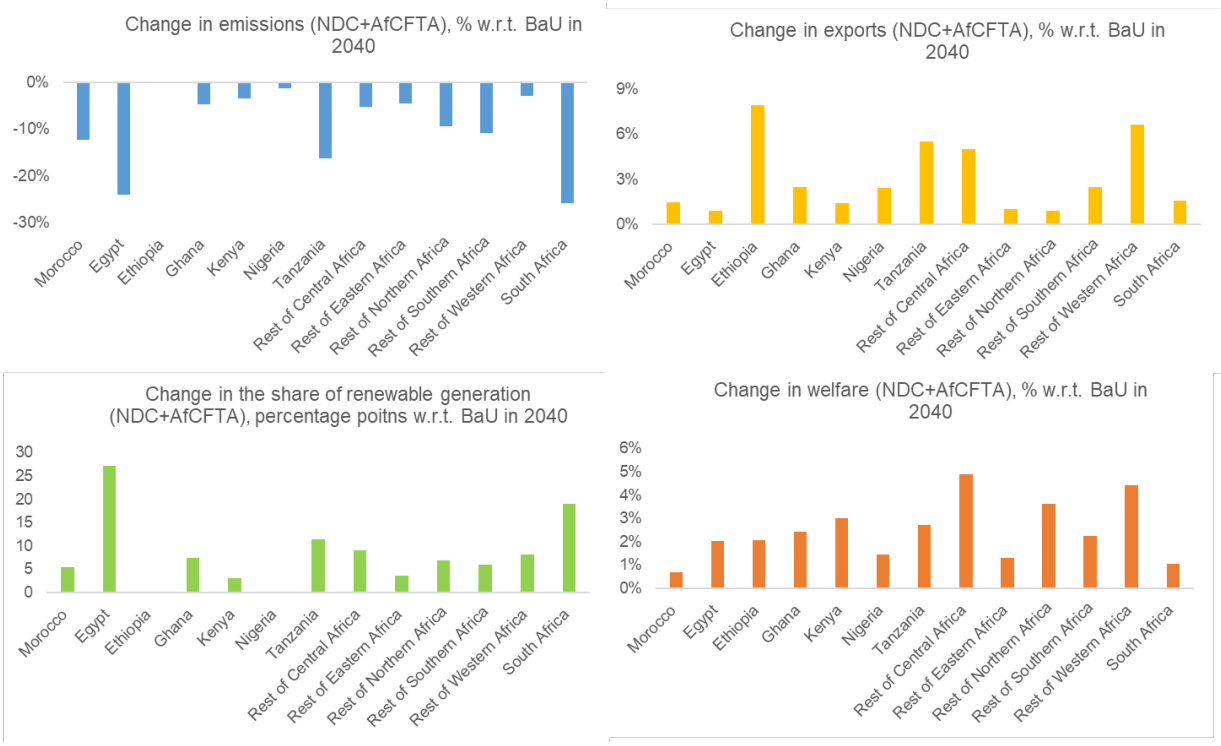

Figure 1. Impacts of the simultaneous implementation of the NDC and AfCFTA policies on key economic and environmental indicators, % difference w.r.t. baseline scenario in 2040

Results also suggest that additional 1% per year improvements in energy efficiency are equivalent to 1%-2% cumulative increase in GDP and welfare in the long-run, also benefiting energy-intensive exports (transport, metals, chemicals). Such energy efficiency improvements could help further reduce GDP energy intensity and emissions but there are rebound effects: as energy becomes cheaper it boosts energy demand and reduces overall benefits from such policies. Key reduction in emissions under energy efficiency improvements are coming from electricity generation and transportation activities.