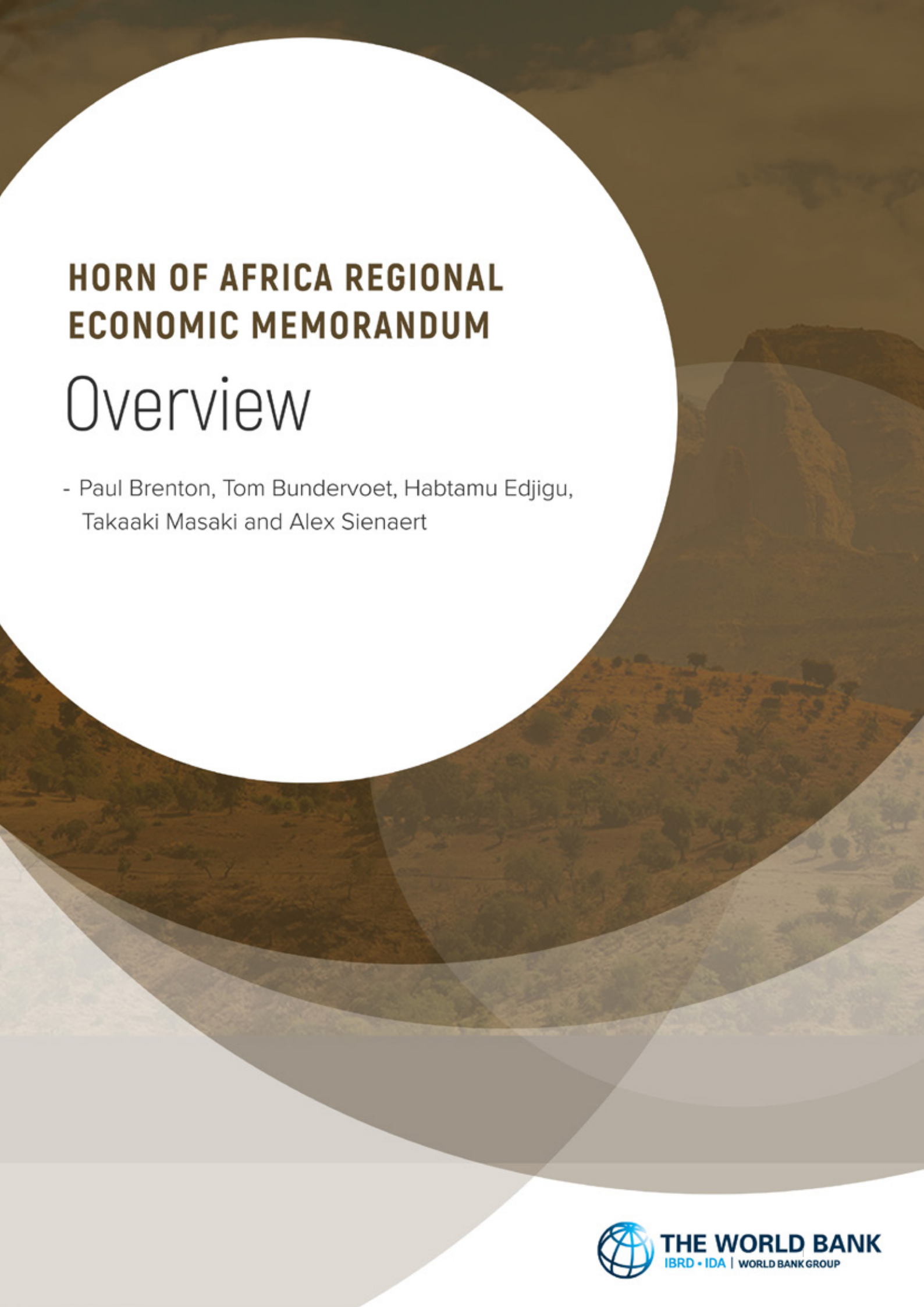
# HORN OF AFRICA REGIONAL ECONOMIC MEMORANDUM

# Overview

- Paul Brenton, Tom Bundervoet, Habtamu Edjigu, Takaaki Masaki and Alex Sienaert



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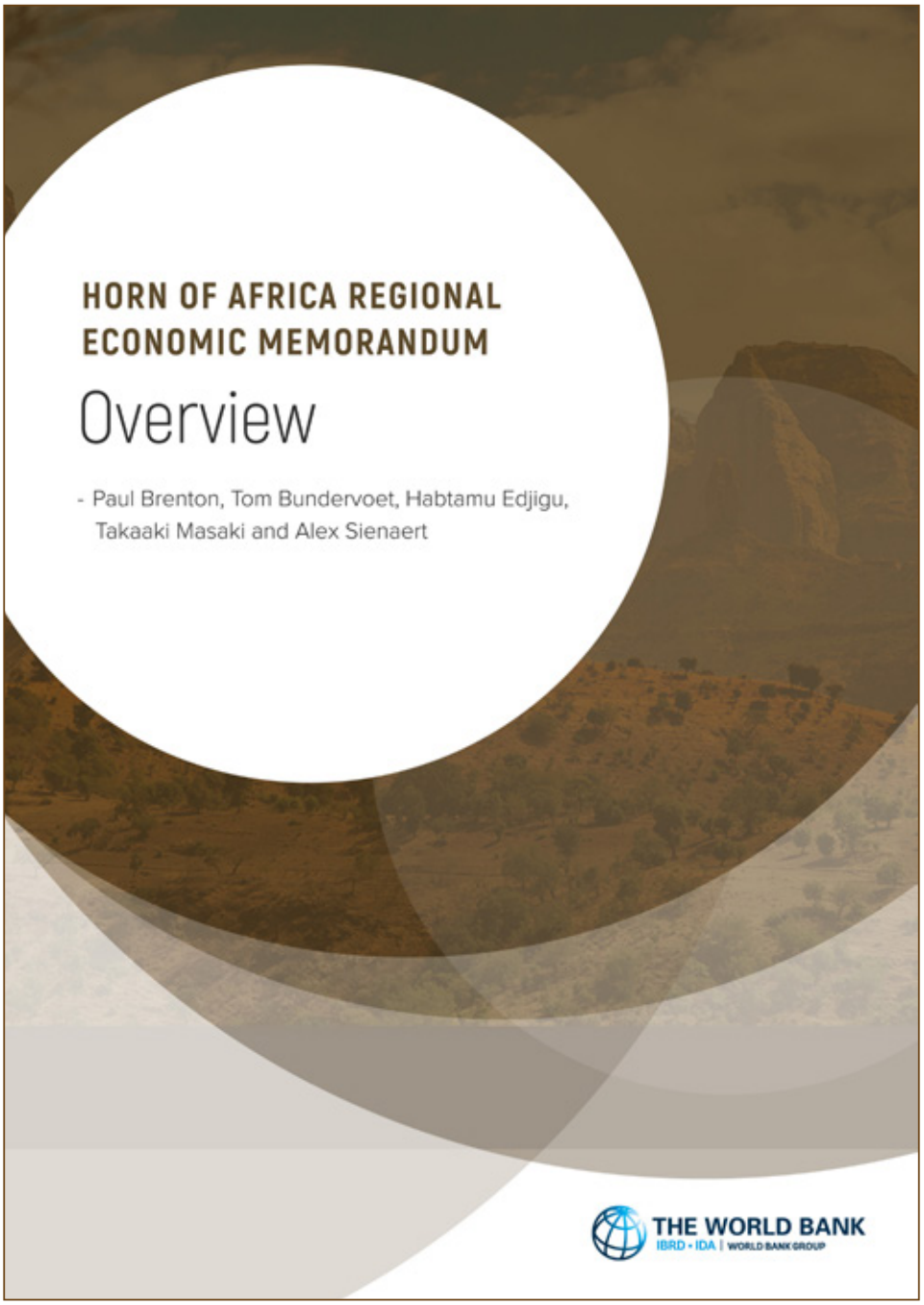
# Overview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SECTION 1

# Introduction

**The Horn of Africa (HoA)[1] is most commonly known for its long history of fragility, catastrophic droughts, and seemingly intractable conflicts.** A complex set of historical, ideological, political, economic, geographical, territorial, and environmental factors have created tensions within and between states, at times boiling over into inter- and intra-state violent conflicts. These conflicts have, in turn, further weakened states' capacity to provide public services, social cohesion, and further increased the vulnerability of its population (particularly in historically marginalized border areas), thereby increasing the risk of future conflicts. Climate change is now exacerbating an already difficult situation, leading to increased tension over natural resources. Successive shocks of different kinds have led to record numbers of displaced people and increased migration, mostly irregular, to Gulf countries.[2]

**Yet the true picture of the HoA is more nuanced, and HoA countries could unlock significant common opportunities.** Cities and towns across the HoA are growing, increasing the demand for food grown elsewhere in the region. The growth in urban incomes is increasing demand for higher-value foods, including processed foods and animal products, with the potential to benefit rural producers and create jobs across the agri-food value chains. The growth of secondary cities attracts service providers that can provide jobs for those migrating from rural areas and deliver services supporting the growth of off-farm employment in rural areas.[3] There is strong demand from the Gulf for some products produced in the region, in particular, meat and other agricultural products. There is considerable potential for enhanced cross-border trade, which is intrinsically transnational but mainly small-scale (informal) in the Horn, with significant potential to leverage entrepreneurship and greater private sector activity to generate jobs. For example, the positive impact of digital innovation to open up new economic opportunities and boost incomes has been demonstrated in Kenya, and the wider region could build on this experience.

**The economic priorities in the region are consistent with the jobs and economic transformation (JET) agenda,** which recognizes the role of connecting to markets in generating job-creating private investment, and the importance of building capabilities and linking workers to jobs. In the Horn of Africa, there is an opportunity to drive the JET agenda through deeper regional integration and investments in connectivity to improve access to markets across borders, realizing common opportunities to diversify, deliver jobs and reduce poverty and vulnerability. At the same time, however, implementing the JET agenda in the HoA will require dramatic improvements in education and other investments to build capabilities and overcome significant cross-border and interconnected risks, including currently poor human capital outcomes, large and rapidly growing numbers of youth, fragility, and environmental degradation and climate change.

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1 For the purposes of this report, the Horn of Africa is defined as a subset of the larger Horn and comprises Djibouti, Eritrea, Ethiopia, Kenya, and Somalia. The map in the Annex shows the smaller Horn of Africa and its main cities.

2 In 2018, over 315,000 migration movements were observed between the HoA and the so-called Eastern Route (towards Yemen and the Arabian Peninsula), increasing to 469,000 in 2019 (DTM, 2019).

3 In Ethiopia, for example, the number of manufacturing firms in Addis Ababa grew by 48% (to 1,120) from 2010 to 2016, compared with growth of 81% (to 850) in the main secondary cities according to manufacturing census data.

**The objective of this Regional Economic Memorandum (REM) is to strengthen the economic analysis available to policymakers on the challenges and opportunities for regional economic integration to support job creation and economic transformation in the Horn of Africa.** It assesses the current state of regional economic integration, how policies and investments can deepen this integration, and how this could help to address the opportunities and challenges confronting the region. The analysis applies both an economic geography perspective (based on the 3Ds framework of the 2009 WDR – density, distance, and division)[4] and the lens of the jobs and economic transformation (JET) agenda,[5] whilst taking into account fragility and conflict and the region's complex and evolving political economy. This overview synthesizes the key findings of the analysis conducted for the HoA REM, full details of which are presented in a series of Background Papers. The overview briefly describes key aspects of the region's economy and development progress (Section 2). Next, in Section 3, it presents features of the economic geography of the region and some key results from economic modeling and transport connectivity analysis. The findings demonstrate the salience of the JET agenda in the Horn, and this and its implications are discussed in Section 4. Finally, Section 5 concludes by highlighting the main policy messages which emerge from the REM's regional-level analysis.

4 World Bank (2009), World Development Report 2009: "Reshaping Economic Geography".

5 Special Theme: Jobs and Economic Transformation (English). IDA19 Washington, D.C.: World Bank Group.

SECTION 2

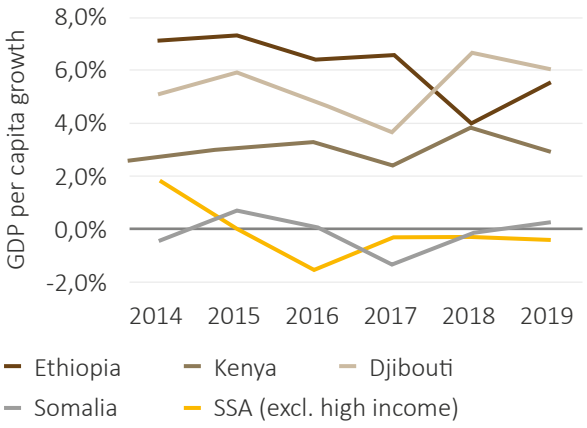
# Background & Context

## Positive growth and poverty trends from a low base

**Between 2014 and 2019, growth in the HoA outpaced growth in Sub-Saharan Africa (SSA) as a whole.** While real per capita GDP levels remained essentially flat in SSA (excluding high-income economies), they grew at an annual rate of four percent in the HoA (Figure 1).[6] Ethiopia, Djibouti and Kenya recorded the highest per capita growth rates, while in Somalia economic growth hardly outpaced estimated population growth. Despite the recent positive trends, income levels in the Horn remain below the SSA average. Average GDP per capita of the four HoA countries amounted to about US$1,100 in 2019, compared to US$1,600 for SSA (excluding high income). There is substantial variation within the HoA itself, with per capita income levels being 10 times higher in Djibouti than in Somalia (Figure 2).

**Figure 1: Economic growth in the HoA was mostly solid**

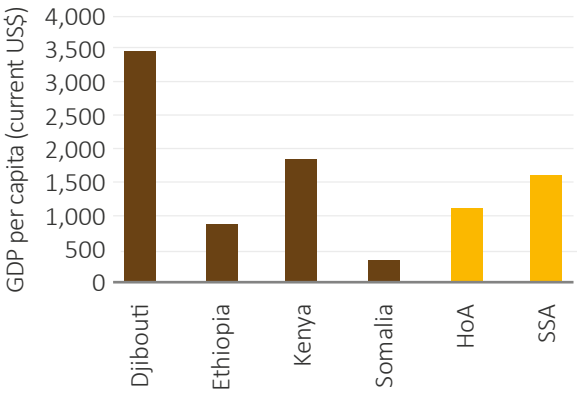
(Per capita GDP growth, 2014-2019)




Source: WDI, 2020; Somalia Economic Update, 2020. World Bank staff calculations.

**Figure 2: Though income levels remain low in comparison**

(Per capita GDP levels, 2019, current US$)




Source: WDI, 2020. Somalia Economic Update, 2020. World Bank staff calculations.

**Though trends in poverty have also been positive, the pace of poverty reduction has been too slow, and population growth too rapid, to reduce the number of people living in extreme poverty.** For the three countries where data are available, poverty rates based on the US$1.9 a day line decreased from around 40 percent in 2005 to 33 percent 10 years later.[7] Given rapid population growth, the absolute number of people living in poverty rose by 9 percent over the same period. Poverty rates range from 17 percent in Djibouti to 69 percent in Somalia (Figure 3).[8] Overall, an estimated 57 million people across the HoA live below the international US$1.9 a day poverty line (Figure 4).

6 This does not include Eritrea for which there are no publicly available and reliable GDP data.

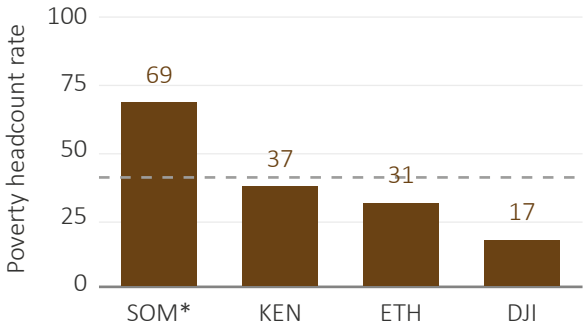
7 For Ethiopia, poverty surveys were conducted in 2004/5 and 2015/16. For Kenya, 2005/6 and 2015/16. For Djibouti, 2002 and 2017. Poverty is based on the international US$1.9 poverty line.

8 Somalia's poverty rate is estimated based on areas that were safe enough to survey. It does not include areas which were inaccessible due to insecurity.

**Human development outcomes have improved in line with economic growth, though remain low.** Between 2014 and 2019, the Human Development Index (HDI), a summary measure of average achievements in health, education, and living standards, improved in all countries except for Eritrea (Figure 5). However, except for Kenya, the HDI remains below the average for Least Developed Countries (LDC). With the exception again of Kenya, education outcomes remain particularly poor, even among the younger generation. Between half and two-thirds of children finish primary school (except in Kenya, where completion is universal) and gross enrolment in secondary remains relatively low (Figure 6). Based on the most recent household living standards surveys, 45 percent of youngsters between 15 and 24 had completed primary school or more at the time of the survey (between 2015 and 2017, depending on the country).[9]

**Figure 3: One third of the population lives below US$1.9 a day**

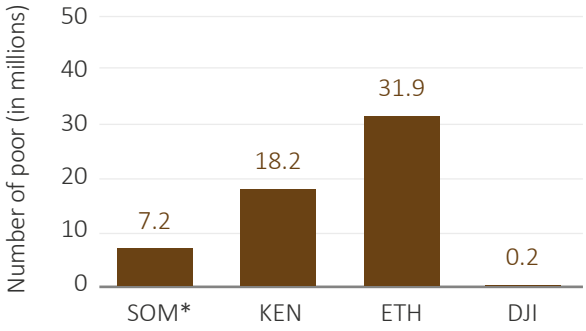
(US$1.9 a day poverty rate)




Source: World Bank staff calculations based on the latest survey available (2017 for Djibouti, 2015 for Kenya, 2015/16 for Ethiopia, and 2017/18 for Somalia). The dash line corresponds to the regional poverty headcount rate for the HoA (except Eritrea).
Notes: * indicates that Somalia's poverty rate is estimated based on areas that were safe enough to survey. It does not include areas which were inaccessible due to insecurity.

**Figure 4: The bulk of the poor live in Ethiopia and Kenya**

(Estimated number of people below US$1.9, millions)

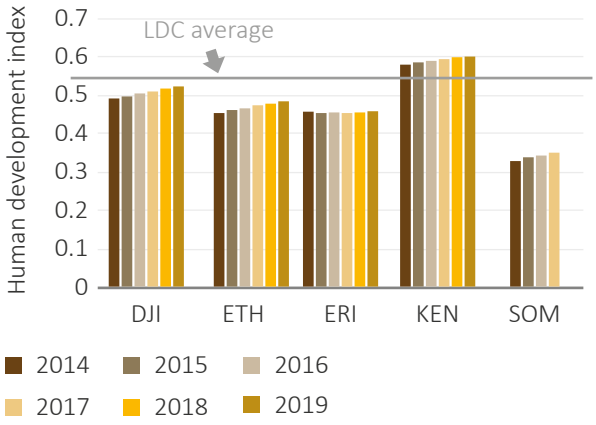



Source: World Bank staff calculations based on the latest survey available (2017 for Djibouti, 2015 for Kenya, 2015/16 for Ethiopia, and 2017/18 for Somalia).

[9] This should not be confused with the primary school completion rate. Given the prevalence of late school enrolment and high repetition rates, a substantial share of 15-24-year-olds are still in primary school.

Figure 5: Human development improved

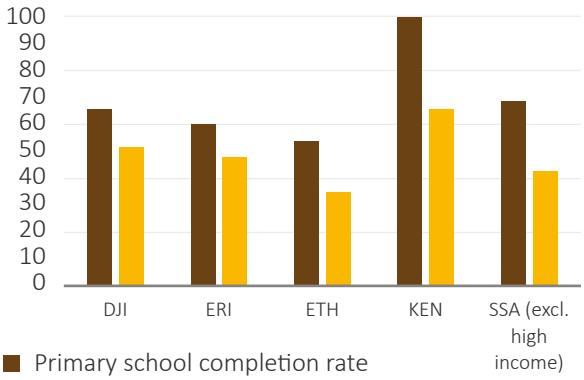
(Human Development Index, 2014-2019)




Source: UNDP, 2020.

Figure 6: But education outcomes remain weak (ex. Kenya)

(Primary completion rate and gross secondary enrolment)



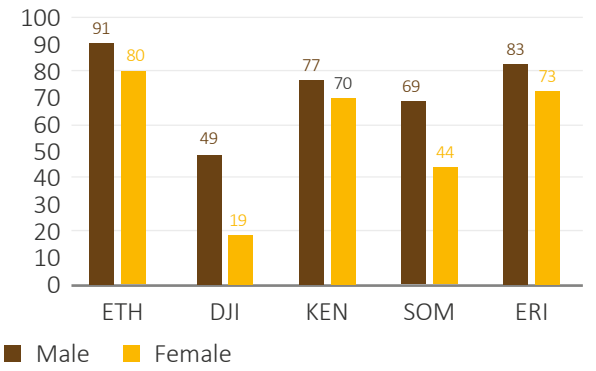

Source: WDI, 2020. KNBS, 2018.

## Employment characterized by self-employment and own-account agriculture, with substantial inequities in participation

**Labor market outcomes differ across countries but remain relatively poor, especially for youth and women.** In countries where the population is predominantly rural (Ethiopia, Eritrea, and Kenya), labor force participation rates are high (Figure 7). High labor force participation is an empirical regularity in largely agrarian low or lower middle-income countries, reflecting the prevalence of unpaid family labor and the need to work, given the lack of robust social assistance systems, rather than strong labor demand. In Djibouti and Somalia, labor force participation is low, mainly driven by social norms regarding the labor market participation of women and, in Djibouti, a pattern of job-poor growth centered around the port. Youths' participation in the labor market is low in Djibouti, Kenya, and Somalia (Figure 8). For Djibouti and Kenya though, this is partly explained by the high share of young people who are in school.

Figure 7: Labor force participation is high except for Djibouti and Somalia

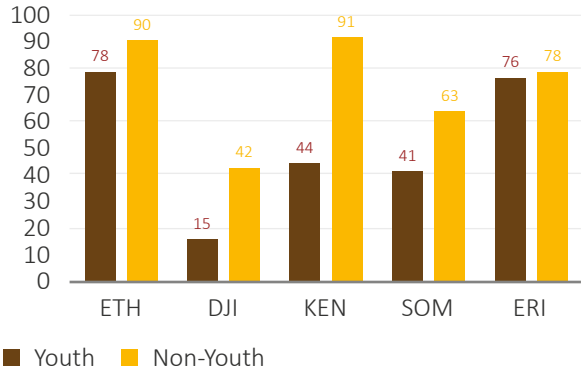
(Labor force participation rate, %)




Source: WDI, 2020. KNBS, 2018.

Figure 8: Youth are generally less likely to participate in the labor force

(Labor force participation rate, %)



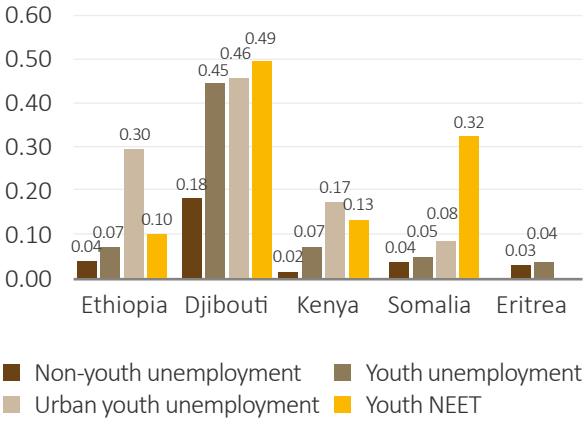

Note: Youth defined as people between 15-24 years of age.

Source: WDI, 2020. KNBS, 2018.

**A considerable share of youth across the HoA are Not in Employment, Education, or Training (NEET).** The share of young people who are NEET captures the extent to which youth are not substantially engaged in productive activity or activity that can increase their productivity in the future (e.g. education), which represents a waste of human resources. As a result, NEET is often considered a measure of exclusion from productive activities. Around half (49 percent) of youth in Djibouti, 32 percent in Somalia, 13 percent in Kenya and 10 percent in Ethiopia are NEET (Figure 9). Young women are particularly at risk of being NEET. Open unemployment is relatively low in the HoA (except for Djibouti). As with participation rates, however, this does not reflect a strong labor market, but rather the rural nature of most countries in the HoA and the need for people to work in the absence of formal social assistance systems. Unemployment is significantly higher in urban areas, especially among youth: 17 percent in Kenya, 30 percent in Ethiopia, and 46 percent in Djibouti. Speeding the school-to-work transition is a legitimate policy concern in these countries, but should be placed in the context of young urban workers accounting for only a small share of the labor force (two percent and seven percent of the labor force in Ethiopia and Kenya).

Figure 9: Youth NEET and unemployment are substantial across the HoA

(Share of youth 15-29 Not in Employment, Education or Training or unemployed)

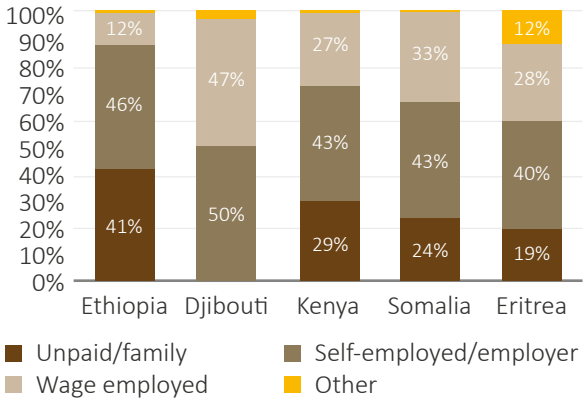



Note: Youth defined as people between 15-24 years of age.
Source: WB staff calculations on latest household surveys.

**Structural transformation is incipient - for most workers in the Horn, a job still comes down to self-employment or work in household activities.** Self-employment and unpaid family work dominate employment in Ethiopia, Kenya, Somalia, and Eritrea, while Djibouti has higher rates of wage-employment (Figure 10). Women are far more likely to be engaged in unpaid family work then men and are underrepresented in wage-employment, though the pattern is more equitable for the younger generations (Figure 11). The incidence of wage employment is closely related to the sectoral composition of employment. In Ethiopia, where agriculture accounts for the bulk of employment, wage-employment is particularly rare (Figure 12). In countries with a larger employment share in services, wage-employment is more common (Djibouti, Kenya, Somalia), though even in the services sector self-employment tends to be at least as important as wage-employment. There are few differences in the sector of employment between youth and older adults, but youth are much more likely to work as unpaid family labor. As a result of it being at only an early stage, accelerating the region's economic transformation has the potential to generate large income gains. Even in Kenya, where structural transformation and industrialization have progressed the most, cross-sectoral earnings differentials remain large: the average earnings of self-employed workers in the informal and modern sectors are 2.1 and 4.0 times those of self-employed agricultural workers.

**Figure 10:** Self-employment and unpaid work account for the bulk of employment in the HoA

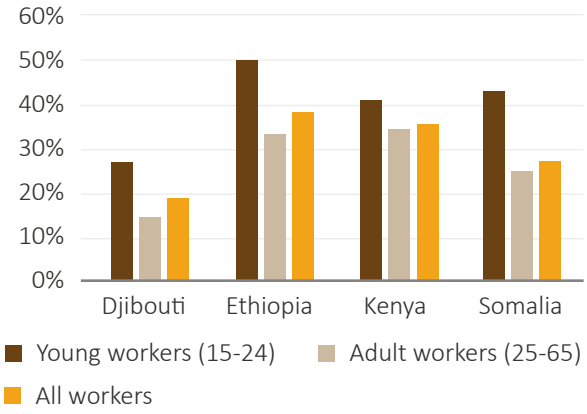
(Share of employment type in overall employment)




Source: UNDP, 2019.

**Figure 11:** Women are under-represented in wage employment

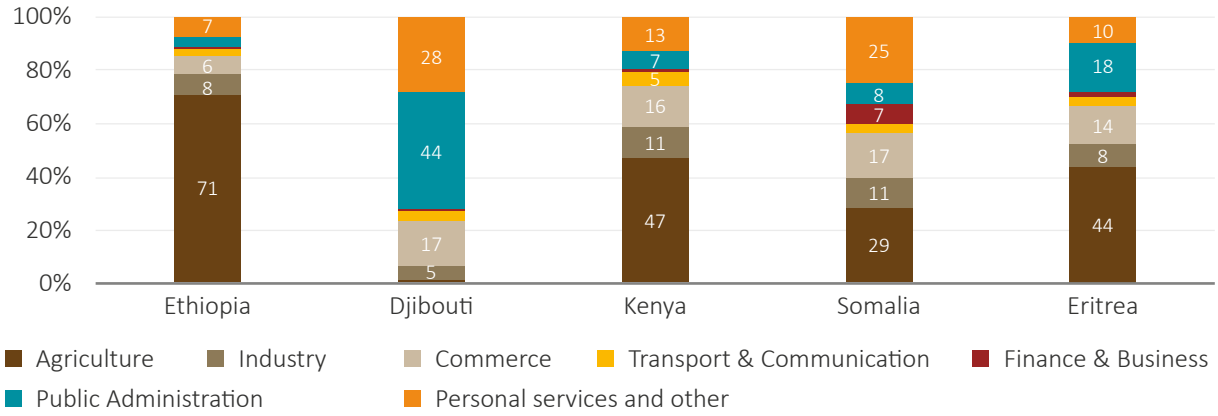
(Share of women in total wage employment, %)




Source: WDI, 2020. KNBS, 2018.

**Figure 12:** Agriculture and services account for the bulk of employment

(Sectoral distribution of employment)




Source: UNDP, 2019.

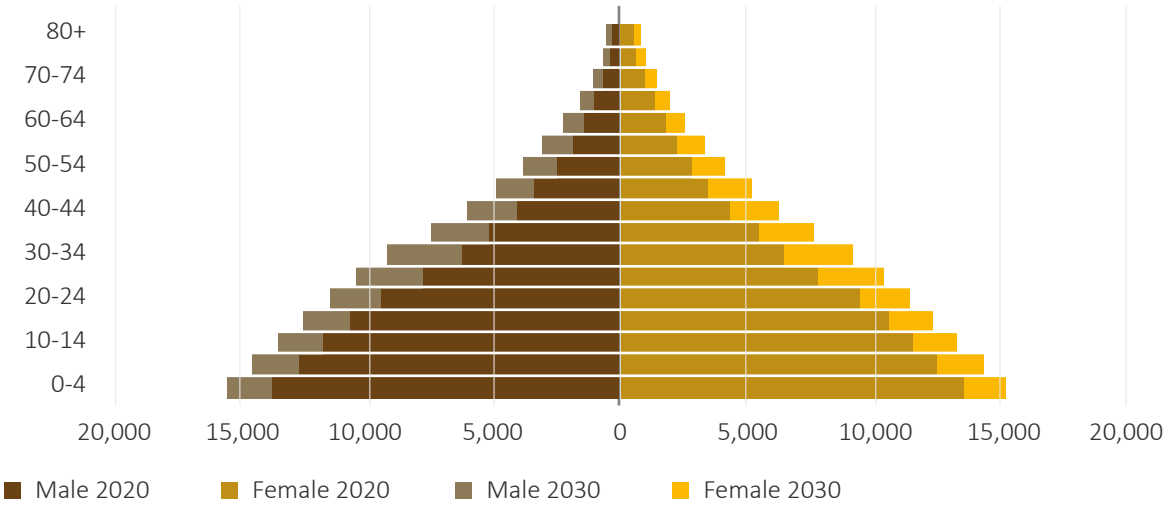
## Rapid population growth

**The employment challenge in the HoA is compounded by its rapidly growing population.** The working-age population in the HoA is projected to grow from 107 million in 2020 to 143 million by 2030, leading to a surge in demand for jobs and economic opportunities. A rapidly growing working age population can be a boon for economic growth through the "demographic dividend" when working age adults are economically productive and the average number of dependents supported by their incomes falls sharply. However, this is not the case in the HoA because fertility rates and dependency ratios remain high and are declining at only a moderate pace. While the share of the working-age population is projected to increase modestly from 57 percent in 2020 to 60 percent by 2030, each successive age cohort will still remain bigger than the previous one, meaning that a HoA-wide demographic dividend is not around

the corner (Figure 13).[10] Lowering fertility rates and strengthening the institutions necessary to realize the demographic dividend should be a priority for the HoA,[11] along with generating productive employment opportunities for a burgeoning and relatively poorly educated labor force.

**Figure 13: The demographic transition is still incipient in the HoA**

(Population pyramid of the HoA, 2020 and 2030)




Source: WPP, 2019. WB staff calculations.

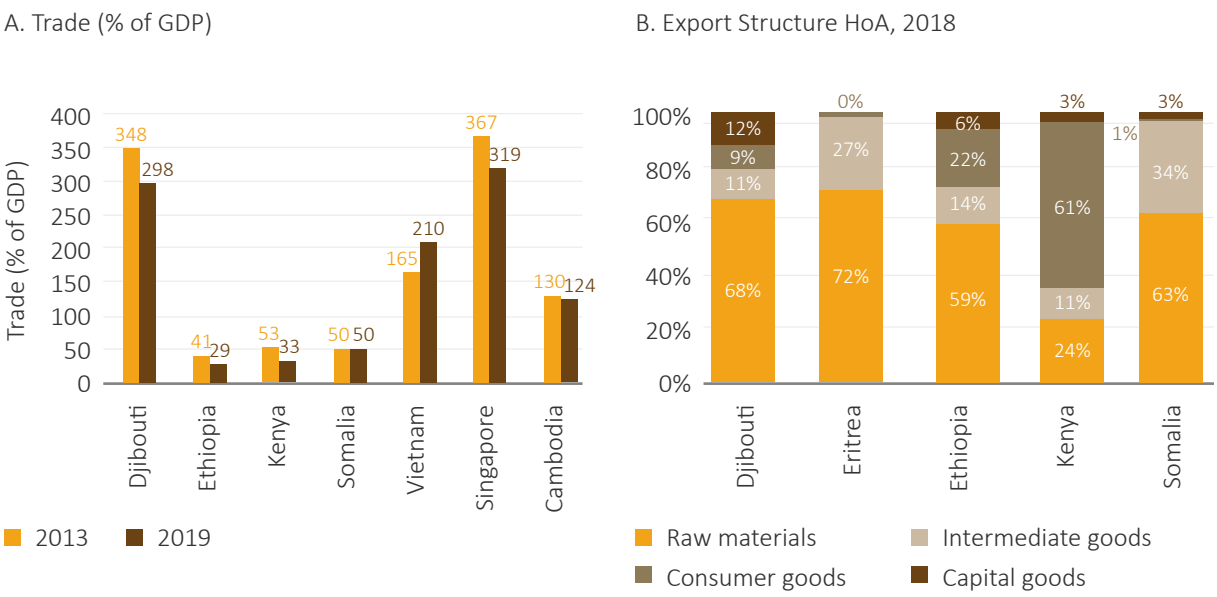
## Weak trade performance

**Trade is underperforming as a driver of growth, job creation and poverty reduction.** The ratio of (recorded) trade to GDP decreased between 2013 and 2019 in Ethiopia, Kenya, and Djibouti, and for countries in the region trade plays a role in the economy considerably below what would be expected based on their economic size and location. In general, HoA countries export agricultural products to the global economy and primarily import manufactures. Official statistics suggest that (except for Somalia) there is little intra-HoA trade. For recorded intra-HoA trade, manufactured exports are typically more important that agricultural exports. For both Ethiopia and Kenya, the share of manufactures in exports to HoA countries is almost double that in trade with the rest of the world. Almost all of Kenya's exports to the region are industrial products. The limited data suggest that Ethiopia is the major market in the region for HoA countries' exports of manufactures and the main exporter of agricultural products to the region. Somalia, the main import market for intra-HoA trade, primarily purchases vegetable products and processed food from the region.

10 A common misperception is that a large and growing youth population itself indicates a coming demographic dividend. It does not. The first step is a transition from high to low birth and death rates (Population Reference Bureau, 2012). Associated development impacts are strongest when this happens quickly, and the age structure shifts abruptly. In the HoA, however, the demographic transition is taking place more slowly.

11 Research shows that the demographic transition will not generate a demographic dividend if quality institutions are not in place. These institutions include basic health care and schooling, infrastructure, rule of law and efficiency of the bureaucracy, etc. (Lee, Lee and Mason, 2006; Bloom, Canning and Sevilla, 2003).

Figure 14: Recorded Trade-to-GDP Ratios and Export Structures in the HoA




Source: staff calculations using data from United Nations Comtrade Database.

**Unrecorded cross-border trade is an important phenomenon in the borderland regions of the Horn of Africa.** Beyond trade that is recorded at the border by Customs Authorities, typically undertaken by formal and larger enterprises, there is a vast amount of cross-border trade undertaken by small-scale traders and micro-enterprises that is not systematically recorded.[12] Such trade supports as many as 17 million people along a variety of different value chains, including crop farmers, brokers, crop traders, livestock-keepers, fodder suppliers, ranch owners, itinerant traders, large livestock traders and transporters. Unrecorded cross-border trade may be as much as 20 times greater than officially recorded intra-regional trade in the Horn.[13] Yet, there is considerable potential to increase regional trade including in livestock, both within the region and with third countries. For example, Ethiopia has the largest cattle inventory in Africa and the 5th largest globally. Kenya and Somalia also have considerable herds of cattle and Somalia is home to the world's largest camel population. Map 1 provides a snapshot of the main border crossings and documented trade routes. Since there is no systematically collected information on cross-border trade and the conditions at border towns, analysis must currently be based on the collection of available but *ad hoc* studies. Investments in data collection are therefore essential. However, surveys at the border and novel techniques such as analysis of satellite imagery and cell phone data records may provide critical information by which to better understand the nature of cross-border trade (see Box 1).

12 In the existing literature, many sources refer to this as "informal cross-border trade (ICBT)". However, this often carries a negative and unwarranted connotation as "informal" can be easily confused with "illegal". It also inaccurately reflects the reality of trade flows on the ground, as traders may indistinctly use both formal and informal crossing channels depending on a variety of factors, such as the nature of the goods, the value of their consignment, the length of the queue at the border, or the mood of the individual official on duty. The preferred terminology here is "unrecorded trade" as this commerce is either missed or under-represented in official (customs) collected data at the border.

13 Official data on cross-border trade is only available for Ethiopia and Kenya. These suggest that intra-HoA trade amounts to just under one percent of total trade. Taking currently unrecorded cross-border trade into account gives a very different perspective on the importance of regional trade in the HoA.

**Map 1: Commodities and livestock trade routes in the HOA**


Source: Brenton & Edjigu (2021).

**Trade, including the high volume of unrecorded trade, is affected by macroeconomic and trade policies, and differences in their implementation, amongst the HoA countries.** Exchange rate arrangements differ widely across Djibouti (currency board), Eritrea (fixed peg), Ethiopia (soft peg), Kenya (managed float) and Somalia (free floating, but with a high degree of de facto dollarization).[14] There are wide disparities in tariff rates and customs duties, and in the extent to which they are enforced. The general lack of systematic regulatory enforcement in Somalia, in particular, has led to the country acting as an entrepôt for the importation of goods into surrounding countries. The interplay between lax regulations and the importance of small-scale trade in supporting livelihoods fuels perceptions that a lot of trade is illicit (cf. footnote 12). The real challenge, however, is to enhance state capacity in ways which enable trade to flourish, including by clarifying, harmonizing and consistently applying the rules affecting how goods and services flow across the borders in the region. Further, convergence in macroeconomic policies in the region over time, especially reducing exchange rate rigidities which may distort incentives and lead to deadweight losses, would boost gains from trade.

**Cross-border trade in the Horn plays an important role in food security, improvements in smallholder income and poverty reduction.** Results from a survey of 200 traders at two border crossings (between Ethiopia and Somalia and between Ethiopia and Kenya) show that cross-border trading activities provide the main source of income for 78% of the traders at the Kenya border and 98% of those at the Somalia border. Previous studies have found that cross-border livestock trade enables herders to provide for their children's education, housing and other basic needs and also increases the incomes of traders, trekkers, fodder produces, brokers and other services, including veterinary services, hotels and restaurants among others.[15] Cross border trade enhances food security through the movement of grain and other food items from surplus areas to deficit areas and by increasing the price incentives to production in those areas where efficiency and yields are highest.[16] Income from cross border trade can also be an important source of saving and capital to startup new businesses or strengthen livelihood activities which can provide additional sources of income, employment and security for the household and a more diversified local economy.

14 Source (except for Eritrea): IMF Annual Report on Exchange Arrangements and Exchange Restrictions (2019).

15 Tesfaye, A. and N Amaha (2018) 'A Review on Cross-Border Livestock Trade Across Dry Land Borders of Ethiopia: The Trends and Implications', *Journal of Scientific and Innovative Research* 7(2): 36-42

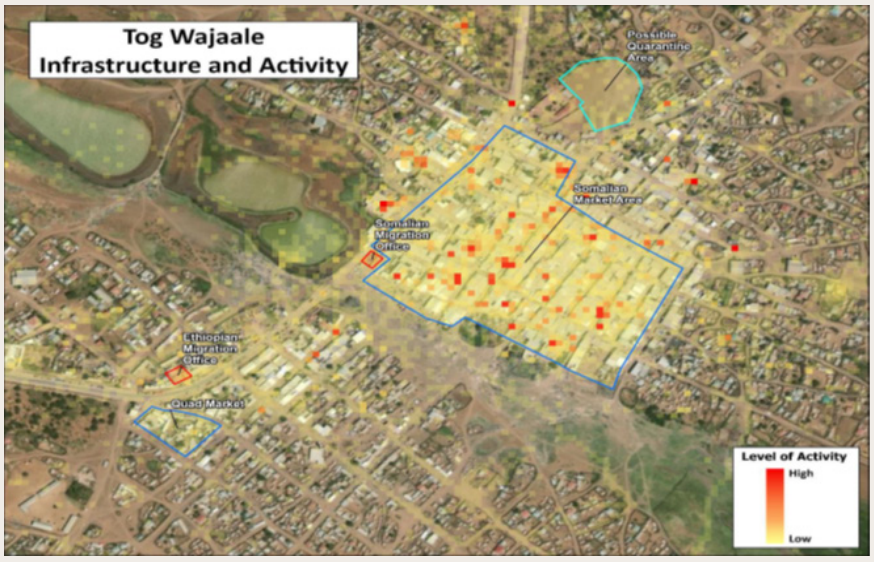
16 There is some evidence from Ethiopia that higher crop prices are associated with reductions in child stunting, with long-term development implications in terms of attainment at school and productivity in the workplace. (Brenton, P and M. Nyawo (2019). Food Prices, Access to Markets and Child Undernutrition in Ethiopia. Policy Research Working Paper 8823, World Bank, Washington, DC)

## Box 1: Monitoring border infrastructure and trade flows through satellite imagery and anonymized cell phone records

**A pilot analysis at two border crossings between Ethiopia and Somalia shows how, in the absence of systematically collected data on trade and trade-related infrastructure, satellite imagery and cell phone data can be used to identify the size and quality of relevant structures in border towns and monitor trade flows.** The analysis can identify market locations, market size, the total number of stalls (uncovered and covered), the extent of available lighting, the total number of market buildings, WASH facilities (well, reservoir, water tower, or water tank) and functionality and key roads (including type, maintenance status and flood risk). The structural information can be complemented by anonymized cell phone data to analyze foot traffic around markets and border crossings. This can identify market-site activity, the change in volume of market participants between different periods, routes traveled by traders, the volume of cross-border traffic, changes in trade over time based on cell phone locations, pings, and unique travel paths. Traders are identified as those who were within or around the market while the market was open, typically spent most of the day at the market, and spent multiple days in a row at the market.

**Figure 15 provides an example of the application of this approach to Tog Wajaale.** This is a key border crossing between Somalia and Ethiopia that appears to have been fully open and functioning during the 2019/2020 period, based on human movement analysis and satellite imagery. This is consistent with reporting by IOM, which monitors 14 border crossings between Ethiopia and Somalia, that all but two (Tog Wajaale and Dolo Ado) are designated as "closed for entry and exit" as of 2020/2021. The human movement analysis from cell phone records suggests that between 2019 and 2020, travel through the Tog Wajaale border crossing increased by 29%, and over half the people who visited the Jijiga markets made multiple (2+) border crossing trips through Tog Wajaale. Hence, it appears that with border closures elsewhere, at least a portion of the trade through those routes was re-directed through Tog Wajaale.

### Figure 15: Infrastructure and activity at Tog Wajaale border point




Source: IPSOS, 2021.

**Tog Wajaale is a split city, with some of the urban area lying in Ethiopia and some in Somalia.** Analysis of anonymized cell phone data shows that visitors to the Somali side of Tog Wajaale tend to cluster and spend most of their time in the main market area. This commercial market area may also be a key draw to this town (for purchase/sale of goods beyond cattle as well). Previous studies have shown that Tog Wajaale is a key node for cattle trade, with many cattle traded in its market originating from the Oromia region of Ethiopia, and that the construction of quarantine stations has facilitated such trade. The cell phone data point to a potential quarantine area identified through imagery analysis, confirming that cattle trade infrastructure is important in attracting additional flows.

**In contrast, the border between Ethiopia and Somalia at Ferfer-Beledweyne shows much less cross-border activity.** Ferfer is a small town, with a bridge across a dry riverbed connecting it to a cluster of buildings. This bridge appears to have likely border crossing infrastructure on either side ("likely" since there is a lack of other reporting to cross-verify this). While the bridge is intact, imagery analysis (Figure 16) reveals that there is noticeable damage – enough to inhibit the passage of heavy commercial vehicles. On the Somalia side, the analysis identified significant road damage that likely occurred during Al Shabaab's control and ultimate ousting from the area between 2006 and 2011. This damage may act as a security countermeasure in a climate of persistent insecurity with occasional clashes between rival clan militias along the border. As a result of the damage, the road is effectively a single lane and conditions are severe enough to prevent a consistent flow of travel, especially of vehicles transporting goods.

**Nevertheless, satellite imagery analysis identifies what appears to be likely informal trading of cattle and livestock along the riverbank.** Clearly defined man-made watering holes are apparent in the riverbed as well as foot paths from one bank to another and goats and cattle are visible gathering around a man-made watering hole .75 km south of the Ferfer bridge, with what appear to be livestock vehicles close by. Human mobility data volume is very low for this area, but it does demonstrate limited activity taking place across the bridge and within surrounding areas, with a slight uptick in 2020. This is consistent with the imagery findings, that demonstrate difficulty to transport a heavy flow of goods over the bridge, but a low level of ongoing trade taking place around the dry riverbed. In sum, this crossing is currently not along a primary corridor for flow of goods and trade, though there does appear to be informal livestock trade.

Figure 16: Little infrastructure and activity at Ferfer border point


Source: IPSOS, 2021.

**Hence, this pilot approach has shown how analysis of satellite imagery and cell phone records can help improve understanding of where important cross-border markets are situated, provide an indicator of trade volume and changes in trade over time and information on the type and extent of market related infrastructure.** Looking forward, if some of the processes can be automated then the approach could be useful for a wide area assessment of market locations and catchment areas.

**The livestock value chain is one of the most important in the Horn of Africa and has developed into a complex structure involving a wide range of stakeholders.** These include producers (herders), brokers, feed and water suppliers, traders, transporters/trekkers, processors, exporters and consumers. The general value chain for livestock starts with the collection of animals from farm gates moving on to local primary markets (collection markets), and then to secondary markets (regrouping markets) where livestock are regrouped and sorted into different classes based on appearance, size, color and conditions and then on to terminal markets and final buyers. If a primary market is near a border, cross-border traders purchase animals from farmers for onward sale in a terminal market, which may be in an overseas country. Secondary markets are relatively larger than primary markets, usually they are the main trading center in a district. The main actors in these markets include pastoralists, local butchers, middlemen and export traders. Pastoralists may directly sell their animals at secondary markets or purchase breeding stock. Brokers purchase animals for reselling to the butchers. Exporters purchase animals and further fatten to export to overseas markets. However, while this summarizes the broad structure of the value chain, processes and interactions between actors in the value chain are casual and change to suit the nature of the border.

**A key feature of the livestock value chain in the region is the importance of clan-based and trust-based trading.** Cross-border trade in the Horn of Africa is sustained by high levels of social capital among key market actors. Livestock sales are transacted mainly based on ethnic and familial ties reflecting the uncertain business environment, absence of strong institutional or judicial intermediation and formal systems of credit enforcement, weak infrastructure, limited market support services and prevalent insecurity in pastoral areas. In the absence of ethnic ties, a trust-based network of pastoralists, intermediates, traders and final buyers is important. Though clan-based and trust-based marketing facilitate trade, they can also distort the livestock market if the result is a clan-controlled monopoly.

SECTION 3

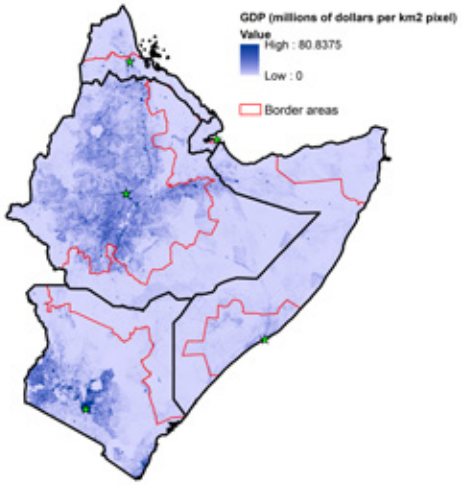
# The economic geography of the HoA

## 3.1 Density: Spatial Distribution of Economic Activity and Living Standards

**Economic activity in the HoA is spatially concentrated.** In countries with a substantial agricultural base (Ethiopia, Kenya and, to a lesser extent, Eritrea), economic activity tends to be concentrated in places with better agricultural potential (Figure 17 and Figure 18): The central highlands of Ethiopia crossing north into Eritrea towards Asmara and crossing east into Somalia towards Hargeisa, and the area around Nairobi and stretching westwards towards Kisumu and the shores of Lake Victoria. It is also in these agricultural breadbaskets that the countries' biggest cities are located. In Djibouti and Somalia, both arid and hot countries, economic activity is concentrated in places with a comparative advantage for trade through seaports: Djibouti city in Djibouti and Mogadishu (and to a lesser extent Kismayo) in Somalia.

Figure 17: Economic production in the HoA is highly concentrated

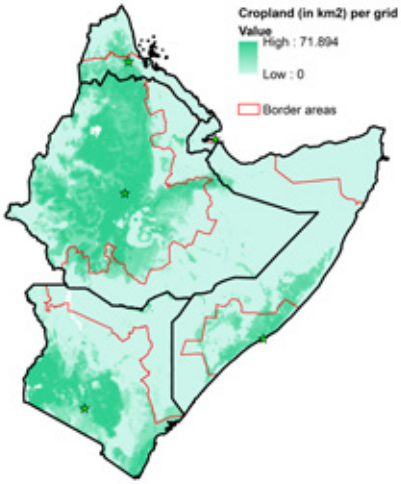
(Estimate of GDP per squared kilometer, 2006)




Sources: Ghosh et al. (2010).

Figure 18: And largely reflects cropland availability

(Cropland area in km² per 5 arc minutes grid cell)




Sources: HYDE3.2.

**Population density and economic density largely overlap.** In Ethiopia, close to 90 percent of the population live in the highlands, despite the highlands accounting for less than half of Ethiopia's territory (World Bank, 2019). In Kenya, 20 percent of counties – which are densely populated and concentrated spatially in the southwestern part of the country – account for over 40 percent of

population[17] while in Eritrea, it is estimated that the top 10 most populated districts, which are located mostly in the northeast, in and around the country's capital, account for around 40 percent of population.[18] In Somalia, high densities of population are observed in Mogadishu, Kismayo, Baidoa and Hargeysa and along major road networks that are connected to these major cities.

**The vast and sparsely populated border areas are a salient feature of the HoA.** The HoA border areas,[19] the area within the red lines in Figure 17, account for over 44 percent of the combined territory of the five countries but make up only 13 percent of total population and 9 percent of economic output. A large swath of the borderlands is classified pastoral/grazing land (see Figure 18). A large majority of people in the borderlands engage in pastoralism, agropastoralism and trade. The border areas are also where many of the Horn's challenges come together: a legacy of economic, social, and political marginalization; poor service delivery and infrastructure; conflict, violence, and forced displacement; and environmental degradation, all spilling across national boundaries. While there are differences across countries, the reach of the state in these areas is generally weak, and informal and illicit activities flourish. Yet these border areas are bound to play a key role if trade and cooperation across the HoA is to increase and deepen, highlighting their importance in the regional integration agenda.

**The spatial distribution of economic density is reflected in spatial differences in living standards.** Using the US$1.9 a day poverty line, poverty rates are generally lower in the economically dense areas than in the economically-lagging ones (Figure 19). There are several ways to classify economically dense (or "leading") areas vs. lagging areas. Poverty rates in rural areas of the HoA (39 percent) are close to three times higher than in urban areas (15 percent), while poverty in the border areas is 12 percentage points higher than poverty in the non-border or core areas. Given the sparsely populated nature of the border areas, the density of poverty is not situated in the border areas; most of the poor live in the wealthier (and hence more populated) parts of these countries (Figure 20). Other social indicators show large spatial disparities as well. The share of 7-14-year-olds attending school, the share of youth aged 15-24 that have completed primary education, and the share of youth 15-20 attending secondary education are substantially lower in rural areas and in border areas for all three countries, as opposed to urban areas and core areas, respectively (Figure 21 and Figure 22). Indicators of access to health care and health outcomes also tend to be substantially worse in the economically lagging areas, translating into multi-dimensional poverty rates that are substantially higher in the border areas than in the economically dense areas.

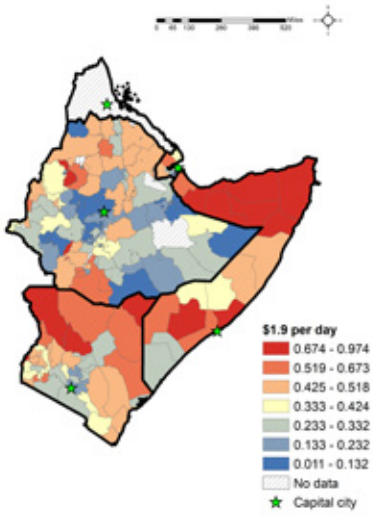
17 Out of 47 counties, the most populated 10 accounted for 41 percent of the population in the 2019 population census.

18 The World Bank's estimates based on population data from WorldPop and GADM ADM2 shapefile.

19 Border areas are defined here as second-order administrative divisions (ADM2) that share a land border with another country, with the exception of the regions of Tigray and Djibouti which have distinctly different demographic and environmental characteristics and are thus not characterized as border areas.

## Figure 19: Poverty rates tend to be higher in the sparsely populated border areas

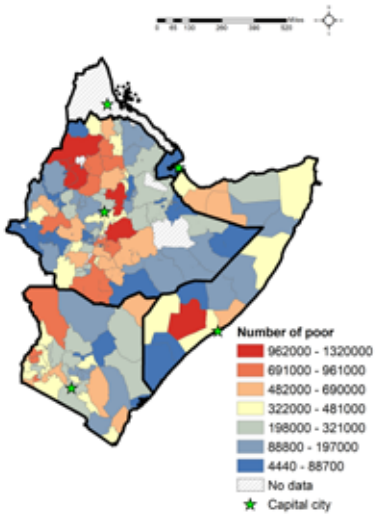
(Share of population below the US$1.9 poverty line)




Source: World Bank staff calculations using the latest household survey available in each country.

## Figure 20: Though most of the poor live in the economically-dense areas

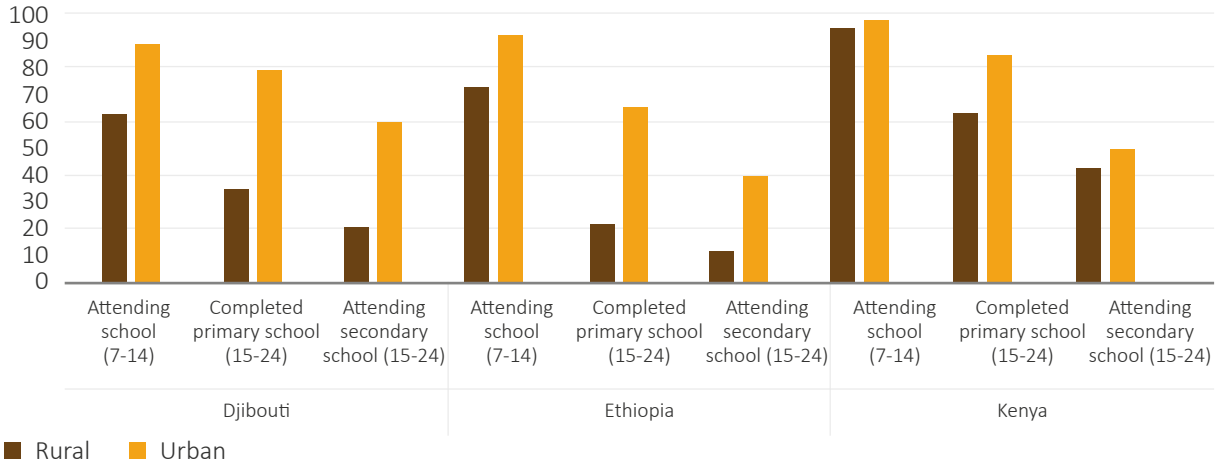
(Number of people below the US$1.9 poverty line)




Source: World Bank staff calculations using the latest household survey available in each country.

## Figure 21: Education outcomes lag in rural areas...

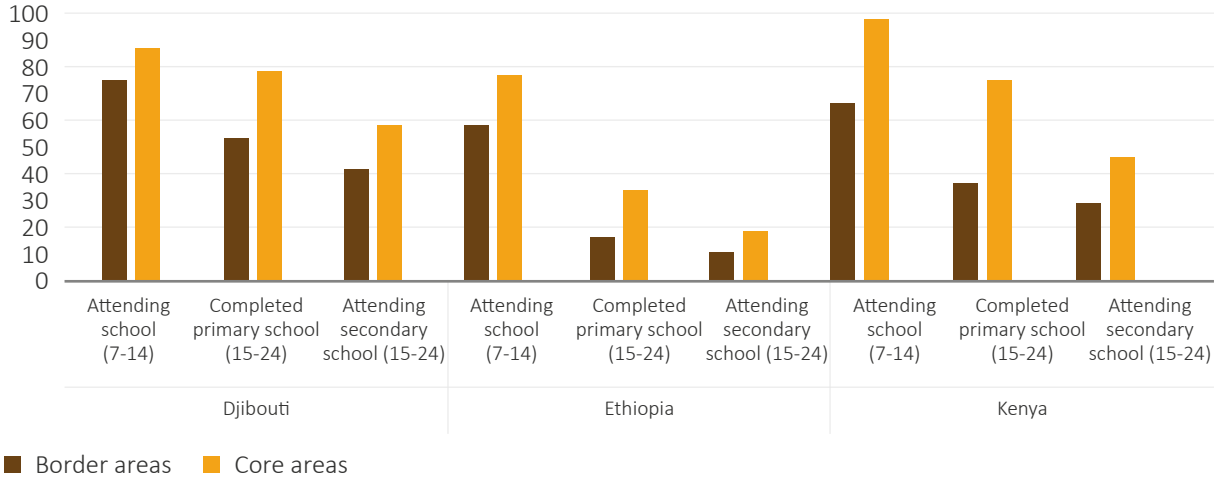
(Selected education indicators, Djibouti, Ethiopia, Kenya)




Source: GMD, 2020; World Bank staff calculations.

## Figure 22: ...and also in the border areas

(Selected education indicators, Djibouti, Ethiopia, Kenya)




Source: GMD, 2020; World Bank staff calculations.

**As countries develop from a low base, economic concentration tends to further increase, widening the economic gap between leading and lagging areas.** The Horn has also experienced this pattern, though in a more nuanced way. In the absence of regional output data, proxy indicators suggest that economic activity in the Horn has grown fastest for places in the middle of the baseline economic activity distribution. Night-time lights, a commonly used proxy for economic production, increased strongest in places that were in the middle of the nightlights distribution in 1992, while both unlit and highly lit places (roughly corresponding to rural areas and big cities, respectively) grew slower (Figure 23). The growth in built-up area, another proxy indicator for development, shows the same pattern, with places that were "medium built-up" to begin with experiencing faster growth in built-up area compared to unbuilt and highly built-up places (Figure 24). Formally testing for *beta-convergence* shows that economic activity has diverged since the early 1990s, with more developed places growing faster.[20] Border areas have experienced the slowest growth, even after controlling for their lower levels of initial luminosity.[21] The non-linear pattern in Figure 23 and Figure 24 was partly driven by faster growth in secondary cities than in large cities and towns (Box 2). Data from Kenya and Ethiopia suggest that the divergence in economic activity was nevertheless associated with modest spatial convergence in living standards.[22]

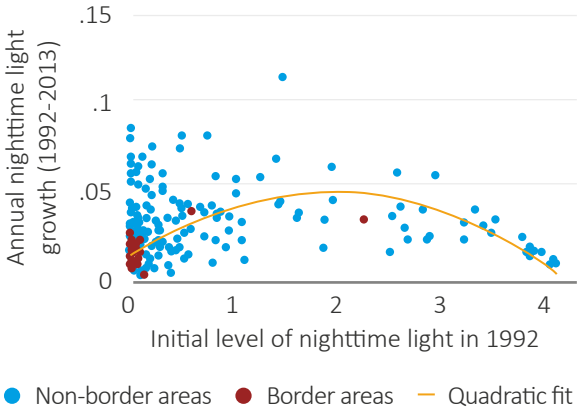
[20] Beta-convergence occurs when poor geographical units grow faster than richer geographical units. Divergence occurs when poor places grow slower than rich places. We estimate beta-convergence based on a regression of annual growth in NTL based on initial NTL. The coefficient on initial NTL is positive and statistically significant, indicating that places that were better lit in 1992 grew significantly faster. The same result is obtained when using built-up area instead of NTL.

[21] The border dummy in the convergence regression is negative and statistically significant.

[22] Kenya and Ethiopia are the only countries in the HoA with at least 2 comparable household poverty surveys since the early 2000s. In both countries, the share of total inequality in household consumption that can be explained by welfare gaps between regions decreased between 2005 and 2015, pointing towards narrowing spatial welfare gaps during this period.

### Figure 23: Luminosity grew fastest in places that were medium lit in 1992

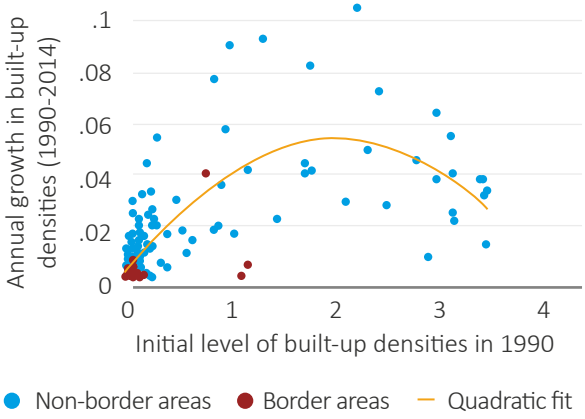
(Growth in night-time lights between 1992 and 2013 by intensity of night-time lights in 1992)




Source: World Bank staff calculations on DMSP nighttime light data.

### Figure 24: Growth in built-up area was higher in places that were more built-up to begin with

(Growth in built-up area between 1990 and 2014 by density of built-up area in 1990)



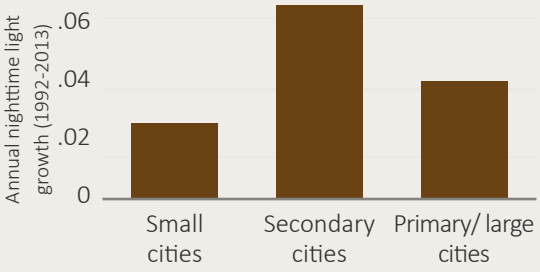

Source: World Bank staff calculations on GHS built-up dataset.

## Box 2: Urbanization, but not metropolization

**Most countries in the HoA are urbanizing rapidly from a low base.** The estimated urban population in the HoA increased from 20 million in 2000 to 50 million in 2020 and is expected to increase to 90 million by 2035. In parallel, the urbanization rate is projected to increase to 35 percent, compared to 26 percent in 2020.[23] Though comparable data is hard to come by, an analysis based on nighttime luminosity suggest that secondary cities have been growing faster than capitals and other large cities and, especially, towns and small cities, contributing to the observed non-linear association between initial levels of economic development and subsequent growth (Figure 25).

### Figure 25: Growth in nighttime lights was faster in secondary cities and large cities than in smaller towns

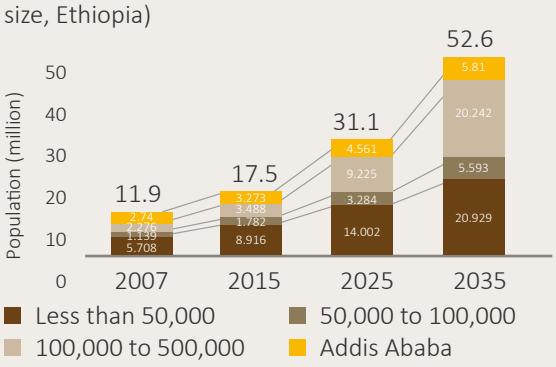
(Growth in night-time lights between 1992 and 2013 by city size)




Source: Source: World Bank staff calculations on GHS built-up dataset.

### Figure 26: Towns and secondary cities will account for the bulk of Ethiopia's urban population growth

(Projected increase in urban population by city size, Ethiopia)




Source: Schmidt et al., 2019.

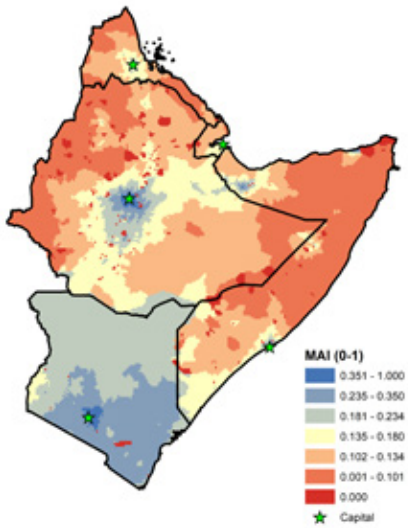
[23] Figures based on World Urbanization Prospects (UN, 2018).

**Projections for the HoA's biggest economies suggest that, going forward, most of the urban population increase will take place in towns and secondary cities.** In Ethiopia (Figure 26), the bulk of urban population growth will happen in small towns (less than 50,000 people) and secondary cities (100,000-500,000 people). Similar projections for Kenya show that most of the urban population growth will take places in cities of between 100,000 and 1 million people, while the urban share of Nairobi is projected to remain constant. These projections call for much-needed investments in infrastructure and public service provision in smaller cities and towns across the region, where infrastructure and service provision are currently lagging.

## 3.2 Distance: Access to markets and integration

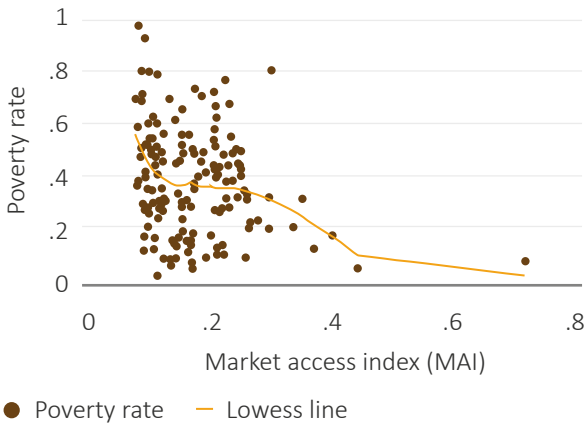
**The concentration of economic activity in certain favored places is a normal phenomenon.** The extent to which other, less-favored, places benefit from the dense clustering of economic activity in the favored places depends on the economic distance that separates them.[24] In the HoA, economic density and economic distance are strongly inversely correlated (Figure 27): market access, an inverse proxy for economic distance, is high in and around economically dense places, such as Addis Ababa, Nairobi and the southeastern part of Kenya, and the dense cross-border corridor between Jijiga (Ethiopia) and Hargeisa (Somalia). In contrast, market access is low, and economic distance high, in most of Somalia and Eritrea and in the peripheral lowlands of Ethiopia and Kenya (though even in Kenya's northeast market access, while low compared to the rest of Kenya, is still better than in most other countries).

Figure 27: Economic distance is high in the border areas and in most of Somalia and Eritrea




Sources: World Bank staff calculation based on OpenStreetMap and WorldPop (2015 population estimates).

Figure 28: Places in the HoA with high economic distance are poorer




Notes: Sample correlation amounts to -0.24 and the linear relationship is statistically significant at the 1% level and robust to outliers (such as Nairobi on the far right). The unit of analysis is the mixture of the first- and second-administrative areas at which household survey was representative.

Source: World Bank staff calculations on countries' latest poverty surveys.

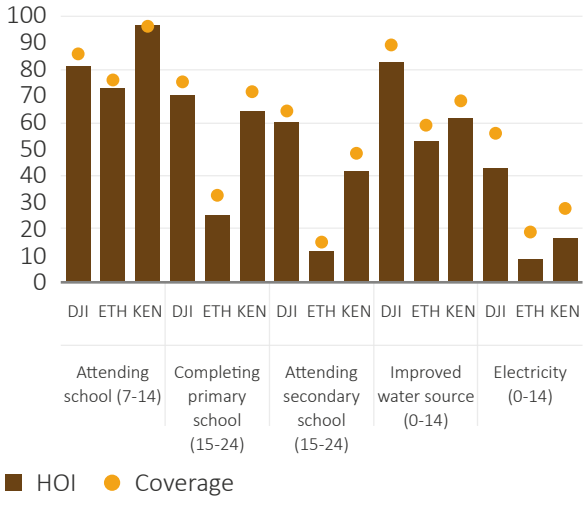
[24] "Distance" here does not refer to physical distance, but to the ease or difficulty for goods, services, labor, and capital to move between the leading places and the other places. It measures how easily capital flows, labor moves, goods are transported, and services are delivered between two locations. Distance here is an economic concept, not just a physical one.

**Economic distance is strongly correlated with poverty rates.** The farther it is from density, the more likely an area is to be lagging because of its lack of integration in the economy of the leading areas. This is often reflected in poverty rates being higher in remote and poorly connected parts of a country. The HoA is no different: market access, an indicator of economic distance, is strongly correlated with poverty rates. Places with better market access have lower poverty rates and vice versa (Figure 28). Rural areas in the Horn that are better connected, as measured by the Rural Accessibility Index,[25] also achieve higher economic growth rates (proxied by changes in nighttime light) than places that are poorly connected.[26]

**Economic distance is not just a theoretical construct; in the Horn of Africa, it shapes access to opportunities.** Access to basic opportunities for children in the HoA is low and uneven, with substantial horizontal inequalities when it comes to completing primary school, attending secondary school, and having access to clean water and electricity (Figure 30 and Box 3). Significant shares of the inequity in access to key opportunities can be explained by location – that is, economic distance. Rural vs urban location is a major contributor to access to opportunities in the Horn, with children in rural areas, where economic distance is high, having far lower access to important opportunities relative to children in urban areas (Figure 29). Living in a lagging border area has a sometimes significant residual effect: living in a border area explains 37 percent of the inequity in attending primary school. Reducing economic distance is key to expanding opportunities in the HoA.

Figure 29: Significant gaps in coverage of basic opportunities

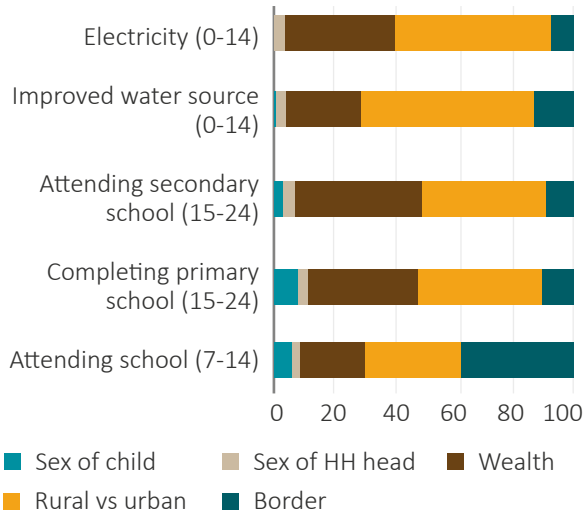
(Coverage rate and human opportunity index, Djibouti, Ethiopia, Kenya)




Sources: World Bank staff calculations on countries' latest poverty surveys.

Figure 30: Location and wealth shape access to opportunities in the HoA

(Contribution to inequity in access to a given opportunity, Djibouti, Ethiopia, Kenya)




Sources: World Bank staff calculations based on countries' latest poverty surveys.

[25] See Roberts, Peter; KC, Shyam; Rastogi, Cordula. 2006. Rural Access Index: A Key Development Indicator. Transport paper series; no. TP-10. World Bank, Washington, DC.

[26] See Bundervoet & Masaki (2021).

**High economic distance in the border areas can be explained by long physical distances to the domestic centers of density and weak cross-border connectivity.** Transport connectivity in the HoA can best be described as a collection of national spaces. Within a network analysis framework that takes account of road, rail, and air connections, within-country connectivity in the HoA is more than 15 times stronger than between-country connectivity. In the top 10 of most connected city-pairs in the Horn, only two straddle national borders: the Djibouti-Addis and Djibouti-Dire Dawa connections, which are mainly driven by air and rail connectivity.[27] The lack of regional economic integration results in, and also results from, the lack of connectivity between the HoA's major cities. Despite domestic connectivity being a lot stronger than cross-country connectivity, domestic connectivity remains weak in Somalia and Eritrea. In Eritrea, the city of Assab is presently isolated on all possible fronts in the face of poor connections between Assab and the major centers in northern Eritrea, in spite of its potential importance as a port.

### Box 3: The Human Opportunity Index

**The Human Opportunity Index (HOI) is widely used to measure inequality of opportunity.** The HOI captures both (i) the overall access to basic services, such as education, water and electricity (the coverage rate); and (ii) inequality in access (Barros, Ferreira et al. (2008)). If access to a basic service is perfectly equal, then the HOI is the same as the coverage rate. As access becomes more and more unequal, so the HOI becomes lower and lower.

**The extent of inequality of opportunity is measured using the D-index (the dissimilarity index).** This index calculates how much access to services varies by birth characteristics, such as socio-economic status of a households and the location of the household. A D-index of zero indicates perfect equality (no gaps in access to services across circumstance groups), whereas a D-index of one indicates perfect inequality

**The central question behind the HOI is to what extent circumstances beyond one's control influence one's access to a set of important basic services.** Simply put, the HOI takes the coverage level of a basic service or "opportunity" (for example whether a child is enrolled in primary education) and combines this with the extent to which that opportunity is determined to be beyond the control of the child (for example being born in a rural rather than urban area or being a girl rather than a boy). Ideally, random circumstances should play no role in determining access to opportunities.

**The D-index measures dissimilar access rates to a given basic opportunity for groups of children where groups are defined by circumstance characteristics (for example, area of residence, or gender) compared to the average access rate to the same service for the population as a whole.** To formulate groups the sample is stratified into groups or "cells," so that all individuals in any given cell have the same combination of circumstances. The resulting subgroups are known in the literature as "types" (Barros, Ferreira et al. (2008)). These cells are then compared to one another. The difference in outcomes between cells can be attributed to inequality of opportunity, while the differences within cells can be considered the result of effort or luck.

[27] The Nairobi-Mombasa connection is the strongest link in the HoA.

The D-index summarizes all the gaps into a single measure by weighting them according to the population share in each circumstance group. The D-index generates a value between 0 and 1. In a society in which there is no inequality of access the D-index is be zero. If average access is denoted by $\bar{p}$, the specific access rate of group $i$ is $p_i$, and the share of group $i$ in the population is given by $\beta_i$ then the D-index is:

$$D = \frac{1}{2\bar{p}} \sum_{i=1}^{n} \beta_i | p_i - \bar{p} |$$

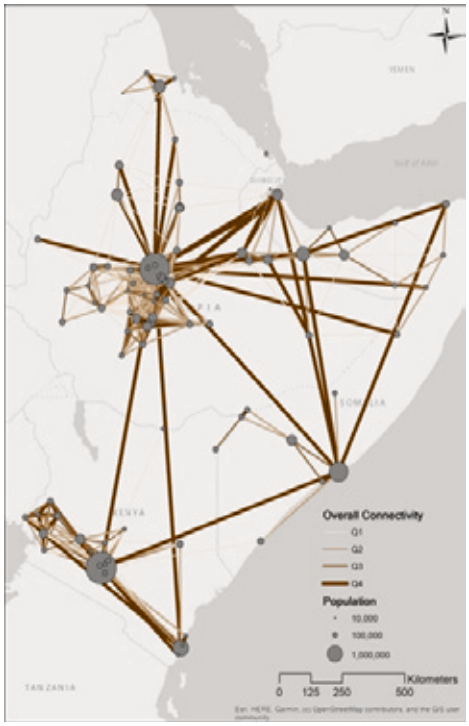
The HOI can then be calculated as:

$$HOI = \bar{p}(1 - D)$$

The measure is also decomposable so that the extent to which specific opportunity sets contribute to the dissimilarity can be assessed. This means that the contribution of different circumstances to overall inequality of opportunity can be determined.

Figure 31: Transport connectivity in the HoA

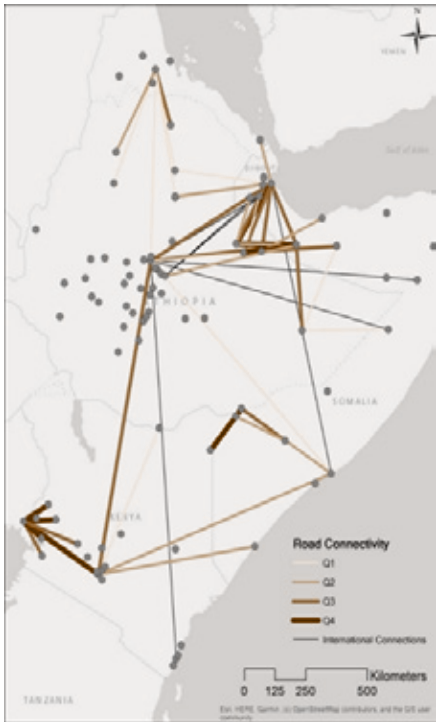
(Strength of connectivity based on road, rail, and air connections)




Source: Kunaka & Derudder (2021).

Figure 32: Road transport connectivity in the HoA

(Strength of connectivity based on road only)




Source: Kunaka & Derudder (2021).

**Cross-border connectivity in the HoA is mostly driven by air, which is far too costly for most of the population.** Focusing on road transport only (Figure 32), the Djibouti-Dire Dawa-Hargeisa triangle is the only part of the HoA where multiple cities are reasonably well connected across borders. In contrast, there are only minor connections between Djibouti and Eritrea, Ethiopia and Eritrea, Kenya and Somalia, and Kenya and Ethiopia. The low average connectivity between cities in Ethiopia and Kenya, the region's two largest economies, requires attention. Beyond the flights between Addis Ababa in Ethiopia and Nairobi and Mombasa in Kenya, and the Addis-Nairobi road link via Moyale, there are essentially no viable connections between the countries, which share one single border post for an 861km-long border. The weakest connections in the HoA are mainly found in the borderlands between Ethiopia, Djibouti, and Eritrea and the borderlands between Ethiopia, Somalia, and Kenya, reflecting and reproducing patterns of peripheralization.

## 3.3 Division: Weak cross-border connectivity compounded by fragility and thick borders

**Division refers to the restrictions on the flow of goods, capital, people, and ideas across space.** Division can both be domestic and international. At the domestic level, nations can be internally divided across linguistic, ethnic, religious, or cultural lines. At the international level, divisions mainly arise from "thick" borders: the many restrictions some countries impose on the flow of goods, capital, people, and ideas with other countries. Thick borders limit trade and the flow of factors of production. Interstate conflict creates the thickest borders. While borders in the rich world have become increasingly thin, thereby facilitating trade and the movement of people and capital, borders in many poor countries remain thick.

**The main sources of division in the Horn are related to weak transport infrastructure and connectivity, thick borders, and pervasive conflict and fragility.** Domestic transport connectivity is weak in Eritrea and Somalia, leading to poorly integrated markets and high within-country price differentials even for basic commodities such as maize and sorghum. Poor road quality as well as lack of suitable vehicles increase the cost of trade and limit the exploitation of scale economies. For example, damaged roads and overloaded trucks that are not specifically designed for carrying live animals, lead to stress and injury to animals, resulting in a rejection rate of up to 5% upon inspection at the point of export. In the HoA countries for which price data are available, a one percent increase in travel time between towns is associated with a nine percent increase in the difference in prices of homogenous agricultural products between towns.[28] If these towns are located on different sides of a border, price differentials increase by a further 12 percent, all else equal. This price effect is substantial given the undifferentiated nature of the products and the high food budget shares of households across the region. Cross-border price differences are highest between Djibouti and Somalia, and Djibouti and Ethiopia.

**Cross-border economic integration is further constrained by the relative lack of border infrastructure.** Kenya and Ethiopia have one border post for an 861-km-long border. Ethiopia and Somalia share a 1,600-km border, served by only 2 operational official border posts. In addition to the relative dearth of operational border crossings, border infrastructure is often poor. As shown in Figure 16, the border between Ethiopia

[28] Maize and sorghum.

and Somalia at Ferfer is characterized by a lack of infrastructure, with a visibly damaged road and waterholes dug in the dry riverbed to compensate for a lack of water infrastructure. Remote sensing analysis shows little activity at this border crossing (which, according to humanitarian monitoring reports, was not operational in 2020), which effectively limits the accessibility of Beledweyne, a fairly sizable city in Somalia's urban system,[29] with connections to Mogadishu and northern Somalia via Garowe covering large distances at limited speeds. In contrast, where borders are operational and some infrastructure has been built, trade has tended to flourish (such as along the Jijiga-Hargeisa corridor, where cross-border mobility increased by 29 percent between 2019 and 2020 and revenues for traders are higher than along other border posts).

**In addition to poor cross-border connectivity and infrastructure, there is a lack of transparency and awareness of policies being applied at the borders.** Information on the policy requirements to export and import are not readily available. This is reflected in reports of ad hoc application of border measures, including exports bans and export taxes on agricultural products and products such as hides and skins. For example, at the border town of Moyale in Ethiopia, in addition to a municipality tax, local officials collect fees at town markets when an animal is sold and an additional tax if the animal crosses the border to Kenya. A lack of understanding of cross-border trade by officials leads to the misperception that all small-scale trade is illicit, resulting in widespread threats of confiscation of products. In reality though, a large proportion of cross-border traders are undertaking the simplest of private sector activities in a hostile policy environment and are not seeking to evade legitimate taxation and regulation by authorities that are legally responsible for border management.

**Challenges at the border appear to be more restrictive for women traders.** A pilot survey that interviewed 200 traders at two main border crossings, one between Ethiopia and Kenya and one between Ethiopia and Somalia, found that the exchange rate and access to foreign currency, corruption and security were problems at both sites. Access to finance, the availability of market information and the ability to find transport were also reported as key problems at the Ethiopia-Kenya border. In contrast, at the Ethiopia-Somalia border, taxes and their administration, trade permits and customs authorities were important challenges. For every issue that created challenges at the border, the proportion of female traders reporting it as an issue was larger than the proportion of male respondents.

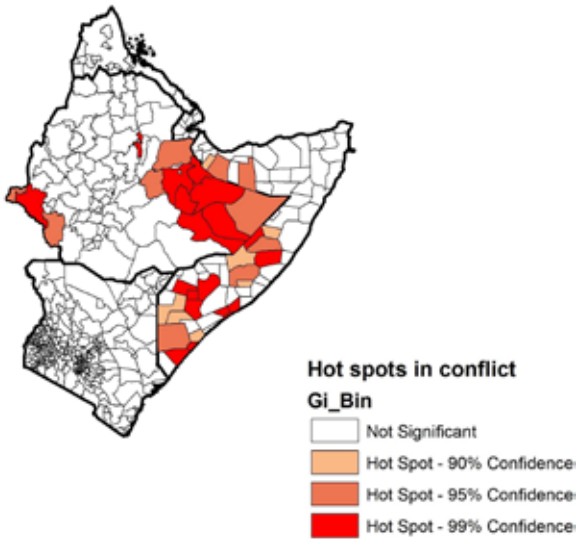
**Social unrest, violence, and conflict, both domestic and interstate, have at times also posed formidable barriers to the flow of goods and people within countries in the Horn.** While this has been most pervasive in Somalia, recent years have seen various episodes of unrest, political turmoil, and open armed conflict in Ethiopia, severely restricting the domestic flow of goods and factors of production. To illustrate the division caused by conflict, food price inflation amounted to more than 38 percent year-on-year in Ethiopia's Tigray region in December 2020, more than double the rate observed in the neighboring regions and the country as a whole, and disproportionally impacting low-income households.

**Conflicts in the HoA have been spatially clustered in the border areas.** The underlying drivers of conflict and fragility in the border areas are multi-facetted and complex, ranging from historical grievances about the political and economic marginalization of the periphery to tensions over scarce resources to opportunities for illicit enrichment. Statistical analysis of conflict events in the Horn shows that conflict is clustered in the lagging border areas (Figure 33) and has significant spillovers, with a high degree of probability that conflict in one

[29] With an estimated population of over 200,000, Beledweyne is the fifth biggest city in Somalia.

region, both within countries and between them, is related to the incidents of conflict in another (usually neighboring) region. Fragility is correlated with economic distance, with conflicts clustered in sparsely populated border areas with low market accessibility.[30] Pervasive fragility in the border areas has led to frequent and sometimes long-lasting closure of several border posts and trade routes, negatively affecting cross-border trade and, indeed, market access. The lack of a stable and regulated environment for cross-border trade has contributed to the growth of illicit activities, with the sustainability of these opportunities depending on the continuing marginalization and peripheral status of border areas. Addressing fragility in the border areas will require addressing the complex web of interests in lucrative activities in these areas, both by state and non-state actors.

Figure 33: Conflict is clustered in the border areas




Note: Hot spots of conflict based on ACLED conflict data. Hot spots identify statistically significant spatial clusters of high values of conflict (as measured by total fatalities between 2000 and 2019), based on the Getis-Ord Gi* statistic. Source: ACLED, 2000-2019.

**Facilitating trade can be a powerful force for stability in border areas and the Horn at large by promoting development and increasing the opportunity cost of conflict.**[31] Trade provides new opportunities and creates jobs related to exports which can offer alternative sources of income for those otherwise drawn towards violence and armed groups. However, trade can also have negative impacts on jobs in sectors that are subject to greater competition from imports, and without support the people who bear these losses may turn to violence to sustain their income. Trade can also affect conflict when it increases the value of economic resources, usually commodities such as minerals and precious stones and timber, but also livestock and hence land, and the incentives to fight over their control. Finally, taxation of trade may be an important source of revenue for both the government and armed organizations and changes in the structure and value of trade may affect the ability to sustain conflict.

**In general, the evidence across a range of countries suggests that increasing trade with neighboring countries reduces both the duration and the intensity of conflict.** There is also a lower risk of conflict when both countries are members of the same regional trade agreement. Reducing barriers to cross-border trade has been found to promote economic activity in border regions, which is sorely needed in the Horn's lagging borderlands.[32] Cross-border trade typically has strong backward and forward linkages to local producers and distribution markets, creating job opportunities for vulnerable youth in production, transport and logistics in border areas. Moreover, facilitating local cross-border trade through trade policy reforms and trade facilitation can be an important means of addressing food security issues faced by poor populations, which can often be a factor behind increasing tensions.

30 This bivariate correlation however disappears if country effects are controlled for. In other words, the incidence of conflict is more related to country-wide influences and legacies than to differences in economic distance within countries.

31 The following draws heavily from Cali, M (2015) Trading Away from Conflict: Using Trade to Increase Resilience in Fragile States, World Bank, Washington https://www.worldbank.org/content/dam/Worldbank/document/Trade/Trading%20Away%20from%20Conflict.pdf

32 See Brulhart, M., Cadot, O., Himbert, A., 2019. Let There Be Light: Trade and the Development of Border Regions. CEPR Discussion Papers 13515, CEPR Discussion Papers.

SECTION 4

# Regional economic integration for job creation and structural transformation

**The predominant challenge for the countries in the Horn is to generate enough adequate-quality jobs through economic transformation, which will require massive human and physical capital investments.** The region's population is growing fast, but the fertility rate is not yet falling fast enough to deliver a demographic dividend; for at least the next decade and likely beyond, dependency ratios will remain high, and each successive cohort will be larger than the previous one. Major improvements in education and healthcare will be needed to accelerate the region's demographic transition and expand economic opportunities for its youth. Strengthening development outcomes will hinge on the extent to which the quantity and quality of jobs keeps up with the growth of the working-age population, from 107 million at present to 143 million by 2030. While the scale of the challenge is daunting (Box 4), there are also significant economic opportunities that could be generated by accelerating structural transformation, supporting trade, and reducing critical gaps and distortions in product and factor markets (for example, gender gaps in regional labor markets, which currently suppress labor force participation to only 56% in Somalia and 33% in Djibouti).

### Box 4: Projected labor force growth dwarfs the existing stock of "good jobs"

**With youthful populations, the labor force in the region is expected to grow rapidly in the coming decade.** Table 1 shows estimates of this evolution, based on UN population projections, and assuming that age and gender-specific labor force participation rates remain as measured in the most recent survey data. With the exception of Djibouti, all countries are expected to see labor force growth rates around 3% per year, translating in large net increases in the number of people available to work. In Ethiopia, by far the region's most populous nation, nearly two million more workers may be looking for a job each year over the coming decade. In Kenya, the net increase is close to a million potential workers per year. If labor force participation rates were to increase, these increases would be larger still.

**Table 1: Projected labor force increase in HoA countries**

| | Labor force | | | Average annual net increase | | Growth rate |
|---|---|---|---|---|---|---|
| | 2020 | 2025 | 2030 | 2020-2025 | 2025-2030 | 2020-2030 |
| Djibouti | 255,000 | 280,000 | 300,000 | 5,000 | 4,000 | 1.7% |
| Ethiopia | 55,578,000 | 60,930,000 | 70,173,000 | 1,832,000 | 1,995,000 | 3.0% |
| Kenya | 23,472,000 | 27,438,000 | 31,574,000 | 793,000 | 827,000 | 3.0% |
| Somalia | 4,373,000 | 5,180,000 | 6,098,000 | 161,000 | 184,000 | 3.4% |
| Eritrea | 1,562,000 | 1,806,000 | 2,057,000 | 49,000 | 50,000 | 2.8% |

Source: WPP, 2019. WB staff calculations.

**The projected labor force growth dwarfs the existing stock of "good jobs" in the HoA countries.**[33] Annual labor force growth is expected to be the equivalent of all current formal private sector wage employment within one to four years. In each country, the labor force is projected to grow within two to three years by as many workers as are currently employed in industry (Table 2). In Kenya, for instance, the projected annual growth of the labor force amounts to 29 percent of current employment in industry and 34 percent of current private sector employment. In Ethiopia, the annual projected labor force growth amounts to over half of all existing private sector wage employment. Even though Ethiopia managed to create a lot of jobs in the industrial sector through focused support, the manufacturing share of urban employment has fallen from 12% in 2010 to 9% in 2018 , illustrating the difficulty of increasing the share of good jobs when the labor supply is increasing rapidly.

**Table 2: Annual labor force growth projections as a share of existing "good jobs"**

| | | Annual net increase as a share of... | |
|---|---|---|---|
| | Absolute annual increase 2020-2025 | Employment in industry | Formal private sector wage employment |
| Djibouti | 5,000 | 37% | 65%[a] |
| Ethiopia | 1,832,000 | 39% | 52% |
| Kenya | 793,000 | 29% | 34%[b] |
| Somalia | 161,000 | 34% | 89% |
| Eritrea | 49,000 | 53% | 25%[b] |

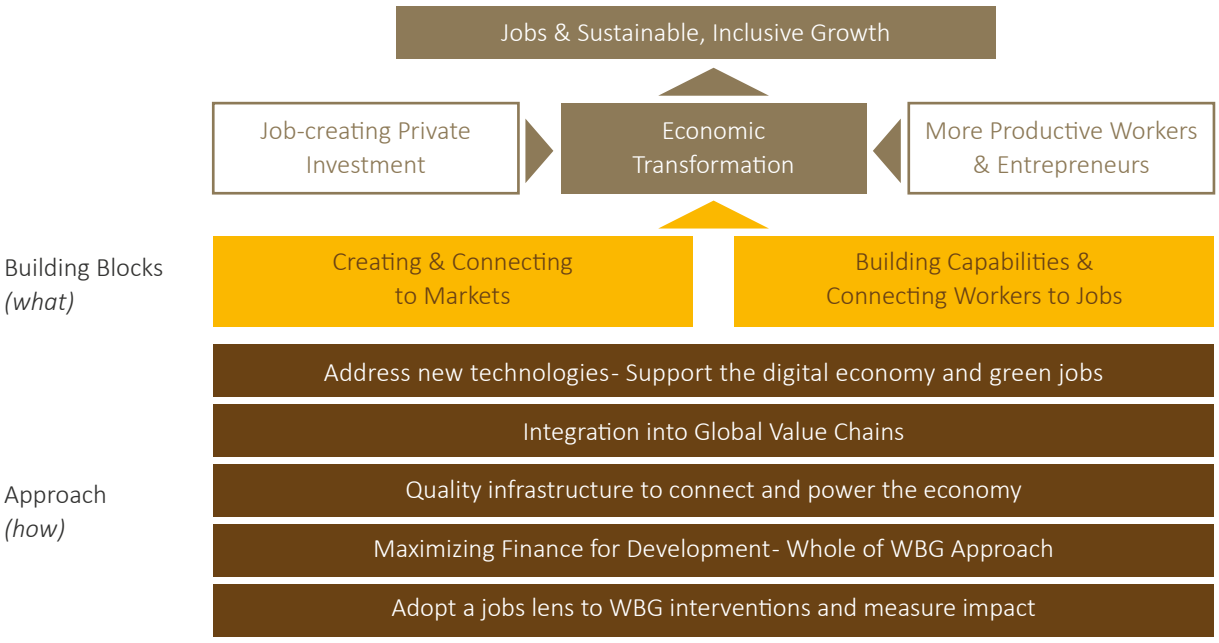
a Increase shown relative to all current private wage employment, including informal.
b Increase shown relative to all current formal private employment, including self-employment.
Source:

33 Due to data limitations, "good jobs" are defined as wage jobs in the private formal sector. The public sector provides good and stable jobs too, but growth in public sector employment is constrained by fiscal space and, hence, not sustainable. Though not all informal self-employment jobs are bad jobs, the comparable data needed to categorize self-employment into "good" and "bad" self-employment do not exist.

**These simple figures highlight the multi-facetted nature of the jobs challenge in the HoA.** The accelerated creation of more private formal sector jobs is needed for structural transformation and to accommodate the rapidly growing and youthful labor force, whose aspirations have been lifted by relatively higher education levels than the older generations, especially in urban areas. At the same time, the bulk of employment is and will remain in agriculture and informal small-scale business activities in services, highlighting the policy importance of supporting broad-based productivity gains in these jobs, including agriculture. Low participation rates and worse employment outcomes for women call for policy measures to address the structural and behavioral barriers to women's employment, further adding to the complexity of the challenge.

**Achieving the economic transformation required to generate sufficient higher productivity jobs and lift living standards in the region will require a decisive upturn in the pace of private sector job creation.** The economic priorities in the Horn are consistent with the jobs and economic transformation (JET) agenda, which recognizes the role of connecting to markets in generating job-creating private investment, and the importance of building capabilities and linking workers to jobs (Figure 34). In the Horn of Africa, there is an opportunity to drive the JET agenda through deeper regional integration and investments in connectivity to improve access to markets across borders, realizing common opportunities to diversify, deliver jobs and reduce poverty and vulnerability. At the same time, however, implementing the JET agenda in the HoA will require dramatic improvements in education and other investments to build capabilities and overcome significant cross-border and interconnected risks, including currently poor human capital outcomes, large and rapidly growing numbers of youth, fragility, and environmental degradation and climate change.

Figure 34: The Jobs and Economic Transformation Framework



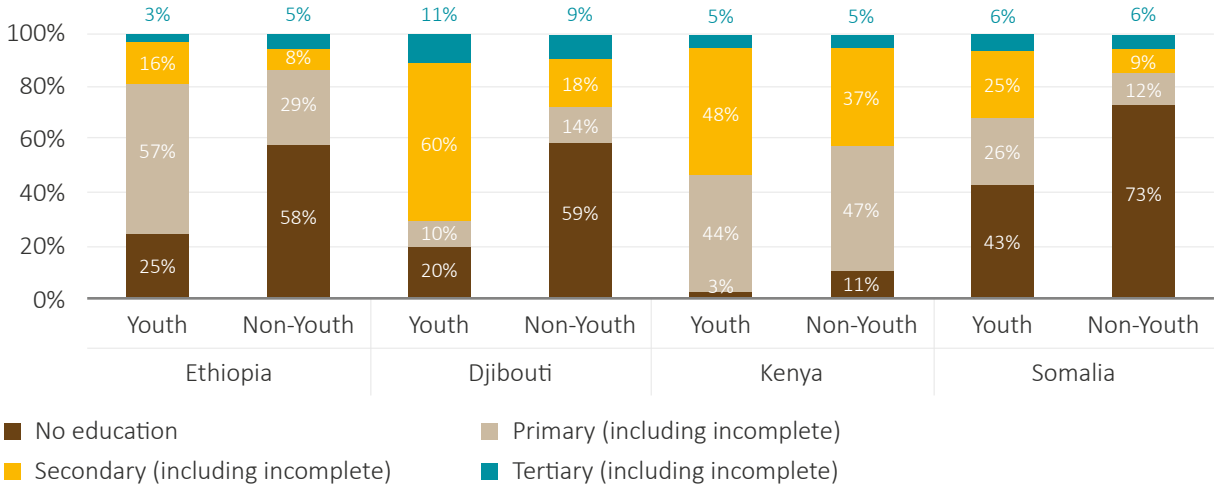

Source: World Bank, 2019.

## 4.1 Building capabilities and connecting workers to jobs

**A first-order priority in the HoA is to improve human capital outcomes of the young and rapidly growing populations.** Returns to education in the region are high, driven by the large earnings gains individuals are able to realize when equipped with the skills and capabilities needed to move into higher-productivity activities and sectors. While countries in the Horn have made progress on getting more children in school, completion of primary school, progression to secondary school, and quality of learning have lagged. While the young generation generally has better educational outcomes compared to generations before, poor outcomes persist for the youth as well (Figure 35). In Somalia, 43 percent of young people have not had any education. In Ethiopia, with a Human Capital Index of 0.38, less than 20 percent of young workers achieved more than primary education.[34] Raising worker productivity and improving access to improved earning opportunities will require strong improvements in basic education, especially given the high returns to primary schooling in low-income countries. Improvements in education for girls are especially important if countries in the Horn hope to reap a demographic dividend.

Figure 35: Educational attainment remains low in the Horn

(Educational attainment of the working-age population)




Source: WPP, 2019. WB staff calculations.

**Improving human capital outcomes will require enhancing the spatial and social equity in public service delivery through spatially blind institutions.** Location and household wealth are key determinants of educational outcomes in the Horn (Figure 30), with children in rural areas, lagging border areas, and children from lower-income households faring far worse. As a result, poverty is transmitted from one generation to the next, creating persistent pockets of poverty and fragility. Provision of basic public services, including education and health care, should be spatially blind and universal in coverage. In the border areas, where populations tend to be mobile, and selected lagging rural areas, targeted programs to improve access to education and other critical public services may be needed to facilitate convergence with the more developed areas. Better educational

[34] Kenya is the exception in the Horn, with better educational outcomes and an HCI of 0.55 (the highest in continental sub-Saharan Africa).

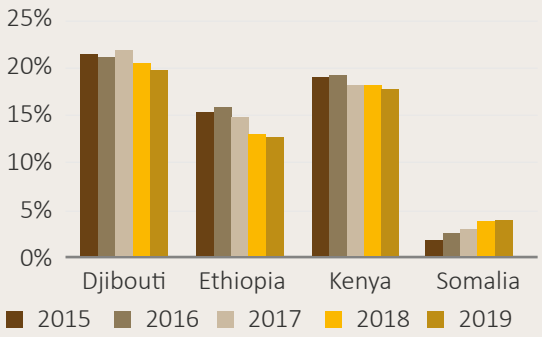
outcomes in the lagging areas would also spur labor mobility towards areas with better economic opportunities, facilitating the integration of lagging and leading areas in the HoA. Such a scale-up in public services, and particularly investing heavily in education in lagging areas, while costly, would be more than merited by the expected high returns this would generate. For low-income countries, private returns to primary education have been estimated at 25.4 percent. Returns to complete primary schooling amount to 32.5 percent in Djibouti, 32.7 percent in Ethiopia and 17.6 percent in Kenya.[35] Box 5 examines the associated public revenue mobilization challenge for the region.

## Box 5: Revenue mobilization in the Horn of Africa

**The level of revenue mobilization varies widely in the HoA countries, ranging from 4% of GDP for Somalia to 20% for Djibouti as of 2019 (Figure 36).** The (unweighted) HoA average of 15.1% is higher than that for low income countries in sub-Saharan Africa (12.7%), but it has declined over the past five years, and is now similar to the global average for low-income developing countries (Figure 37). Mobilizing more revenues will be essential to meet social and infrastructure spending needs, especially if these are to be ramped up and made spatially blind to improve development outcomes in the lagging areas. Deepening regional integration will support this indirectly through its positive impact on economic growth and the tax base, but effective policy reforms and enhanced revenue administration will also be critical to meeting the funding challenge.

### Figure 36: Revenue mobilization is relatively low

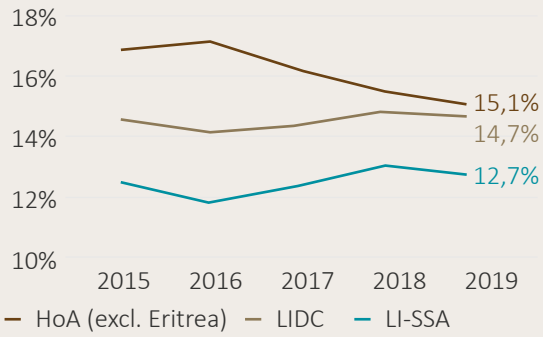
(HoA countries' revenue (excl. grants), % of GDP)




Sources: World Bank staff calculations based on IMF data.

### Figure 37: And has decreased since 2016

(Regional average revenue (ex. grants), % of GDP)




Sources: World Bank staff calculations based on IMF data.

**With respect to revenue policy, a number of tax expenditures and special regimes in the region are costly and distortionary, and could be streamlined to minimize revenue leakage and broaden the tax bases.** Ethiopia could realize additional revenue of 6.4% of GDP through sunsetting tax expenditures and not granting new ones, removing VAT exemptions on some goods and services, and raising excise taxes on tobacco and beer. In the case of Djibouti, implicit tax expenditure costs amount to 7% of GDP, while in Kenya, rationalization of income tax and VAT could potentially yield revenue of up to 3% of GDP. Furthermore, the countries should review "nuisance" taxes and fees (which can generate disproportionate administrative costs and weaken tax morale and compliance), and regularly evaluate

[35] See Psacharopoulos and Patrinos (2018) on education returns in LICs, and Montenegro and Patrinos (2014) for the country estimates cited.

the effectiveness of individual tax expenditures in achieving the intended policy objectives. Annual reporting on tax expenditures would increase accountability and transparency.

**Reforms in revenue administration could also improve collection, particularly in Djibouti and Somalia, where institutional and technical capacity are weak.** Business processes should be simplified to reduce the cost of revenue administration and taxpayers' compliance burden. This requires comprehensive review and reengineering of processes, such as registration of taxpayers, assessment, payment, audit, and dispute resolution. For example, in Somalia, the operationalization of the large- and medium-taxpayer office is important, as such segmentation would enable a better understanding of key taxpayers, their needs and behavioral risks, and improve the targeting of taxpayer service and compliance measures.

**Effective data management is critical for tracking goods and services, managing revenue risk, designing tools to facilitate compliance, and enhancing tax policies.** There is a critical need for more and better revenues data, including on trade-related revenues, which remain opaque in most of the region. This agenda would benefit from increased automation of revenue systems, provisions for transparency, and more data exchanges between countries' revenue agencies and other government entities which can serve as third-party data sources.

**For populations in the lagging border areas, connectivity to economic opportunity can be improved through easier cross-border mobility.** In many cases, border cities are closer to economic centers in other countries than they are to their domestic centers of economic density. Cities in border areas have been growing slower due to thick borders and large distances from their domestic economic centers. An exception to this general pattern and an example of the possibilities of improved cross-border connectivity has been the corridor between Jijiga in Ethiopia and Hargeisa in Somalia, in particular the Jijiga – Hargeisa – Borama triangle through the border post of Tog Wajaale and onwards to Berbera port (Figure 38), where relatively good cross-border connectivity has led to flourishing trade and rapidly growing cities. Using night-time lights as a proxy for growth, Jijiga, Hargeisa, Borama and Berbera grew substantially faster than other cities in border areas (Figure 39). Coincidentally or not, poverty rates in Jijiga city are the lowest among all Ethiopian cities.[36] An example of the other extreme is Assab in Eritrea, the only city which experienced a large decrease in economic activity (as measured by NTL) since the early 1990s (Figure 39). Despite its strategic importance as a port, border closures with Ethiopia and Djibouti isolated Assab on all possible fronts with close to zero market access, leading to a collapse in economic activity.

[36] Based on the national poverty line, poverty in Jijiga decreased from 31.6 percent in 2005 to 5.9 percent in 2016. Overall, urban poverty decreased from 35.1 percent to 14.8 percent over the same period (FDRE, 2018).

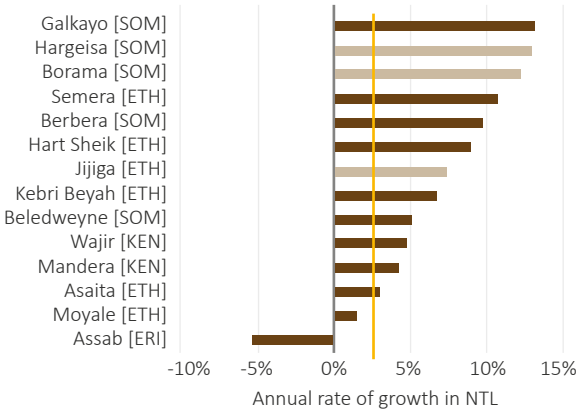
**Figure 38: The Jijiga-Hargeisa link is currently the densest cross-border economic corridor**

(GDP of cities in the HoA border areas)


Source: Source: Ghosh et al. (2010).

**Figure 39: And cities along this link have grown rapidly**

(Growth in nighttime lights, 1992-2013)




Sources: WB staff calculations based on Li et al. (2020).

**Growth of towns and secondary cities also plays an important role in connecting workers to jobs and economic opportunities.** Towns and secondary cities are growing fast across the HoA and the bulk of urban population growth in coming decades is projected to take place within these smaller cities and towns. An urbanization pattern characterized by growth of towns and smaller cities has tended to be more poverty-reducing as compared to growth of mega-cities, given the closer linkages towns have with the surrounding rural populations and the lower skills requirements of jobs in towns and smaller cities.[37] In the sparsely populated border areas, towns and secondary cities play a particularly important role in providing essential services to generally underserved mobile populations. Infrastructure and service provision is, however, lagging in towns and smaller cities as compared to large cities and national capitals, and substantial investments will be required to prepare towns and smaller cities in the HoA for the projected large growth in their populations.

**Digital infrastructure holds substantial promise for growth and jobs, though, except for Kenya, its development is lagging in the Horn.** Poor regulatory quality, slow download speeds and relatively high costs result in low mobile penetration rates, predominantly skewed towards the largest cities (Table 3). The importance of digital connectivity has been highlighted by the ongoing pandemic, with everything from maintaining business operations and administrative government services to providing basic services such as education and pandemic-response social transfers hinging on access to affordable and reliable connectivity. Improving digital infrastructure in the HoA in an inclusive way will be required to allow businesses to be competitive in the digital economy, connect workers to jobs more effectively, including through the development of the "gig economy", and spur financial inclusion, especially for vulnerable people in remote and underserved areas.

[37] Christiaensen, L., De Weerdt, J., & Todo, Y. (2013). Urbanization and poverty reduction: The role of rural diversification and secondary towns. Agricultural Economics, 44(4-5), 435-447.

Table 3: Key telecom indicators for the HoA

| Country | Fixed Broadband Penetration % | Mobile Penetration % | Number of Mobile Licensed Operators | Number of Fixed Licensed Operators | Mobile concentration index HHI* (GSMA) |
|---|---|---|---|---|---|
| Djibouti | 16.3 | 37.6 | 1 | 1 | 10,000 |
| Eritrea | 0 | 10.6 | 1 | 4 | 10,000 |
| Ethiopia | 1.3 | 46.9 | 1 | 1 | 10,000 |
| Kenya | 3.8 | 107.9 | 4 + | 8 | 5,135 |
| Somalia | 0.6 | 50.8 | 8 | 8 | 1,886 |
| Africa Average | 8.3 | 84.7 | n/a | n/a | 4,600 |

Notes: *The Herfindahl-Hirschman Index (HHI) is a measure of market concentration. A market with an HHI of less than 1,500 is considered to be a competitive marketplace, an HHI of 1,500 to 2,500 to be a moderately concentrated marketplace, and an HHI of 2,500 or greater to be a highly concentrated marketplace.
+ Kenya has also licensed three Mobile Virtual Network Operators (MVNOs) which can resell spectrum to offer more specialized financial services, for instance for the retail and financial services sectors.

## 4.2 Creating and connecting to markets

**Poor intra-regional connectivity in the Horn emerges as one of the main manifestations of weak regional integration as well as an impediment to increased trade within the region.** Enhancing regional connectivity should reduce the cost of access to factor and product markets and make connected economic centers in different countries more attractive by providing productivity benefits. Improving connectivity in the Horn will require substantial and coordinated investments in the development of physical transport corridors as part of a coherent strategy. To reap maximum benefits from these large investments, the corridor investments must be accompanied by policy and procedure harmonization and trade facilitation.

**In the HoA, four priority corridors have been put forward as levers of regional integration, but improvements in domestic connectivity will be required to maximize the impact of these corridors.** The four regional priority corridors are (i) the Kismayo, Lamu and Mogadishu corridor, (ii) the Assab and Djibouti corridor, (iii) the Berbera and Djibouti corridor, and (iv) the Mogadishu, Berbera and Bossasso corridor. While these corridors and other envisaged or ongoing policy ideas on infrastructure coordination and policy and procedure harmonization are promising, they must be grounded in the development of coherent and comprehensive connectivity corridors. In that regard, targeted improvements in domestic connectivity can have substantial impacts on improving overall regional connectivity. In Eritrea, a national policy strengthening connectivity across the coastline from Assab to Massawa and Asmara and connecting this to the links coming in from northern Ethiopia would have large effects on both domestic and regional market access, as would extending connections from Assab into Djibouti. In Somalia, upgrading the road from Kismayo to the Kenyan border at Liboi would have major effects on connectivity between Nairobi and southern Somalia. Unlocking the gains from the priority corridors and other initiatives to improve transport connectivity in the region would benefit from improved coordination between national, bilateral, region-wide, and border city connectivity plans. The need for international coordination is particularly critical in the case of connectivity to port cities and major airports that serve as gateways to the region and the rest of the world.

**Investments in the four corridors are expected to have significant effects on structural transformation and real household incomes,**

**but only if accompanied by trade and border facilitation.** Results from a spatial general equilibrium model suggest that upgrading the four priority corridors would result in a three percentage-point increase in the non-agricultural employment share and a modest one percent annual increase in real household incomes. If the physical corridor investments are accompanied by better trade and border facilitation, estimated income effects are far larger, amounting to a 4.3 percent annual increase in real household incomes over the medium term (Table 4). Under conservative assumptions, this corresponds to an internal rate of return on the corridor investments of 15-18 percent (depending on the duration of construction, and based on a back-of-the-envelope calculation to illustrate the strong likely returns). The importance of improved trade and border facilitation cannot be emphasized enough: Reducing impediments to trade and thinning borders can be at least as important to connect and spur the growth of markets as infrastructure spending that decreases travel time and cost. In the price dispersion analysis conducted for this report, the price effect of crossing a border is equivalent to increasing the travel time by three hours. Substantial improvements in market access can thus be attained though a coordinated approach on border facilitation to alleviate physical and institutional barriers (Figure 40).

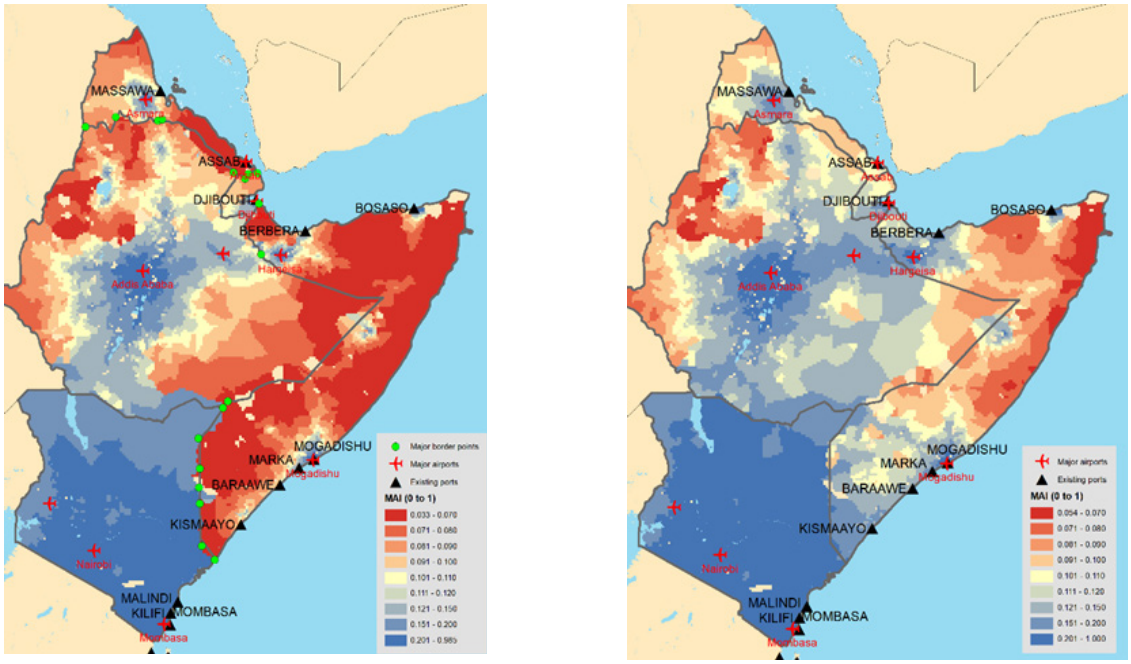
Table 4: Percentage change in real income from corridor investments, with and without trade facilitation

| Scenarios | Total | Ethiopia | Djibouti | Somalia | Kenya |
|---|---|---|---|---|---|
| Transport only | 1.0 | 1.3 | 0.0 | 1.4 | 0.7 |
| With trade facilitation | 4.3 | 3.9 | 5.3 | 6.3 | 4.9 |

Source: Herrera-Dappe and Lebrand (2021). No data for Eritrea.

Figure 40: Improved border facilitation would have a large effect on market accessibility

(Current market accessibility index) (Market accessibility index when borders are opened)

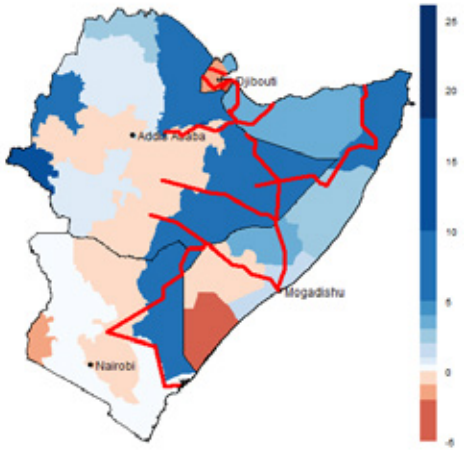



Source: World Bank background paper on HoA connectivity. The "borders opened" scenario models market accessibility if all existing border posts within the HoA would be open and operational.

**In general, the border areas would benefit most from regional corridor investments, and the benefits would be higher and more widespread if accompanied by trade and border facilitation.** Upgrading regional corridors would boost household incomes in the border regions most (Figure 41). If combined with trade and border facilitation, the benefits in terms of increased household incomes would be higher and more widespread, reaching the hinterlands of the Horn as well (Figure 42). Corridor investments and improved border facilitation would also lead to increased regional specialization, with certain regions specializing in agriculture (due to comparative advantages) and others in non-farm activities; Figure 43 shows the modeled results of improved connectivity and border facilitation on the share of non-agricultural employment.

**Figure 41: Corridor investments would boost incomes in the border areas**

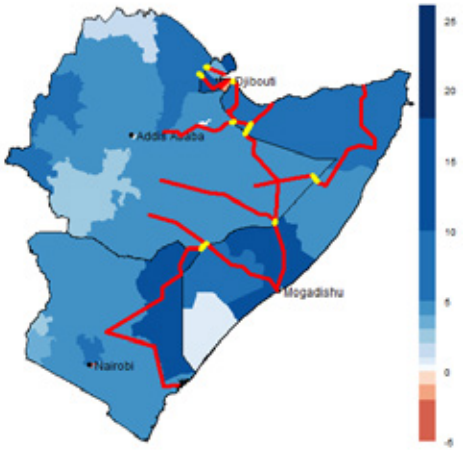
(Welfare impacts of corridor investments vs. baseline, %)




Sources: Herrera Dappe and Lebrand, 2021.

**Figure 42: And would be higher and more widespread if combined with border facilitation**

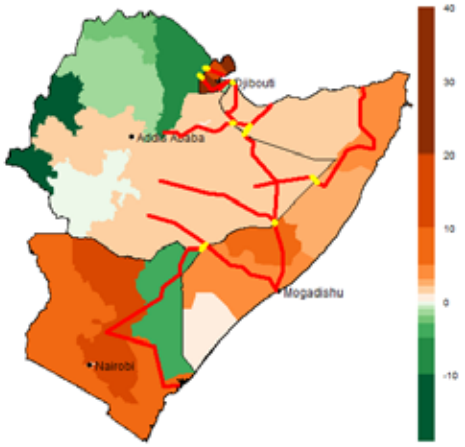
(Welfare impacts of corridor investments and border facilitation vs. baseline, %)




Sources: Herrera Dappe and Lebrand, 2021.

**Figure 43: More regional specialization in response to improved connectivity**

(Change in the non-agricultural employment share, transport and border facilitation)




Source: Herrera Dappe and Lebrand, 2021.

**Trade facilitation encompasses measures and investments at the border, and also along trade value chains to reduce trade costs.** Whilst there are still important knowledge gaps to fill on the key trade cost raising barriers and challenges, information from this REM, and experience from other regions in Africa, suggest a broad approach to trade facilitation that both reduces trade costs and improves the efficiency of regulation at the border. Every border crossing is unique in terms of the terrain, climate, the types of goods being traded and the challenges that traders and officials face. Nevertheless, effective trade facilitation will typically require:

- Simplification and greater transparency of trade policies and border procedures (accompanied by automation where possible).

- Investments in physical infrastructure at the border to improve security and working conditions for officials and traders (e.g., electricity, water, buildings, shelter).
- Capacity-building for officials (especially gender awareness) and traders and traders' associations.
- Developing cross-border markets in terms of facilities and access (including ensuring that women traders have equal access).
- Investing in sanitary, phytosanitary and veterinary services and facilities to improve the quality of food and livestock trade, increase returns to farmers and improve control over pest and disease outbreaks.
- Addressing the challenge of access to foreign exchange in certain countries.
- Improving access to, and the quality of, trade-related transport and logistics to reduce costs and damage and wastage.

**These reforms and investments will be most effective when coordinated on both sides of the border.** This can be achieved through dialogue at the national level on policies, procedures, and physical investments and also at the local level on implementation through, for example, joint border committees. Monitoring of progress to ensure the effective implementation of reforms will require investments in data collection and reporting mechanisms. For example, the ability of traders to report instances of abuse is an essential element in bringing accountability to the actions of officials and to reduce harassment, physical violence, and corruption at the border.

**Better infrastructure and coordinated trade policy reforms that reduce trade costs for small-scale traders will encourage the use of formal border crossings and promote security.** Poor facilities at official crossings together with lack of awareness of relevant rules and regulations by traders, harassment by, and weak accountability of, border officials, may push some traders towards more convenient and less costly informal crossings. However, this can put the traders at risk from lack of security and they may be forced to make payments to local militias. Solutions to this challenge are undermined by a lack of cohesion and a common understanding between the federal government, which controls the official international border checkpoints, and the local administrations.

**Increased volumes from trade facilitation measures and reductions in corruption tend to generate larger revenues from taxation of trade.** In addition, greater trade activity leads to more expenditures in the local economy on services such as food and hotels, which in turn contributes to general revenue collection. If some of these revenues remain in the border areas, or are allocated by the center to investments in those areas, then experience from other countries suggests this can support a gradual escape from a low level equilibrium of corruption, distrust of officials and small-scale activities, to a more virtuous circle in which improvements in policy and facilities further contributes to higher trade volumes and revenues and broader private sector activity.

**Deepening trade integration in the Horn of Africa will pave the way for the effective implementation of the Africa Continental Free Trade Area and the significant economic benefits it is expected to bring.** A recent study by the World Bank suggests that implementation of the African Continental Free Trade Area would provide a substantial boost to trade in Africa and generate significant economic benefits.[38] For Ethiopia these could amount to an income gain of around 9 percent, and for Kenya over 11 percent, among the highest in Africa, reflecting high current barriers to

[38] World Bank (2020) *The African Continental Free Trade Area: Economic and Distributional Effects,* World Bank, Washington

trade. These gains come from the removal of tariffs and reduction of non-tariff barriers on intra-African trade. But the biggest impact comes from trade facilitation measures, accounting for around three-quarters of the overall gains for both countries. The large boost in household consumption expected to result from greater trade openness could lift as many 8.2 million people in Ethiopia and 4.4 million in Kenya out of moderate poverty. Although data limitations prevented detailed modelling for Eritrea and Somalia, similar, if not larger impacts, could be expected given their higher trade restrictiveness. Hence, this reinforces the importance of improvements in trade facilitation and the removal of tariff and non-tariff barriers among the Horn of Africa countries and that this would generate additional benefits beyond those directly related to greater trade within the region, by better connecting the countries to partners elsewhere in Africa under the broader objective of African integration.

**Next to investments in domestic and regional connectivity in the Horn to connect to markets, local investments are needed to enhance connectivity within metropolitan regions.** Addis Ababa and Nairobi already are some of the major metropolitan regions of Africa, encompassing millions of people. Other economic centers are also growing in importance. The emphasis on connectivity provision for border cities and port cities should not preclude improving connectivity around the biggest cities' metropolitan regions. This additional focus is justified because the virtuous effects of air transport connectivity and rail corridors between major cities tend to spill over to proximate cities. When multiple cities form a dense regional network, a larger number of producers and consumers can be connected. The infrastructure built by public authorities in these urban regions opens markets and opportunities in proximate towns through the capitals' gateway effects.

SECTION 5

# Key actions for jobs and economic transformation in the HoA

**Raising living standards in the Horn through more and better jobs will require a menu of actions and reforms.** Some of these actions will, due to their very nature, be more domestically oriented or less amenable to a regional approach (for instance, improving education and strengthening skills) while others will require deliberate and sustained regional coordination (such as coordinated investments and reforms to facilitate cross-border trade). This section lays out the key actions based on the analysis presented in this overview, structured around the 2009 WDR framework of "Institutions, Infrastructure, and Interventions". Institutions refer to policies that should be spatially blind and universal in coverage (for instance, the provision of basic public services). Infrastructure refers to polices and investments that are spatially connective (roads, railways, etc.). Finally, interventions are programs that are explicitly spatially targeted.

## 5.1 Institutions: Building human capital

**The countries in the Horn are characterized by sparsely populated and peripherally located lagging areas.** People in those areas are on average poorer and suffer from multiple overlapping deprivations in public service delivery. The policy approach to integrate these lagging areas with the leading areas should focus on institutions.[39] Examples of institutions include property rights, land and labor regulations, macroeconomic stability, and the provision of essential social services such as health, education, and water and sanitation. Institutions should be provided and applied regardless of place.

**The spatially blind provision of social services, and especially education, is a foundational priority for countries in the Horn and a major national policy priority.** Based on the latest household surveys, a substantial share of youth (15-24) in the HoA do not complete primary education (with large variations across countries and regions within countries). Consistent with the emphasis placed by the JET agenda on building capabilities, it is difficult to see how broad-based improvements in productivity, earnings, and living standards can be achieved with these low levels of education. Improving human capital will require a strong effort in the Horn's borderlands and lagging rural areas, where human development indicators and service delivery are poor. Improving girls' education will also be particularly important given its effect on bringing down fertility rates and laying the foundations for a growth-boosting demographic dividend.

[39] See World Development Report 2009.

## 5.2 Infrastructure: Trade facilitation and harmonization and selective investments in physical infrastructure

**There are substantial projected gains from deeper integration and more trade in the Horn, in terms of higher incomes, increased food security and greater stability.** This will require policies and investments that are spatially connective: Improving regional transport connectivity, including through addressing missing links in domestic transport networks, and improving trade and border facilitation. While physical investments in cross-border corridors and infrastructure are projected to have positive effects on household welfare, especially in the border areas, the effects will be far greater and more widespread if the physical investments are combined with improved trade and border facilitation. Reducing impediments to trade and thinning borders can be at least as important to connect and spur the growth of markets as infrastructure spending that decreases travel time and cost, especially in the HoA's border areas. Investments in connective infrastructure (both between and within countries), trade policy reforms and trade facilitation will need to be assessed from a regional perspective and coordinated with neighboring countries in order to reap the biggest returns. Given the high cost of infrastructure, investments in cross-border connectivity need to be selective and rigorously analyzed within a cost-benefit framework.

**The Horn's border areas in particular would benefit greatly from improved coordination and harmonization of trade policies and improved border infrastructure.** The Horn's borderlands are lagging areas, the result of a long and complex history of fragility and marginalization, and are characterized by low economic density and high economic distance to the domestic economic centers. Often, the nearest economic center for borderland populations is located at the other side of the border, but thick borders and opaque trade policies limit productive interactions with these centers. Facilitating cross-border trade and mobility is the least-cost way to increase market access for the populations in the border areas, with expected positive impacts on welfare and economic activity. In the few places in the HoA where borders are operational and relatively fluid, and where some key infrastructure has been provided, trade has flourished, and vibrant cross-border corridors of density have emerged.

## 5.3 Interventions: Metropolitan regions and selected secondary cities

**The ongoing rapid urbanization in the Horn can be an engine for structural transformation and better jobs, but requires targeted investments in secondary cities and around metropolitan areas.** The Horn's urban population has grown from 20 million in 2000 to 50 million in 2020 and is expected to increase to 90 million by 2035. This rapid urbanization will increase demand for food grown in rural areas of the region, potentially benefiting rural producers. Most of the increase in urban population is projected to happen in secondary cities and towns, which usually have stronger links with their surrounding rural hinterland and are more poverty-reducing. However, infrastructure and service provision in smaller cities are lagging compared to capitals, warranting substantial investments to prepare for their projected growth. This is particularly important for secondary cities in the border areas, which play a crucial role in service delivery to, and market access for, mobile populations in sparsely populated lowlands.

**In addition to targeted investments in secondary cities, local investments are needed to enhance connectivity within the big metropolitan regions in the Horn.** Addis Ababa and Nairobi already are some of the major

metropolitan regions of Africa, encompassing millions of people. Improving connectivity and tackling congestion around the capital cities' metropolitan regions allows nearby places and people to benefit from agglomeration economies, unleashing network spillover effects.

## 5.4 Additional considerations

### The analysis conducted for the HoA REM points to three additional policy considerations and priorities.

**First, the analysis has shown that there is a strong case for a concerted and coordinated effort to improve living standards and reduce fragility in the Horn, including by applying regional, cross-border strategies.** While spread across different countries, the border areas of the HoA face similar challenges: poor service delivery and human development outcomes, lagging infrastructure, high economic distance from domestic density and international density (thick borders), vulnerability to climate change, and fragility. The returns to investments and policy reforms in the border areas will be amplified by coordinated, subregional efforts. For instance, cross-border models of education and health service delivery could be considered, taking advantage of target populations having greater scale when people living on either side of a border are included (e.g., to realize scale economies in the provision of home-language education), and could be particularly cost-effective where populations are isolated domestically but closer to service delivery facilities across a border. Similarly, investments in better infrastructure and connectivity in a border area of one country will only have limited effects if the border remains thick or infrastructure on the other side remains poor. Coordinated disaster preparedness and response effects could help protect the poor and vulnerable, especially in the face of climate change. Across all these dimensions, a regional perspective would also help focus development partners' support and maximize its overall impact.

**Second, job generation in the formal private sector in the Horn, while essential, will only deliver a fraction of the job opportunities needed to accommodate the booming labor force.** While jobs policy must take account of the differences in economic structure between the countries of the region, workers in the Horn would likely benefit most from policies for broad-based, cross-sectoral productivity growth (notably including in agriculture), centered around maintaining macro-fiscal stability, mobilizing more public revenues and deploying these towards greater and more efficient spending on public services (notably education) and infrastructure, as well as improving the investment climate and access to finance.

**Third, there is an urgent need for more, better quality and more timely economic data for the region** (including using more recent technology and methods, such as remote sensing and big data such as mobile phone data) to support analysis and sound policies. These tools are likely to be of particular use in improving our understanding of the issues at the main border crossings and along the key cross-border value chains, as well as those arising in secondary cities – critical dimensions for driving development in the borderlands of the HoA.

## Annex Map: The Horn of Africa and its main cities

# References

This overview draws on the following Horn of Africa Regional Economic Memorandum Background Papers (2021):

1. Economic Geography Analysis (Tom Bundervoet and Takaaki Masaki)
2. Jobs in the Horn of Africa (Tom Farole, Jan von der Goltz and Tove Sahr)
3. A Review of Cross-Border Trade in the Horn of Africa (Paul Brenton and Habtamu Edjigu)
4. Infrastructure and Structural Change (Matias Herrera Dappe and Mathilde Lebrand)
5. A Framework for Enhancing Intra-Regional Connectivity in the horn of Africa (Charles Kunaka and Ben Derudder)
6. Overview of Digital Development in the Horn of Africa (Tim Kelly and Eric Dunand)


Barros, R.P., Ferreira, F., Molinas Vega, J. & Saavedra, J. (2009). Measuring Inequality of Opportunities in Latin America and the Caribbean." Washington DC: The World Bank.

Brenton, P. and M. Nyawo. (2019). Food Prices, Access to Markets and Child Undernutrition in Ethiopia. Policy Research Working Paper 8823, World Bank, Washington, DC.

Bloom, D., Canning. D & Sevilla, J. (2003). The Demographic Dividend. *A New Perspective on the Economic consequences of Population Change*. RAND Corporation

Federal Democratic Republic of Ethiopia. (2018). Poverty and Economic Growth in Ethiopia (1995/96 – 2015/16). Ethiopia: Planning and Development Commission.

Ghosh, T., Powell, R. L., Elvidge, C. D., Baugh, K. E., Sutton, P. C., and Anderson, S. 2010. The Open Geography Journal 3: 147-160.Sources: HYDE3.2.

Gribble, J. & Bremner, J. (2012). "Achieving a Demographic Dividend." *Population Bulletin* 67 (2), The Population Reference Bureau.

IDA. (2019). Special Theme: Jobs and Economic Transformation. Washington DC: The International Development Association.

IMF Annual Report on Exchange Arrangements and Exchange Restrictions (2019).

Li, X., Zhou, Y., Zhao, M. and Zhao, X. (2020). A harmonized global nighttime light dataset 1992-2018. Nature Scientific Data 7(168).

Montenegro, C. and Patrinos, H. (2014). Comparable Estimates of Returns to Schooling Around the World. Policy Research Working Paper 7020. Washington DC: The World Bank.

Psacharopoulos, George; Patrinos, Harry Anthony. (2018). Returns to Investment in Education: A Decennial Review of the Global Literature. Policy Research Working Paper No. 8402. Washington, DC: World Bank.

Roberts, Peter; KC, Shyam; Rastogi, Cordula. 2006. Rural Access Index: A Key Development Indicator. Transport paper series; no. TP-10. World Bank, Washington, DC.

Ronald Lee and Andrew Mason (2006) "What is the Demographic Dividend?" Finance and Development (September) 16-17.

Schmidt, E., Dorosh, P., Jemal, M. and Smart, J. 2018. Ethiopia's Spatial and Structural Transformation. ESSP Working Paper 119. International Food Policy Research Institute (IFPRI). World

Urbanization Prospects (UN 2018).

Tesfaye, A. and N. Amaha. (2018). A Review on Cross-Border Livestock Trade Across Dry Land Borders of Ethiopia: The Trends and Implications', Journal of Scientific and Innovative Research 7(2): 36-42

United Nations. (2019). Department of Economic and Social Affairs, Population Division. World Population Prospects 2019, Online Edition. Rev. 1.

World Bank (2009), World Development Report 2009: "Reshaping Economic Geography". Washington DC: The World Bank

World Bank Group; U.K. Department of International Development. 2019. Poverty and Vulnerability in the Ethiopian Lowlands: Building a More Resilient Future. World Bank, Washington, DC: World Bank.

World Bank. 2019. Transport note for the high-level conference on promoting economic integration in the Horn of Africa, February 2019. Unpublished.

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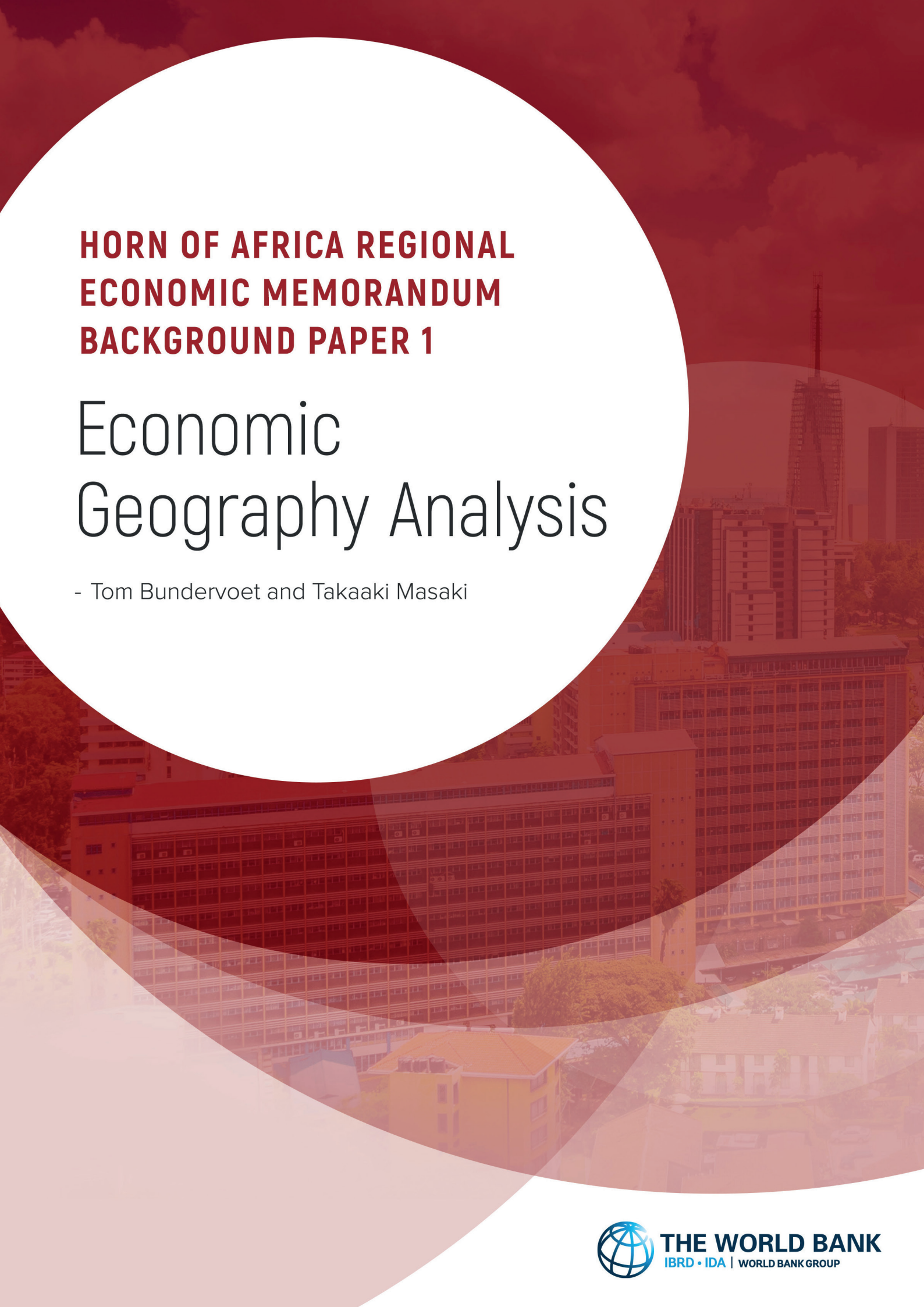

HORN OF AFRICA REGIONAL ECONOMIC MEMORANDUM BACKGROUND PAPER 1

# Economic Geography Analysis

- Tom Bundervoet and Takaaki Masaki

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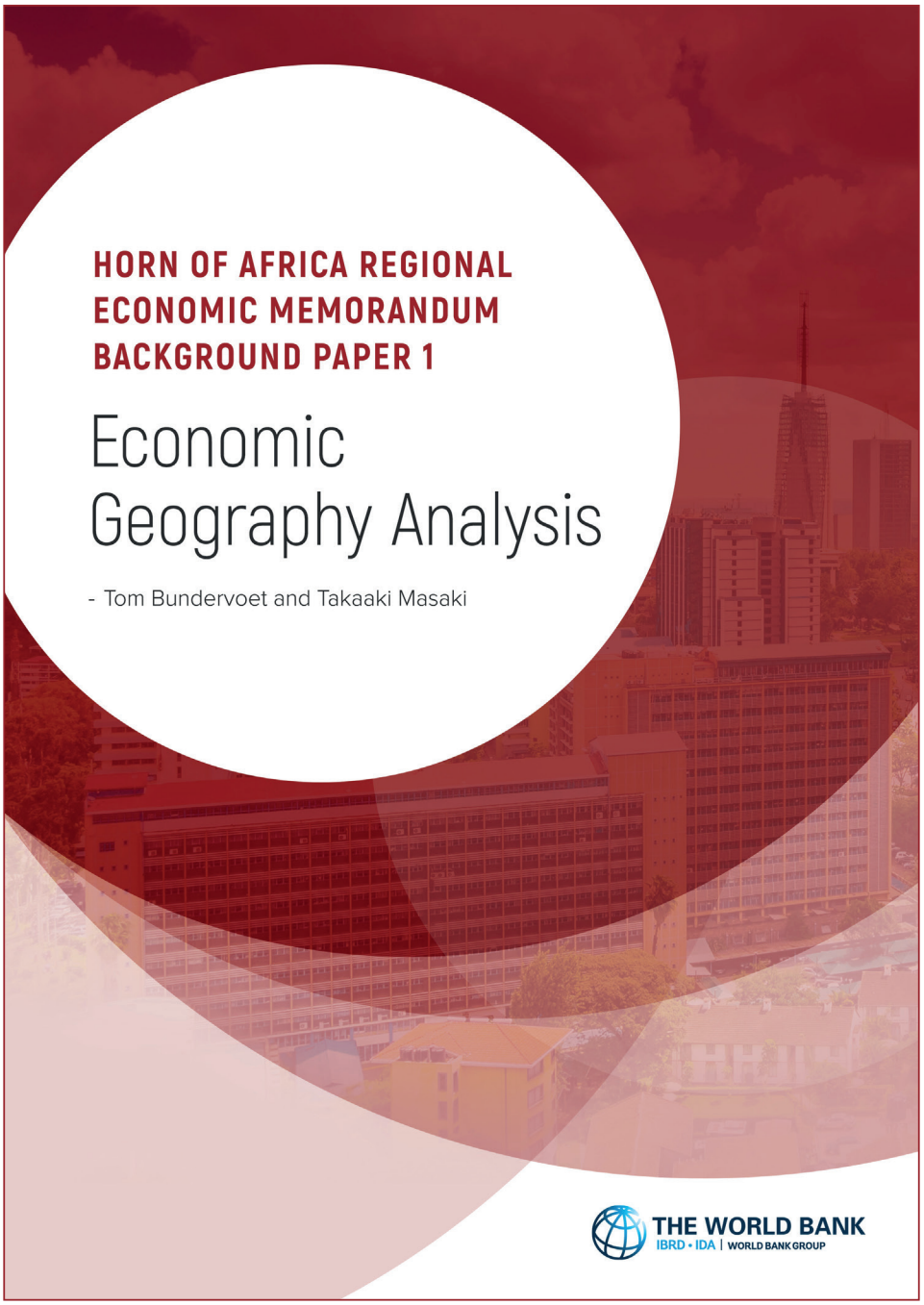


# CONTENTS

**The Horn of Africa (HoA) is most commonly known for its long history of strife, fragility, droughts, and seemingly intractable conflicts.** A complex set of historical, ideological, political, economic, geographical, territorial, and environmental factors have created tensions within and between states, at times boiling over into inter- and intra-state violent conflicts. These conflicts have, in turn, further weakened states' capacity to provide public services, social cohesion, and further increased the vulnerability of its population and the risk of future conflicts. Climate change is now exacerbating an already difficult situation, leading to increased tension over natural resources. Successive shocks of different kinds have led to record numbers of displaced people[1] and increased migration, mostly irregular, to Gulf countries.[2]

**Yet the true picture of the HoA is more nuanced, with the HoA including Africa's fastest-growing economy (Ethiopia) and East Africa's most advanced economy (Kenya).** Despite all the challenges, real progress has been made in recent years. Per capita GDP levels in the HoA increased at an average annual rate of almost four percent between 2013 and 2018 and the share of the population living below the US$1.9 a day poverty line declined from 40 percent in 2005 to 33 percent 10 years later.[3] Gains were made on non-monetary dimensions of welfare as well, with the four HoA countries for which data are available increasing their Human Development Indices.[4]

**This background note analyzes the economic geography of the Horn of Africa using the framework of the 2009 Word Development Report.[5]** For the purpose of this report, the Horn of Africa (henceforth HoA) comprises of five countries: Djibouti, Eritrea, Ethiopia, Kenya and Somalia.[6] This note first seeks to provide a descriptive snapshot of recent socio-economic trends in the HoA countries vis-à-vis the regional trends in sub-Sahara Africa (SSA) as a whole. Second, it sheds light on the economic geography of the HoA region with a particular focus on 3D (density, distance, and division).[7] In particular, this note highlights that borderlands of the HoA countries suffer from a combination of low density and high distance that hinders the borderlands from tapping their full economic potential. It finally concludes with a set of policy recommendations for removing barriers to sustainable growth in the region.

1 In 2019, there were an estimated 4.3 million IDPs in the HoA, divided between Somalia and Ethiopia.

2 In 2018, over 315,000 migration movements were observed between the HoA and the so-called Eastern Route (towards Yemen and the Arabian Peninsula), increasing to 469,000 in 2019 (DTM, 2019; https://ronairobi.iom.int/sites/default/files/document/publications/2019_DTMRegionalSnapshot_EHoA_2019.pdf.

3 Based on PovCalNet and WDI. Only includes Kenya, Ethiopia and Djibouti. There are no consistent data on Somalia and Eritrea, whose combined population accounts for nine percent of total population in HoA.

4 http://hdr.undp.org/en/composite/HDI. No data for Somalia.

5 World Bank, 2009.

6 These five countries decided, on October 18, 2019, to forge closer economic ties by fostering economic integration and regional cooperation in the HoA.

7 This 3D analytical framework is borrowed from WDR2009. *Density* refers to the economic mass per unit of land area, or the geographic compactness of economic activity. It is shorthand for the level of output produced—and thus the income generated—per unit of land area. It can, for example, be measured as the value added or gross domestic product (GDP) generated per square kilometer of land. Second, *distance* refers to the ease or difficulty for goods, services, labor, capital, information, and ideas to traverse space. It measures how easily capital flows, labor moves, goods are transported, and services are delivered between two locations. Distance, in this sense, is an economic concept, not just a physical one. Lastly, *division*, by contrast, refers to any restrictions on the mobility of people, goods and services due to border restrictions, territorial disputes, civil wars, and conflicts between regions and countries, among others.

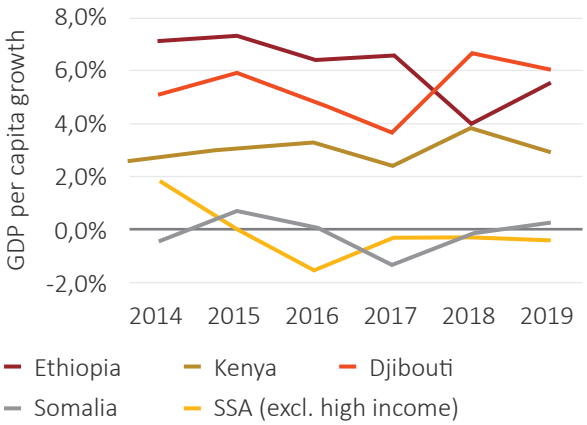
SECTION 1

# Introduction: Positive Recent Trends, Mostly from a Low Base

**Between 2014 and 2018, growth in the HoA outpaced growth in SSA as a whole.** While real per capita GDP levels remained essentially flat in SSA (excluding high income), they grew at an annual rate of four percent in the HoA[8] (Figure 1). Ethiopia, Djibouti and Kenya recorded the highest per capita growth rates, while in Somalia economic growth hardly outpaced estimated population growth. Despite the recent positive trends, income levels in the Horn remain below the SSA average. Average GDP per capita of the four HoA countries amounted to about US$1,000 in 2018, compared to US$1,600 for SSA (excluding high income). There is substantial variation within the HoA itself, with per capita income levels being almost 10 times higher in Djibouti than in Somalia (Figure 2).

**Figure 1:** Economic growth in the HoA was solid

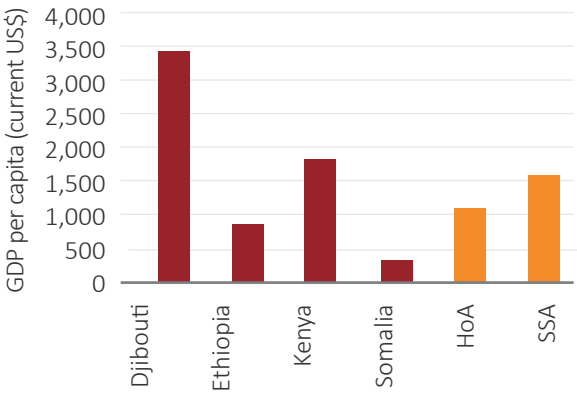
(Per capita GDP growth, 2014-2018))




Source: WDI, 2020; Somalia Economic Update, 2020. World Bank staff calculations.

**Figure 2:** Income levels remain low in comparison

(Per capita GDP levels, 2018, current US$)




Source: WDI, 2020. Somalia Economic Update, 2020. World Bank staff calculations.

**Though trends in poverty have been positive too, the pace of poverty reduction has been too weak to reduce the number of poor people.** For the three countries where data are available, poverty rates saw a modest decline from 40 percent around 2005 to 33 percent around 2015,[9] while the absolute number of people living in poverty rose by 9 percent over the same period. Poverty rates range from 17 percent in Djibouti to 69 percent in Somalia (Figure 3).[10] Overall, an estimated 57 million people across the HoA live below the poverty line (Figure 4).

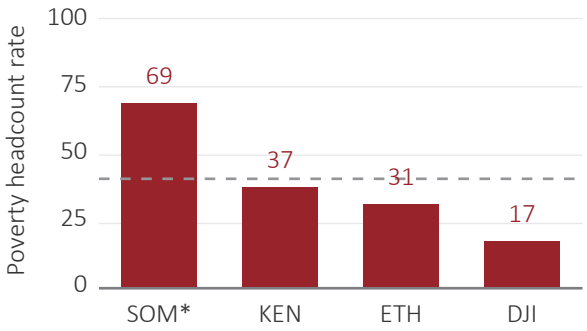
8 This does not include Eritrea where there are no publicly available and reliable GDP data.

9 For Ethiopia, poverty surveys were conducted in 2004/5 and 2015/16. For Kenya, 2005/6 and 2015/16. For Djibouti, 2002 and 2017. Poverty is measures based on the international US$1.9 poverty line.

10 Somalia's poverty rate is estimated based on areas that were safe enough to survey. It does not include areas which were inaccessible due to insecurity.

## Figure 3: One third of the population lives below US$1.9 a day

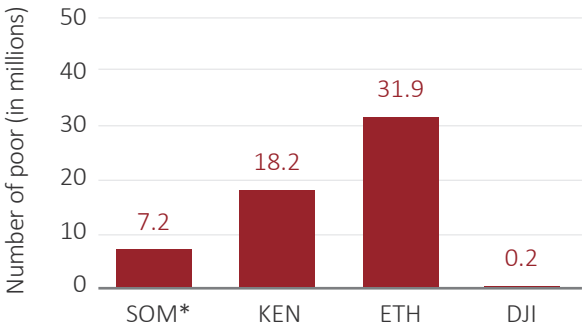
(US$1.9 a day poverty rate)




Source: World Bank staff calculations based on the latest survey available (2017 for Djibouti, 2015 for Kenya, 2015/16 for Ethiopia, and 2017/18 for Somalia). The dash line corresponds to the regional poverty headcount rate for the HoA (except Eritrea).
Notes: * indicates that Somalia's poverty rate is estimated based on areas that were safe enough to survey. It does not include areas which were inaccessible due to insecurity.

## Figure 4: Ethiopia and Kenya account for the bulk of the poor

(Estimated number of people below US$1.9, millions)

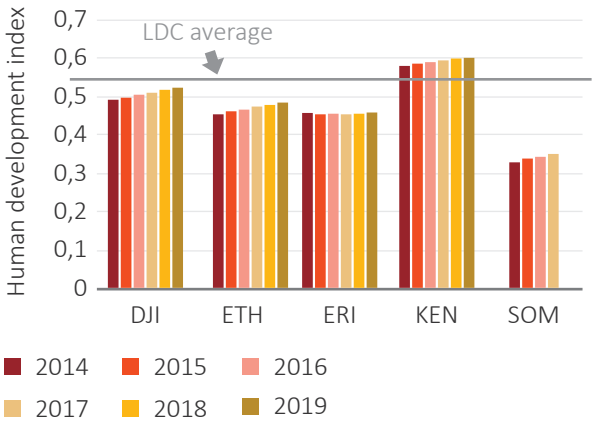



Source: World Bank staff calculations based on the latest survey available (2017 for Djibouti, 2015 for Kenya, 2015/16 for Ethiopia, and 2017/18 for Somalia).

**Human development outcomes improved in line with economic growth but still remain low.** Between 2014 and 2018, the Human Development Index (HDI), a summary measure of average achievements in health, education, and living standards, improved in all countries except for Eritrea (Figure 5). With the exception of Kenya, the HDI remains however below the Least Developed Countries' average. Education outcomes remain particularly poor, even among the younger generation. Between half and two-thirds of children finish primary school (except for Kenya, where completion is universal) and gross enrolment in secondary school remains relatively low (Figure 6). Based on the most recent household living standards surveys, 45 percent of youngsters between 15 and 24 had completed primary school or more at the time of the survey (between 2015 and 2017, depending on the country).

## Figure 5: Human development improved

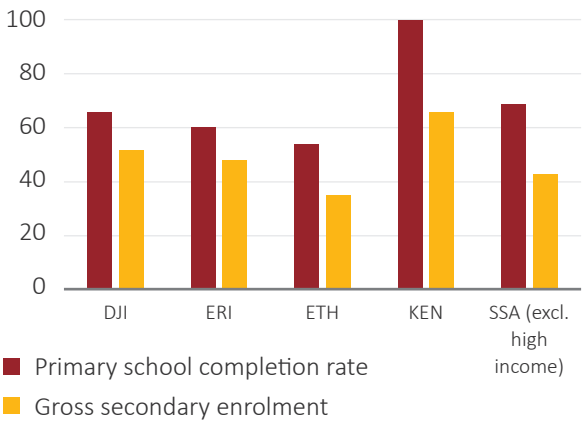
(Human Development Index, 2014-2018)




Source: UNDP, 2020.

## Figure 6: But education outcomes generally remain weak

(Primary completion rate and gross secondary enrolment)

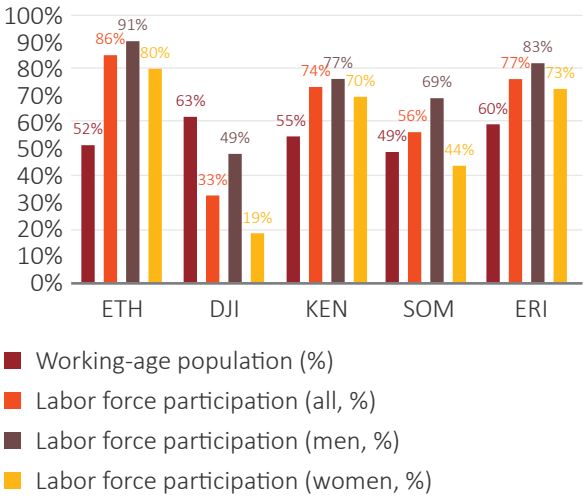



Source: WDI, 2020. KNBS, 2018.

**Labor market outcomes differ across countries but remain relatively poor, especially for youth and women.** In countries where the population is predominantly agricultural, labor force participation rates are high. High labor force participation is an empirical regularity in largely agrarian low or lower middle-income countries and reflect the high prevalence of unpaid family labor and the need to work in absence of robust social assistance systems rather than strong labor demand. In Ethiopia, Eritrea and Kenya, labor force participation rate reaches 86 percent, 77 percent, and 74, respectively (Figure 7). In Djibouti and Somalia, labor force participation is low, mainly driven by cultural and social norms regarding the labor market participation of women. Youths' participation in the labor market is low particularly in Djibouti, Kenya and Somali (Figure 8). For Djibouti and Kenya though, this is partly explained by the high share of young people who are in school.

Figure 7: Labor force participation is high except for Djibouti and Somalia

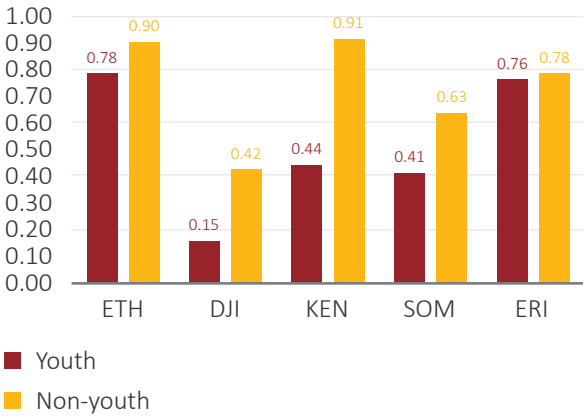
(Labor force participation rate, %)




Sources: 2013 LFS for Ethiopia, 2017 household survey for Djibouti (GMD database), 2015 KIHBS for Kenya, 2017 HFS Wave 2 for Somalia, and 2015/16 LFS for Eritrea.

Figure 8: Youth are generally less likely to participate in the labor force

(Labor force participation rate, %)

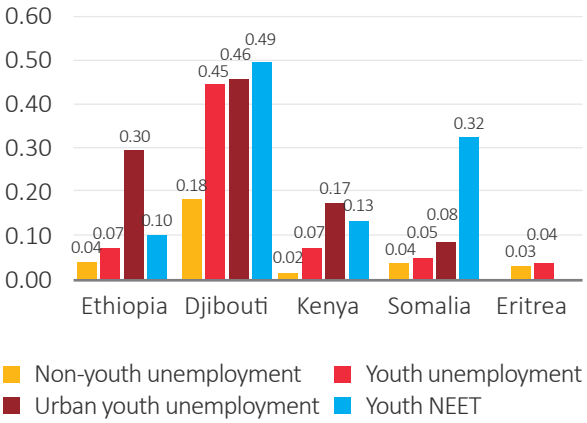



Sources: 2013 LFS for Ethiopia, 2017 household survey for Djibouti (GMD database), 2015 KIHBS for Kenya, 2017 HFS Wave 2 for Somalia, and 2015/16 LFS for Eritrea.

**A considerable share of youth across the HoA are Not in Employment, Education, or Training (NEET) (Figure 9).** A young person who is NEET is not engaged in any productive activity or any activity that can increase his/her productivity in the future (e.g. education), which represents a waste of human resources. As a result, NEET is often considered a measure of exclusion from productive activities. Young women are particular at risk of being NEET. Open unemployment is relatively low in the HoA (except for Djibouti) (Figure 10). Once again, this does not reflect a strong labor market though rather the rural nature of most countries in the HoA and the need for people to work in absence of public social assistance systems. Unemployment is significantly higher in urban areas, especially among youth: in Ethiopia, in Kenya and in Djibouti.

**Figure 9:** Youth NEET is substantial across the HoA

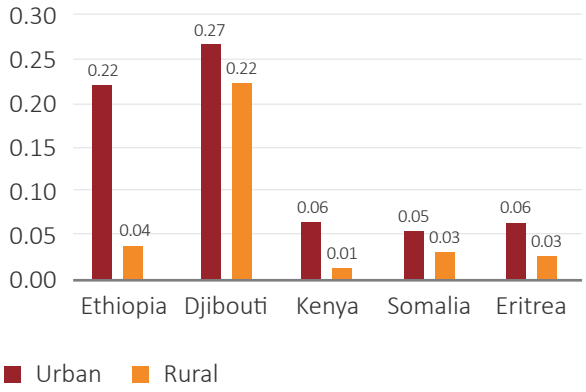
(Share of youth 15-29 Not in Employment, Education or Training)




Sources: 2013 LFS for Ethiopia, 2017 HBS for Djibouti (GMD database), 2015 KIHBS for Kenya, 2017 HFS Wave 2 for Somalia, and 2015/16 LFS for Eritrea.

**Figure 10:** Though unemployment rates are fairly low

(Unemployment rate, %)



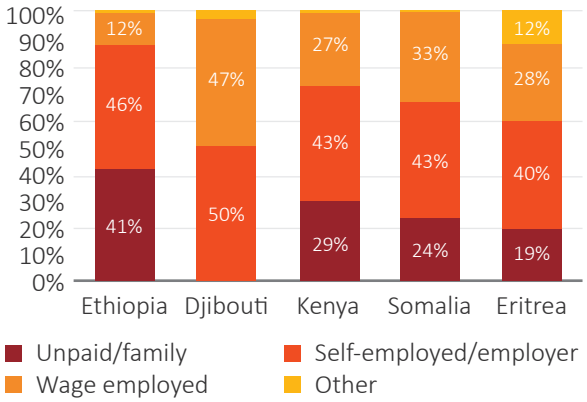

Sources: 2013 LFS for Ethiopia, 2017 HBS for Djibouti (GMD database), 2015 KIHBS for Kenya, 2017 HFS Wave 2 for Somalia, and 2015/16 LFS for Eritrea.

**Employment is dominated by self-employment and agriculture, though there are substantial variations across countries.** Self-employment and unpaid family work dominate employment in all the HoA countries except for Djibouti, which has a higher rate of wage employment though this number may be over-reported (Figure 11).[11] The incidence of wage employment is also closely related to the sectoral composition of employment (Figure 12). In Ethiopia, where agriculture accounts for the bulk of employment, wage employment is particularly rare. In countries with a larger employment share in services, wage employment is more common, though even in the services sector self-employment tends to be at least as important as wage employment. There are few differences in the sector of employment between youth and older adults, but youth are much more likely to work as unpaid family labor.

[11] The survey data used for Djibouti records no unpaid work at all and it is likely that such employment is instead mistakenly coded as self-employment, wage employment, or perhaps, as inactivity. Thus, the numbers for Djibouti need to be treated with caution.

**Figure 11: Self-employment and unpaid work account for the bulk of employment in the HoA**

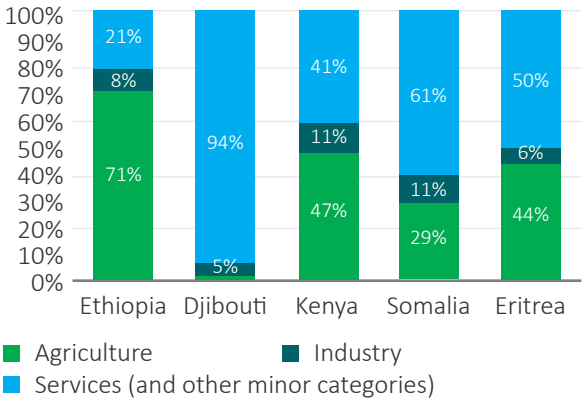
(Share of employment type in overall employment)




Sources: 2013 LFS for Ethiopia, 2017 HBS for Djibouti (GMD database), 2015 KIHBS for Kenya, 2017 HFS Wave 2 for Somalia, and 2015/16 LFS for Eritrea.

**Figure 12: Agriculture and services dominate employment in the HoA**

(Sectoral composition of employment)




Sources: 2013 LFS for Ethiopia, 2017 HBS for Djibouti (GMD database), 2015 KIHBS for Kenya, 2017 HFS Wave 2 for Somalia, and 2015/16 LFS for Eritrea.

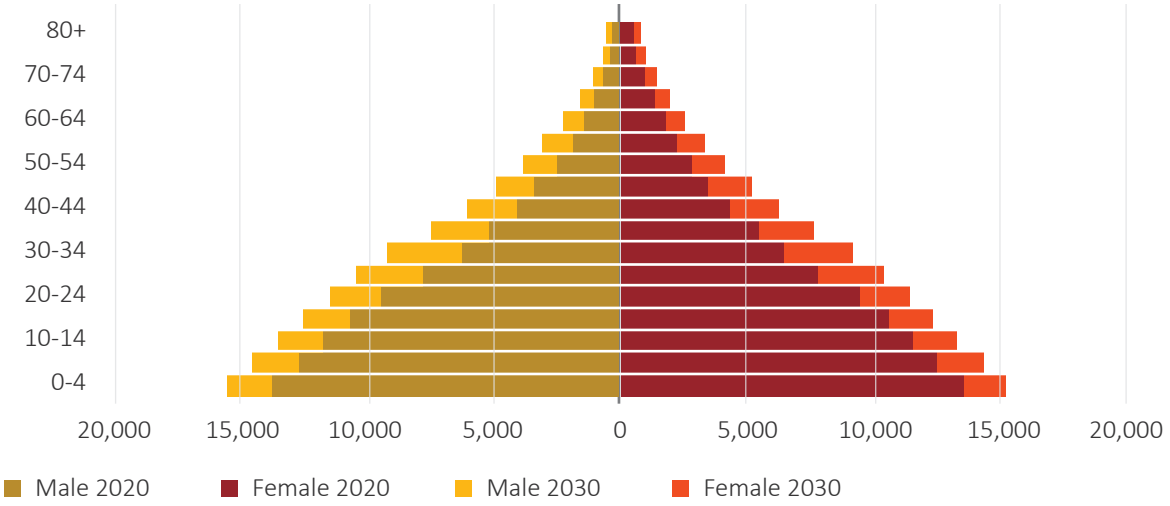
**The employment challenge in the HoA is compounded by its rapidly growing population.** The working-age population in the HoA is projected to grow from 107 million in 2020 to 143 million by 2030, leading to a spike in demand for jobs and economic opportunities. While a rapidly growing working age population can be a boon for growth through the so-called demographic dividend, fertility declines in the HoA have so far been too slow to lead to rapid shifts in the projected age-structure of the population. While the share of the working-age population is projected to increase from 57 percent in 2020 to 60 percent by 2030, each successive age cohort will still remain bigger than the previous one, meaning that a HoA-wide demographic dividend is not around the corner (Figure 13).[12] Lowering fertility rates and strengthening the institutions necessary to realize the demographic dividend should be a priority for the HoA,[13] along with generating productive employment opportunities for a burgeoning and relatively poorly-educated labor force.

12 A common misperception is that a large and growing youth population itself is an indicator of a coming demographic dividend. It is not. The first step is a transition from high birth and death rates to low birth and death rates (Population Reference Bureau, 2012). This transition, especially the one to low birth rates, has been slow.

13 Many scholars acknowledge the ineffectiveness of the demographic transition in realizing the demographic dividend if quality institutions are not in place. These institutions include basic health care and schooling, infrastructure, rule of law and efficiency of the bureaucracy, etc. (Lee, Lee and Mason, 2006; Bloom, Canning and Sevilla, 2003).

## Figure 13: The demographic transition is still incipient in the HoA

(Population pyramid of the HoA, 2020 and 2030)




Source: WPP, 2019. WB staff calculations.

SECTION 2

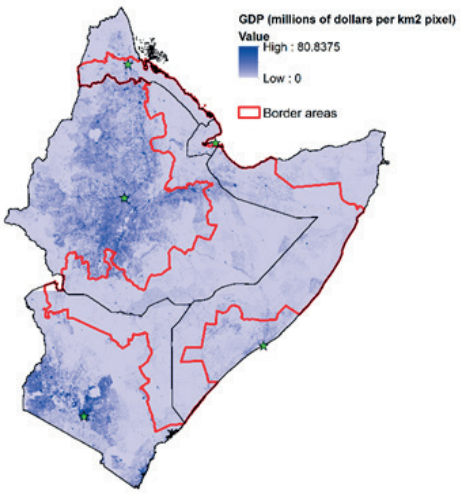
# Economic Geography of the HoA: Density, Distance, and Division

## 2.1 Density: Spatial Distribution of Economic Activity and Living Standards

**Population density and economic density are closely linked.** The economic density map (Figure 14) largely mirrors the population density map (Figure 15).[14] In Ethiopia, close to 90 percent of the population live in the highlands, despite the highlands accounting for less than half of Ethiopia's territory (World Bank, 2019). In Kenya, 20 percent of counties – which are densely populated and concentrated spatially in the southwestern part of the country – account for over 40 percent of population[15] while in Eritrea, it is estimated that the top 10 most populated districts, which are located mostly in the northeast, the country's capital, account for around 40 percent of population.[16] In Somalia, high densities of population are observed in Mogadishu, Kismayo, Baidoa and Hargeysa and along major road networks that are connected to these major cities.

Figure 14: Economic production in the HoA is highly concentrated

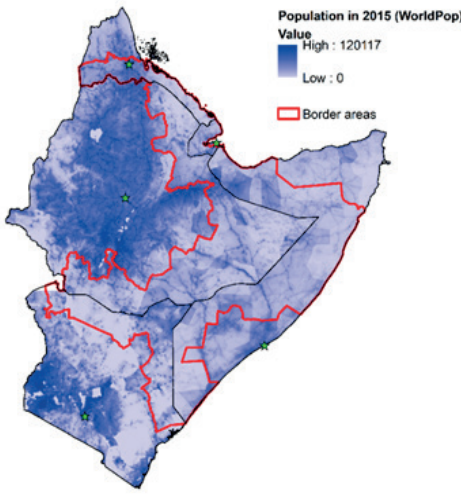
(Estimate of GDP per squared kilometer, 2006)




Sources: Ghosh et al. (2010).

Figure 15: Population is concentrated in economically-dense areas

(Estimated population distribution, 2015)




Sources: WorldPop.

14 Our regression analysis suggests that population densities alone account for about half of the variation in economic densities (See Appendix A-1).

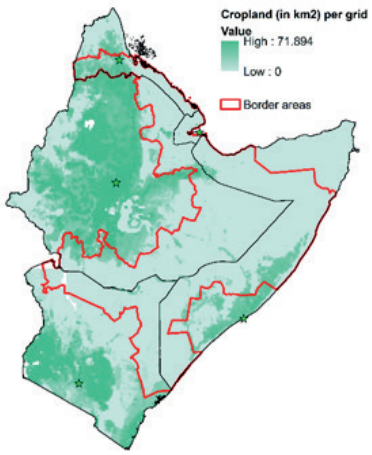
15 Out of 47 counties, the most populated 10 accounted for 41 percent of the population in the 2019 population census.

16 The World Bank's estimates based on population data from WorldPop and GADM ADM2 shapefile.

**Economic activities in the HoA are also spatially concentrated particularly in areas that are characterized by high market accessibility and agricultural productivity.** Those areas that are proximate to or better connected to large urban population centers tend to attract much of the regional economic activities – a topic that is discussed more extensively in the following section on distance.[17] This is particularly visibly discernible in and around Addis Ababa where the higher densities of economic activities are observed along the major corridors stretching from or into the city. Furthermore, in countries with a substantial agricultural base (Ethiopia, Kenya and, to a lesser extent, Eritrea), economic densities tend to be higher in places that are largely characterized as agrarian (or dominated by croplands): The central highlands of Ethiopia crossing north into Eritrea towards Asmara and crossing east into Somalia towards Hargeisa, and the area around Nairobi and stretching westwards towards Kisumu and the shores of Lake Victoria (Figure 16). It is also in these agricultural breadbaskets that the countries' biggest cities are located. In Djibouti and Somalia, both arid and hot countries, economic activity is concentrated in places with a comparative advantage for trade through seaports: Djibouti city in Djibouti and Mogadishu (and to a lesser extent Kismayo) in Somalia.

Figure 16: Economic density also largely reflects cropland availability

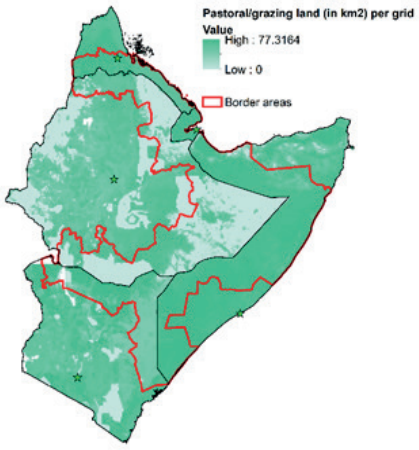
(Cropland in km² per 5 arc minutes cell 2010)




Source: HYDE 3.2.

Figure 17: Low economic densities in border areas where predominant way of living is pastoral

(Pastoral/grazing land in km² per 5 arc minutes cell 2010)




Source: HYDE3.2.

**The vast and sparsely populated border areas are a salient feature of the HoA.** The HoA border areas,[18] demarcated by the red lines in Figure 14, account for over 44 percent of the combined territory of the five countries but make up only 13 percent of total population and 9 percent of economic output. A larger swath of the borderlands is classified pastoral/grazing land (Figure 17). A large majority of people in the borderlands engage in pastoralism, agropastoralism and trade. The border areas are also where many of the Horn's challenges come

17 Our regression analysis shows that market accessibility, as defined in Box 3, is strongly and positively correlated with economic densities. Overall, market accessibility explains 14 percent of the overall variation in economic densities across the HoA.

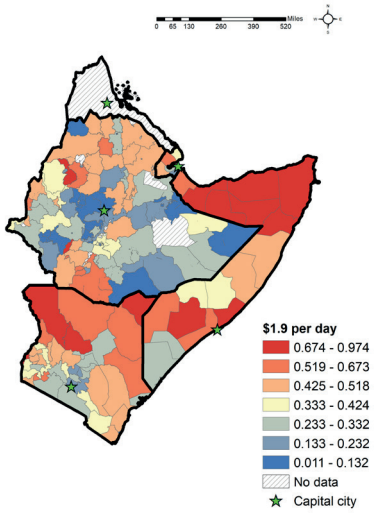
18 We defined border areas as second-order administrative divisions (ADM2) that share a land border with another country with the exception of the regions of Tigray and Djibouti which are distinctively different from the rest of the borderlands in terms of their demographic and environmental characteristics and thus excluded.

together: A legacy of economic, social, and political marginalization; poor service delivery and infrastructure; conflict, violence, and forced displacement; and environmental degradation, all spilling across national boundaries. While there are differences across countries, the reach of the state in these areas is generally weak, and informal and illicit activities flourish. Yet these border areas are bound to play a key role if trade and cooperation across the HoA is to increase and deepen, highlighting their importance in a regional integration agenda.

**The spatial distribution of economic density is reflected in spatial differences in living standards.** Using the US$1.9 a day poverty line, poverty rates are generally lower in the economically dense areas than in the economically-lagging ones (Figure 18).[19] There are several ways to classify economically dense (or "leading") areas vs. lagging areas. This report uses two alternative classifications, which, as will be shown below, yield qualitatively similar results. First, a simple urban vs rural dichotomy is used as a proxy for leading vs. lagging areas given the concentration of formal economic activity in urban areas. Second, we use the border area definition introduced before to define the border areas as economically-lagging areas, as evidenced by Figure 14. We find that poverty rates in rural areas of the HoA (39 percent) are close to three times higher than in urban areas (15 percent), while poverty in the border areas is 12 percentage points higher than poverty in the non-border or core areas. Using the border area definition introduced before, poverty rates in the economically-lagging border areas amounted to 44 percent, compared to 32 percent in the non-border areas. Differences in poverty between the economically dense core and the periphery (or borderlands) are high and statistically significant. That said, given the sparsely populated nature of the border areas, the density of poverty is not situated in the border areas. The bulk of the poor live in the wealthier (and hence more populated) parts of these countries (Figure 19).

Figure 18: Poverty rates tend to higher in the sparsely populated border areas

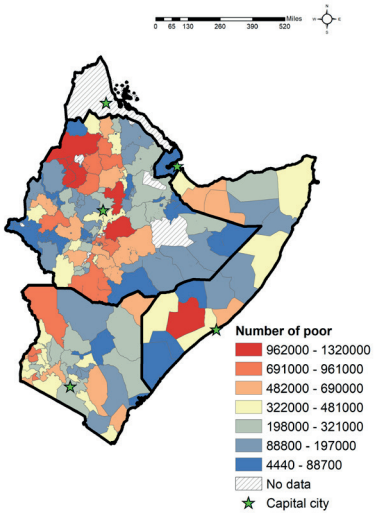
(Share of population below the US$1.9 poverty line)




Source: World Bank staff calculations using the latest household survey available in each country.

Figure 19: Though most of the poor live in the economically-dense areas

(Number of people below the US$1.9 poverty line)



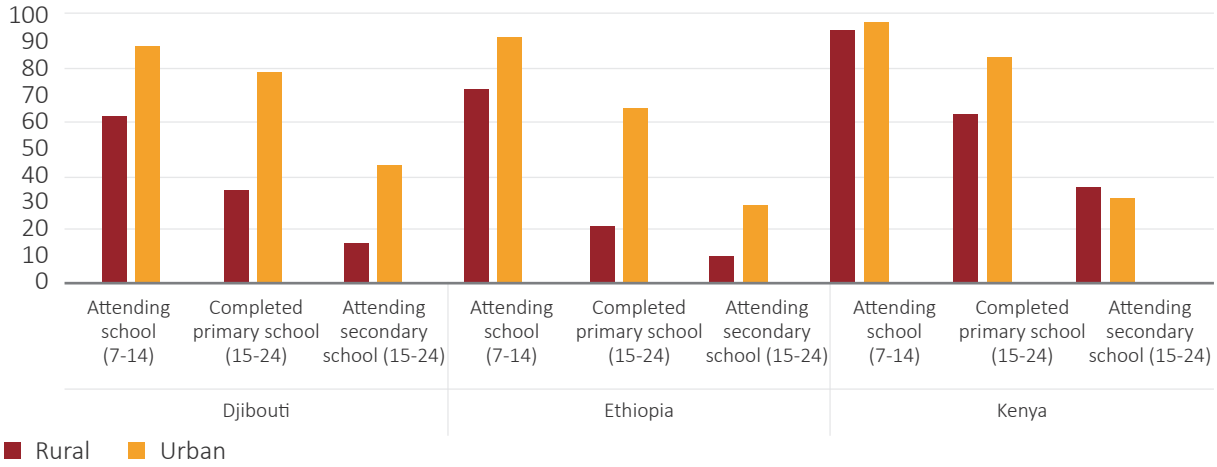

Source: World Bank staff calculations using the latest household survey available in each country.

19 Our econometric diagnostic identifies a strong negative relationship between economic densities and poverty (see Appendix A-1).

**The disparity between leading and lagging areas is salient for other social indicators as well.** Education indicators display large disparities between both the rural and urban areas and the border and core areas of each of three countries for which comparable data are available (Djibouti, Ethiopia, and Kenya). The share of 7-14-year-olds attending school, the share of youth aged 15-24 that have completed primary education, and the share of youth 15-24 attending secondary education are substantially lower in rural areas and in border areas for all three countries, as opposed to urban areas and core areas, respectively (Figure 20 and Figure 21). Indicators of access to health care and health outcomes also tend to be substantially worse in the economically-lagging areas, translating into subnational multi-dimensional poverty rates that are substantially higher in the border areas than in the economically dense areas (Figure 22).

Figure 20: Education outcomes lag in rural areas

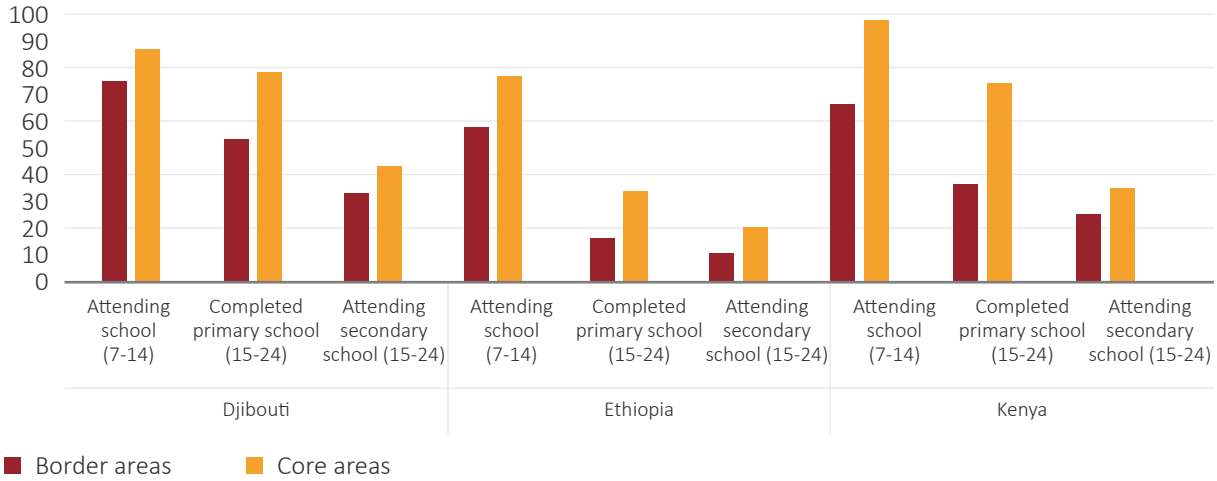
(Selected education indicators, Djibouti, Ethiopia, Kenya)




Source: GMD, 2020; World Bank staff calculations.

Figure 21: Education outcomes also lag in the border areas

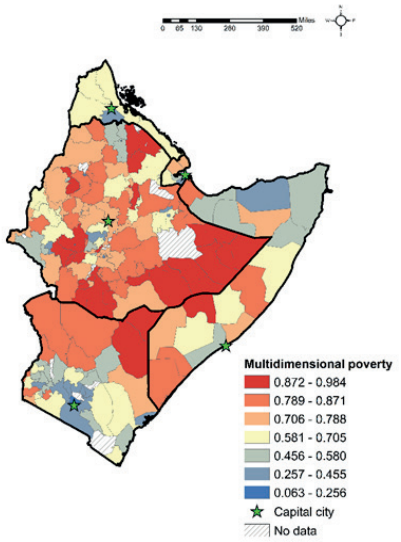
(Selected education indicators, Djibouti, Ethiopia, Kenya)




Source: GMD, 2020; World Bank staff calculations.

## Figure 22: Non-monetary dimensions of poverty are most severe in the border areas

(Subnational multi-dimensional poverty rates)



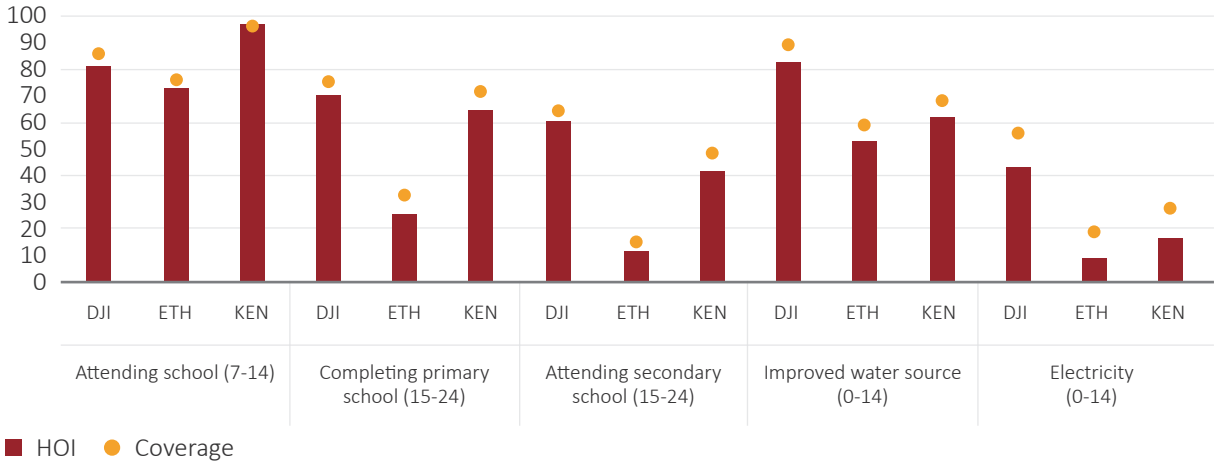

Source: World Bank staff calculations based on the latest household survey available for Djibouti (2017), Ethiopia (2015), Kenya (2015), and Somalia (2018) while the subnational estimates for Eritrea are imputed based on the subnational human development index database (Smits and Permanyer 2019). Notes: Our estimates of multidimensional poverty for Somalia based on the 2018 SHFS should be treated with caution as the survey is only representative for safe areas.

**To explore in more detail the source of inequity in access to public services and opportunities in the HoA, we use the "Human Opportunity Index" (HOI) approach (Box 1).** In basic terms, the HOI methodology calculates the coverage of a certain opportunity in the population (for instance, the share of children completing primary school) as well as a measure of inequality in accessing that opportunity (for instance, the share of children completing primary school can be higher in urban than in rural areas, or higher for children from better-off compared to worse-off households). The coverage rate is then corrected by this inequality measure to arrive at the HOI for that opportunity. The larger the difference between the coverage rate and the HOI, the larger the inequity across groups for the specific opportunity.

**Access to most basic opportunities in the HoA is low and uneven.** The exception is school attendance for young children (defined as 7-14-years-old), which is generally high and equally distributed (small differences between the coverage rate and the HOI), reflecting solid progress in extending basic education to larger segments of the population (Figure 23). Completing primary school and attending secondary however remain lower, especially in Ethiopia, and is much more unequal. Inequity is highest for electricity access, where the HOI is substantially lower than the coverage rate in all three countries.

## Figure 23: Significant gaps in coverage of basic opportunities in the HoA

(Coverage rate and human opportunity index, Djibouti, Ethiopia, Kenya)

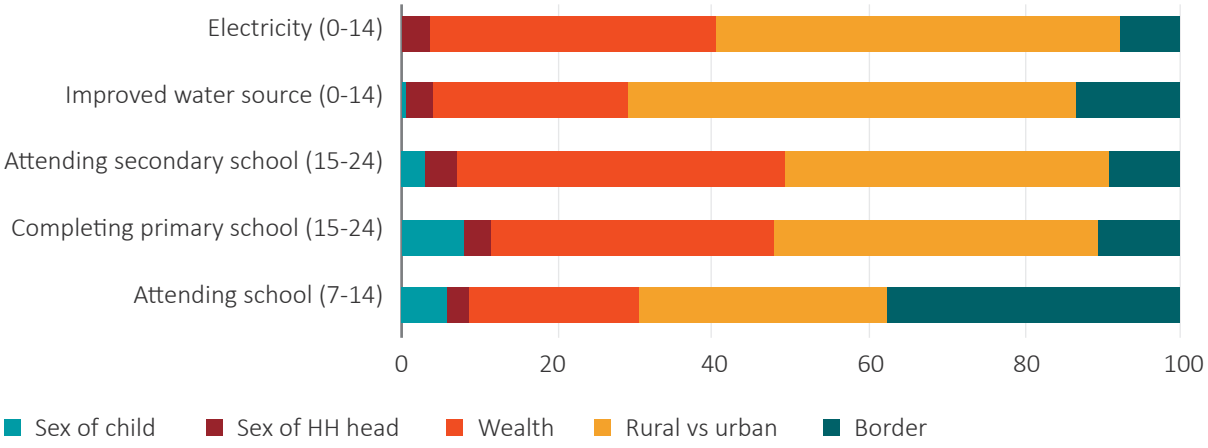



Source: World Bank staff calculations on the countries' most recent poverty surveys.

**Location and wealth shape access to opportunities in the HoA.** Decomposing the inequality in access to opportunities into contributions by different circumstances shows that the location and welfare levels of the household a child is born into determines to a significant extent of the child's access to opportunities.[20] To illustrate, 42 percent of the inequity in primary school completion can be attributed to rural vs urban location and 37 percent to differences in household welfare levels (as proxied by quintiles of per capita household consumption expenditures - Figure 24). Similarly, rural vs urban location accounts for 58 percent of the inequity in access to an improved drinking water source, with differences in household welfare explaining another 25 percent. While urban vs. rural location emerges as the main source of spatial inequity in access to important basic services, being located in a border area adds to the rural disadvantage. For instance, living in a border area is the main predictor of whether a young child attends school.

Figure 24: Location and wealth shape access to opportunities

(Contribution to inequity in access to a given opportunity, Djibouti, Ethiopia, Kenya)




Source: World Bank staff calculations on countries' latest poverty surveys.

Box 1: The Human Opportunity Index

**The Human Opportunity Index (HOI) is widely used to measure inequality of opportunity.** The HOI captures both (i) the overall access to basic services, such as education, water and electricity (the coverage rate); and (ii) inequality in access (Barros, Ferreira et al. (2008)). If access to a basic service is perfectly equal, then the HOI is the same as the coverage rate. As access becomes more and more unequal, so the HOI becomes lower and lower.

**The extent of inequality of opportunity is measured using the D-index (the dissimilarity index).** This index calculates how much access to services varies by birth characteristics, such as socio-economic status of a households and the location of the household. A D-index of zero indicates perfect equality (no gaps

[20] "Circumstances" are variables that are outside the control of a child but nevertheless affect his/her opportunities in life. Five circumstances are considered in the analysis: Location of the household (binary variables for rural or urban and being located in a border area), gender of child, gender of the household head, and the household's consumption quintile.

in access to services across circumstance groups), whereas a D-index of one indicates perfect inequality

**The central question behind the HOI is to what extent circumstances beyond one's control influence one's access to a set of important basic services.** Simply put, the HOI takes the coverage level of a basic service or "opportunity" (for example whether a child is enrolled in primary education) and combines this with the extent to which that opportunity is determined to be beyond the control of the child (for example being born in a rural rather than urban area or being a girl rather than a boy). Ideally, random circumstances should play no role in determining access to opportunities.

**The D-index measures dissimilar access rates to a given basic opportunity for groups of children where groups are defined by circumstance characteristics (for example, area of residence, or gender) compared to the average access rate to the same service for the population as a whole.** To formulate groups the sample is stratified into groups or "cells," so that all individuals in any given cell have the same combination of circumstances. The resulting subgroups are known in the literature as "types" (Barros, Ferreira et al. (2008)). These cells are then compared to one another. The difference in outcomes between cells can be attributed to inequality of opportunity, while the differences within cells can be considered the result of effort or luck.

The D-index summarizes all the gaps into a single measure by weighting them according to the population share in each circumstance group. The D-index generates a value between 0 and 1. In a society in which there is no inequality of access the D-index is be zero. If average access is denoted by $\bar{p}$, the specific access rate of group $i$ is $p_i$, and the share of group $i$ in the population is given by $\beta_i$ then the D-index is:

$$D = \frac{1}{2\bar{p}} \sum_{i=1}^{n} \beta_i | p_i - \bar{p} |$$

The HOI can then be calculated as:

$$HOI = \bar{p}(1 - D)$$

The measure is also decomposable so that the extent to which specific opportunity sets contribute to the dissimilarity can be assessed. This means that the contribution of different circumstances to overall inequality of opportunity can be determined.

**To summarize, economic activity in the HoA is concentrated in areas with better agricultural potential, high market access, and in large cities with high population densities.** Living standards and access to public services tend to be better in the economically-dense leading areas, with monetary and non-monetary dimensions of welfare being substantially worse in areas with lower economic density. Location and wealth shape access to opportunities in the HoA, with urban vs. rural location being the main spatial source of inequity in access to important opportunities and border area location conferring an additional disadvantage.

**The spatial concentration of economic activity in the HoA is by no means exceptional.** Economic activity is highly spatially concentrated in almost every country in the world, even in today's highly-developed nations. Nor is the concentration of economic activity accidental: Economic activity tends to concentrate in places favored by market forces. The co-incidence of economic density and better living standards have led many policy-makers around the globe to try to push economic activity to lagging regions with the aim of spurring economic development and improved living standards in those regions. These efforts have in most cases failed or come at a high cost to the public purse. Rather, improved living standards in lagging regions can come about through better integrating the economies of the leading and lagging regions through reducing the economic distance. This is the topic of the next section.

## 2.2 Distance: Access to Markets and Lagging Areas

**The previous section looked at the spatial concentration of economic activity in the HoA and the disparities in living standards between economically-dense and economically-thin areas.** This section focuses on the second important geographic dimension: Distance. While it is normal for economic activity to concentrate in certain favored places, the distance to these places will largely determine whether other, less-favored, places benefit from the dense economic activity as well. Distance here does not refer to physical distance, but to the ease or difficulty for goods, services, labor, and capital to move between the leading places and the other places. It measures how easily capital flows, labor moves, goods are transported, and services are delivered between two locations. Distance here is an economic concept, not just a physical one.

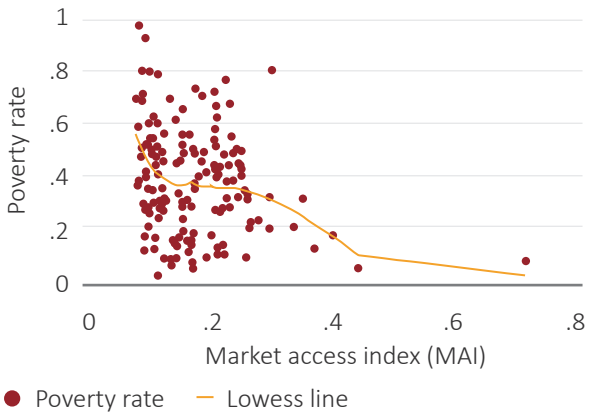
**Higher distance to density tends to be correlated with worse social and economic outcomes.** The farther from density, the more likely an area is to be lagging because of its lack of integration in the economy of the leading areas. This is often reflected in poverty rates being higher in remote and poorly connected parts of a country. The HoA is no different. Market Access Index (MAI) – an indicator of economic distance (see Box 2 for further details)– is strongly correlated with poverty rates. Places with better market access have lower poverty rates and vice versa (Figure 25). Rural areas in the Horn that are better connected, as measured by the Rural Accessibility Index (RAI) or share of people living with 2km away from all-season roads (see Box 2 for further details), also experience higher increases in the density of economic activities (as proxied by nighttime light luminosity) than places that are poorly connected (Figure 26).[21]

**Seen through the lens of density and distance, lagging areas are defined as places with low economic density and high distance to density.** Taking together their lack of economic activity (Figure 14) and low levels of market access (Figure 27), it is clear that the border areas of the HoA classify as lagging areas. Overall, market access in the border areas is significantly worse than in other parts of the countries. Only about 27 percent of the rural population in the borderlands live less than 2km away from all-season roads, whereas this percentage jumps to about 52 percent in the non-border areas.

[21] The results from a simple bivariate quintile regression yields a positive correlation between annual nighttime light growth and RAI that is statistically significant at the 0.01 level. In this analysis, annual nighttime light growth is calculated based on changes in the mean of nighttime light for the second-administrative areas, instead of its sum. We prefer to use mean of nighttime light as a proxy for growth in economic densities because using sum would implicitly favor larger ADM2 areas with greater margins of growth by virtue of simply having larger areas (see Bruederle and Hodler 2018). If the sum of nighttime light is used, we still find a statistically significant positive relationship ($p<0.01$). However, it is worth noting that changes in nighttime light, while used extensively in the literature as a proxy for growth, may not necessarily be an accurate or precise proxy for increases in economic activities or consumption per se (Asher et al. 2021). Thus our findings should be treated with caution.

**Figure 25:** Distance to density is strongly correlated with poverty in the HoA

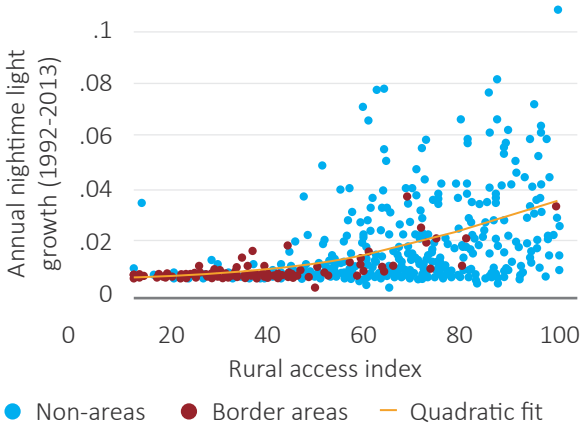
(Estimated relation between the market access index and poverty rates)




Source: World Bank staff calculations based on countries' latest poverty surveys for subnational poverty rates. The unit of analysis here is the mixture of the first- and second-administrative areas at which the latest household survey was representative.

**Figure 26:** Better rural access is correlated with faster growth in economic activities

(Estimated relation between the rural accessibility index and changes in economic activities at the subnational level)




Sources: Nighttime light growth based on Li et al.'s (2020) intercalibrated nighttime light data. See Box 3 for sources of data used to construct RAI. The unit of analysis here is the second-level administrative areas (ADM2) based on GADM shapefiles.

**The overall level of market access varies significantly within each country in the region.** Kenya performs relatively well both in terms of the MAI and RAI compared to the other HoA countries (with about 64 percent of rural people living within less than 2km away from all-season roads). However, market access appears to be lower in the northern counties than in the economically-dense belt between Nairobi and Mombasa. In Ethiopia, market access is high around Addis Ababa and in the central highlands, but poor in the peripheral parts of the country. Market access in Somalia, Djibouti and Eritrea is generally low, expect for the areas surrounding their national capitals. In several countries in the HoA, the border areas are explicitly considered as lagging regions in national programs and development plans.

## Box 2: Market Access Index and Rural Access Index

**The Market Access Index (MAI) captures the relative size of market capacity weighted by the degree of transportation costs.** More formally, the index is constructed based on the following formula:

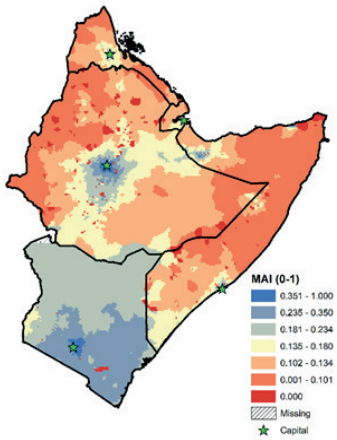
$$MAI_i = \frac{\sum_k^{\cdot} m_k / d_{ik}}{\max_i (MAI_i)}$$

where $m_k$ refers to the size of market capacity for major city $k$, and $d_{ik}$ refers to estimated transportation costs from pixel $i$ to large city $k$. The weighted sum of the size of market capacity is normalized as it is divided by the maximum value of the market access index across all pixels; thus, the final index ranges from 0 to 1. In other words, what this index measures is how easy it is to access major markets from pixel $i$ relative to other locations.

**The Rural Access Index (RAI) measures the share of rural population living within 2km away from all-season roads.** To construct this index, we rely on three sources of data: OpenStreetMap, WorldPop 2015 population estimates, and GRUMP Global Rural-Urban Mapping Project, Version 1 (GRUMPv1) (CIESIN, Columbia University, CUNY, CIDR, IFPRI, and CIAT 2017). We apply the following methodology as laid out in https://rai.azavea.com/:

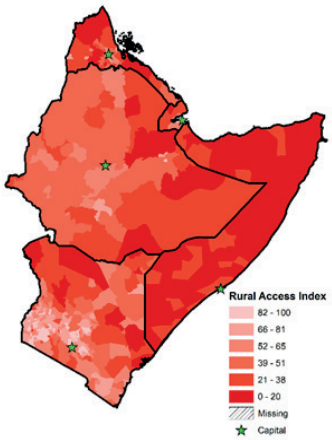
- Select commonly used tags from OpenStreetMap (Trunk, Primary, Secondary, Tertiary) that serve as an approximation for all-season roads
- Create a mask based on 2 km buffer on these roads
- Create a mask based on urban areas as defined by GRUMP urban extents polygons
- Summarize the population remaining on the 100 metre raster dataset from WorldPop 2015.

### Figure 27: Market access index




Sources: World Bank (2019).

### Figure 28: Rural access index




Sources: World Bank staff calculation based on OpenStreetMap and WorldPop (2015 population estimates).

**Low market access in the border areas is a function of both underdeveloped transport infrastructure and relatively few large cities that serve as local centers of demand.** The density of primary roads in the borderlands is about half of that in the rest of the countries.[22] In terms of urban centers, most big cities in the HoA are located in the leading areas. There are however clusters of cities across borders, notably between Ethiopia and Eritrea and Ethiopia and Somalia, that could greatly benefit from increased integration and trade across borders (Figure 29). Such medium-size cities can potentially serve as economies catalysts and secondary hubs in driving the regional production and trade (e.g., facilitating the flow of people, trade, information, and services between other smaller or metropolitan cities).[23] Looking across all the urban agglomerations across the region, it is worth highlighting that the annual rate of growth in economic densities tends to be higher in these medium size urban agglomerations than the larger ones. Based on our analysis, those secondary or medium-size cities (with an estimated population size of 100,000-500,000) saw a faster annual rate of growth in nighttime light luminosity (6 percent) compared to smaller towns/cities (3 percent) and larger urban agglomerations (4 percent).

Figure 29: Estimated GDP of urban agglomerations in the borderlands


Source: Ghosh et al. (2010).

**As countries develop, economic concentration tends to further increase, only to level off at fairly high levels of development.** Though there are no regional accounts in the HoA, proxy indicators suggest that economic activity has gradually concentrated in the HoA as well. Night-time lights, a commonly-used proxy for economic production, increased faster in places that were already brighter to begin with relative to less-lit (and presumably less-developed) places, though the relationship is non-linear (Figure 30). Similar, the growth in built-up area was higher in places that were already more built-up (and presumably more developed) to begin with although again, this relationship is not linear (Figure 31).

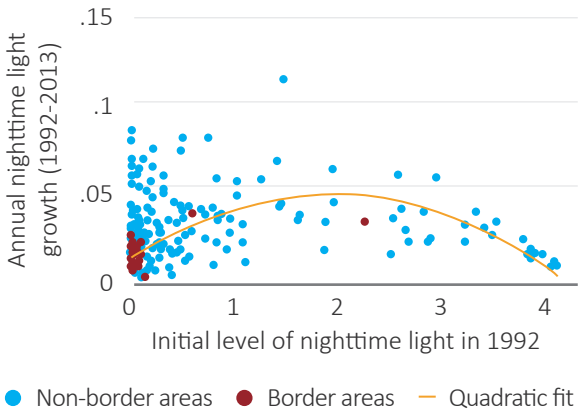
22 The World Bank calculation based on GRIP Global Roads Database (Meijer et al. 2018).

23 Roberts and Hohmann (2014).

**While these indicators are proxies, they point towards people and economic activities increasingly concentrating in places that were already more developed, in terms of economic production and urbanization, to begin with.** This finding accords with other studies (Henderson et al. 2018; Jedwab et al. 2017) showing that the locations of urban agglomerations remain persistent over time even after controlling for other factors that led to their establishments in the first place. These urban agglomerations continue to grow faster compared to more sparsely populated areas and have important implications for widening spatial gaps between those core cities and the rest of the countries. The border areas, marked in red in Figure 30 and Figure 31, experienced little growth in nightlights and built-up areas over the periods considered, which is in line with economic activity increasingly concentrating in the favored areas.

**Figure 30: Annual rate of growth in nighttime light increased more in areas that were initially better lit**

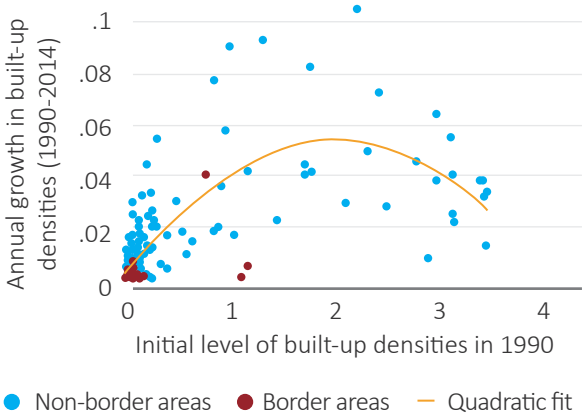
(Growth in nigh-time lights between 1992-2013 by intensity of night-time lights in 1992)




Source: World Bank staff calculations on DMSP nighttime light data. The unit of analysis is ADM2 areas based on GADM. The x-axis is the log of nighttime light plus a constant of 1 in 1992 to keep all observations.

**Figure 31: Annual rate of growth in built-up area was higher in areas that were initially more built-up**

(Growth in built-up densities between 1990 and 2014 by density of built-up area in 1990)



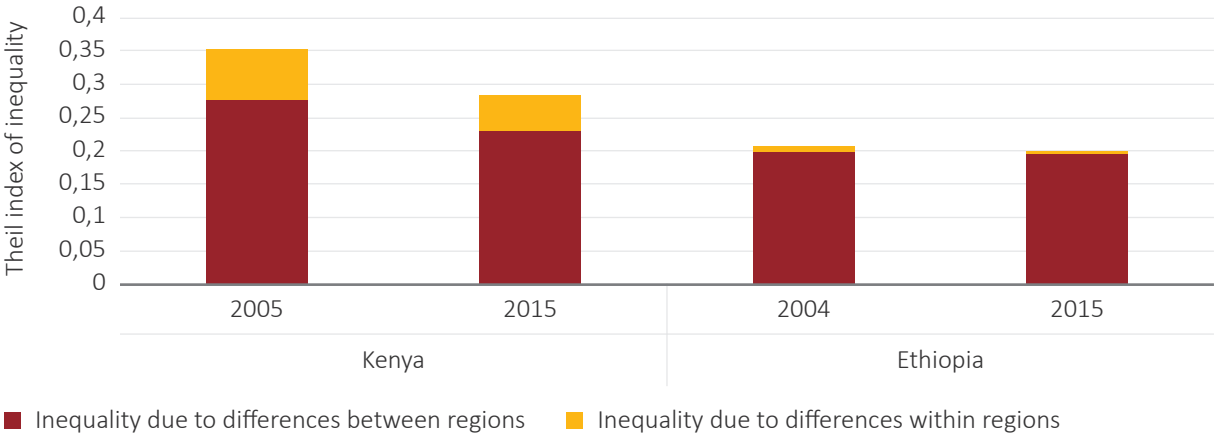

Source: World Bank staff calculations on GHS built-up dataset. The unit of analysis is based on ADM2 areas based on GADM. The x-axis is the log of building density plus a constant of 1 in 1990 to keep all observations.

**Increased concentration of economic activity needs however do not necessarily coincide with increased spatial disparities in living standards.** Spatial equity in living standards can improve even as economic production further concentrates. Several countries in the HoA appear to have done just that. While economic activity in Ethiopia, as proxied by night-time lights, has increasingly concentrated in the leading areas, the share of inequality in household consumption that is explained by welfare gaps between regions has decreased over time, from an already low five percent in 2004 to two percent in 2015 (Figure 32). Health and education indicators have started to converge as well but remain far lower in Ethiopia's lagging areas. In Kenya, 27 percent of the inequality in household consumption could be accounted for by gaps between provinces in 2005. By 2015, this had modestly decreased to 23 percent. These examples show that increased economic concentration and increased spatial equity in living standards can go hand-in-hand.[24]

[24] Data that allow comparisons over time are only available for Ethiopia and Kenya.

Figure 32: Gaps in household welfare between regions or provinces have become smaller

(Decomposition of the Theil index of inequality)




Source: World Bank staff calculations on countries' latest poverty surveys.

**Government policies can facilitate convergence in living standards by investing in social services in lagging areas.** As shown earlier, education and health outcomes in the border areas of the HoA severely lag, which is a key reason for the slow closing of the gap with the leading regions. Investing in human capital would make the labor force in the lagging areas more mobile, reducing economic distance with the leading areas through increased migration. It would also raise productivity and incomes of the future labor force in the lagging regions. In these lagging regions, investing in people is of crucial importance.

**Reducing economic distance through a skills-driven increase in labor mobility and better market access will lead to a closer integration of the economies of leading and lagging areas and, over time, a decrease in spatial disparities in welfare.** Whether this, by itself, will be sufficient to address the issues of lagging areas depends on the third important geographic dimension: Division. This is the topic of the next section.

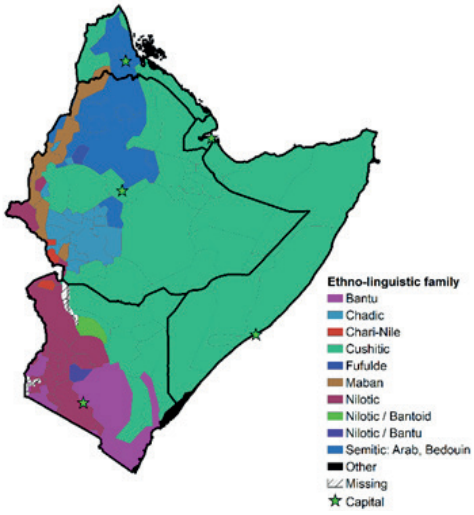
## 2.3 Division: Internal and External Impediments

**After density and distance, the third important geographic dimension is division.** Division applies at both national and international scales. At the national scale, nations can be internally divided across linguistic, ethnic, religious, and/or cultural lines. At the international level, divisions mainly arise from so-called thick borders: The many restrictions some countries impose on the flow of goods, capital, people, and ideas with other countries. Thick borders limit trade and the flow of factors of production. Interstate conflict creates the thickest borders. While borders in the rich world have become increasingly thin, hereby facilitating trade and the movement of people and capital, borders in many poor countries remain thick.

**Internal and external divisions are present in the HoA.** In Kenya and Ethiopia, the lagging regions are home to ethnically, religiously, and linguistically distinct populations (Figure 33 and Figure 34). That the spatial disparities coincide with different ethno-linguistic groups adds a

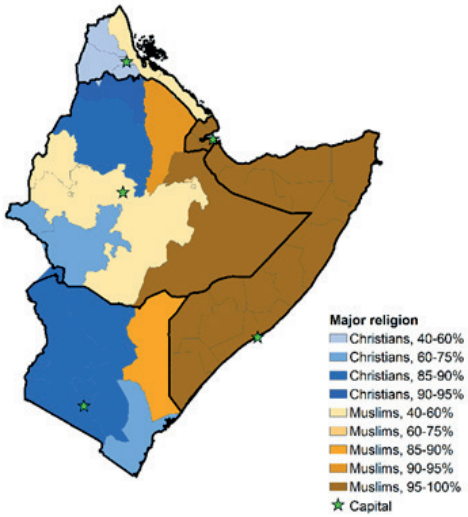
particular significance to the disparities, at times undermining social stability. Integrating lagging and leading areas in this context will require careful consideration on how potential tensions between distinct groups should be managed. On the other hand, the existence of shared identities across the border areas can facilitate cross-border trade and risk management.

Figure 33: Ethno-linguistic families in the HoA




Sources: AfricaMap (Ethnicity Felix 2001) based on the georeferenced version of the People's Atlas of Africa made available by permission from Marc Felix.

Figure 34: Major religions in the HoA




Sources: AfricaMap (World Religion Map) based on World Religion Database (Johnson et al. 2008).

**The unofficial cross-border trade in the borderlands of the HoA plays a vital role in the livelihoods of people in the borderlands.** A study indeed suggests that it supports about 17 million people along the different value chains, including crop farmers, brokers, crop traders, livestock-keepers, fodder suppliers, ranch owners, itinerant traders, large livestock traders and transporters.[25] It is estimated that this cross-border trade accounts for more than 95 per cent of total (officially recorded and unrecorded) intra-regional trade in the Horn.[26] During 1993-2000, for example, the total value of Ethiopia's unofficial cross-border trade in livestock in the region is estimated to have averaged $105 million, 100 times greater than the average annual official livestock export trade.[27]

**Externally, borders between the HoA countries remain thick, hampering the mobility of people and goods across borders.** There are limited efforts to legalizing such informal cross-border trade. On the contrary, government policies towards the informal cross-border trade have historically been to focus on curbing it instead of facilitating it.[28] In addition, poor connectivity across key markets in the borderlands has posed an impediment to market integration across the borderlands.

25 Tesfaye and Amaha, 2018.
26 Little, 2007 and 2009.
27 Halderman, 2005.
28 World Bank 2020.

## Policies for the lagging areas

### a. Integration through spatially blind institutions and policies

**The way to deal with lagging areas has traditionally been hotly debated.** Many policymakers considered, or still consider, concentration of economic activity as inconsistent with spatial equity in living standards, and have tried to push economic activity or, even worse, people, to areas with low economic and/or population density. According to the 2009 World Development Report on "Reshaping Economic Geography", these spatially targeted development initiatives have either mostly failed or been highly cost-ineffective in attaining their stated objectives. Rather, so-called "territorial development policies" should focus on integrating lagging with leading areas through a variety of spatially blind institutions.

**Given the sparsely populated nature of the HoA border areas, policies should first and foremost focus on reducing economic distance with the more developed areas.** The 2009 WDR proposed a policy framework based on the characteristics of the lagging areas (Box 4). In case of sparsely populated lagging areas, policies that are universal - spatially blind in their design and coverage – should do the heavy lifting in achieving economic integration. The primary objective of these policies should be to remove as much as possible the obstacles that prevent people in the border areas from migrating to places with better economic opportunities. These obstacles may relate, among others, to poor education services in the lagging regions (skills drive migration and poorly educated people are less likely to migrate) and/or land market distortions that tie people to a specific place. Providing essential services such as basic education and health care, water and sanitation should be universal policy priorities, as well as removing any policy-induced restrictions to mobility.

**Box 4: The 2009 WDR policy framework**

**The 2009 WDR on Reshaping Economic Geography identifies three types of countries, depending on the characteristics of their lagging areas:**

- Type 1: Countries with sparsely populated lagging areas
- Type 2: Unified countries with densely populated lagging areas
- Type 3: Divided countries with densely populated lagging areas

**In Type 1 countries, the main challenge is economic distance between the lagging and leading areas and policies should focus on reducing that distance.** Institutions and policies that are universal in their design and coverage *(spatially blind institutions)* can shoulder much of the task of successful economic integration. The primary objective of these policies should be to encourage people to migrate to places with more economic opportunities. Essential social services such as education, health care, water and sanitation, etc., should be provided to everyone in the country regardless of space and any impediments to mobility should be removed.

**In Type 2 countries, high economic distance is coupled with high population densities in lagging areas.** For these countries, spatially blind policies and institutions need to be combined with investments in spatially connective infrastructure to improve access of entrepreneurs in lagging areas to markets. Though migration will also aid spatial efficiency and equity in these countries, high population density in lagging areas means that this would

take a long time. Better infrastructural links between lagging and leading areas may, by improving market access, some activities to flourish in lagging areas.

**In Type 3 countries, high economic distance and high population density in lagging areas are combined with internal divisions along ethnolinguistic or religious lines.** In these countries, factor mobility is constrained and spatially focused incentives may need to complement institutions and infrastructure to encourage economic production in lagging areas. Commonly used incentives include fiscal incentives and subsidies, special economic zones, and industry location regulations. These incentives tend to be costly and should be used as a last resort and always to complement integrative institutions and infrastructure, not instead of it. Policy makers should keep in mind that the primary goal of development is to improve the welfare of people, not of places.

Source: WDR, 2009.

**While the border areas of the HoA countries classify as "Type 1" in Box, several countries are to some extent internally divided along ethnolinguistic or religious lines.** In these circumstances, much of the policy response should still be spatially neutral, but special efforts may be needed to ensure equal access to public services for people living in the lagging areas. As shown earlier in this paper, people living in the border areas have far worse human capital outcomes. Spatially targeted programs to improve education in the HoA border areas may be needed to facilitate convergence with the more developed areas. In case of persistent labor market gaps, equal opportunity legislation to ensure that workers from culturally distinct lagging areas do not face labor market discrimination in other parts of the country may also be required.

### b. Investments in secondary cities

**In the lagging areas of the HoA, investing in human capital and removing other obstacles to migration should be the mainstay of development policy.** Most of this migration will, at least in the shorter-run, likely not be directed to the national capital or other cities in leading areas, but rather to smaller secondary cities in the lagging areas. In Ethiopia, the urban population is expected to triple by 2034, which much of this increase happening in small towns (less than 50,000 people) and secondary cities (between 100,000 and 500,000).[29] In Kenya, while the urban population is growing relatively fast, Nairobi's share of the urban population is not expected to increase by 2030. In contrast, Kenya is likely to see a larger share of the urban population living in medium cities (between 100,000 and 1 million).[30] These projected trends bode well for poverty reduction: Urbanization through migration to secondary cities has been shown to be more poverty-reducing compared to metropolization (where migration is mainly directed to the capital city).

**The projected fast growth of secondary cities calls for substantial investments in public infrastructure and services.** Access to public infrastructure and services is generally worse in smaller cities than in the capital, reflecting large cities' better access to

[29] Schmidt et al, 2018.
[30] World Bank, 2016.

finance. This is the case in the HoA as well. Improved human capital in the lagging areas of the HoA – the absolute priority- will likely lead to accelerated migration from rural areas to towns and cities in the border areas. Preparing these secondary cities for a rapidly growing population through coordinated investments in public infrastructure and services will be required to maximize the welfare effects of this spatial shift.

**While the biggest urban centers in the HoA are located in the leading areas, there are a number of secondary urban centers in the border areas that play an important role in trade and local economic activity.** Using a spatial-demographic approach as outlined in Box 5, some of the major economic and population centers in the border areas include Hargeisa, Kismayo, Galkayo and Borama in Somalia, Asmara in Eritrea, Jijiga in Ethiopia, and El Wak, Mandera and Wajir in Kenya (Figure 35). And these cities have seen a rapid increase in the level of economic activities over time (again proxied by changes in nighttime light) (Figure 36).

## Box 5: Identifying urban agglomerations using geospatial data

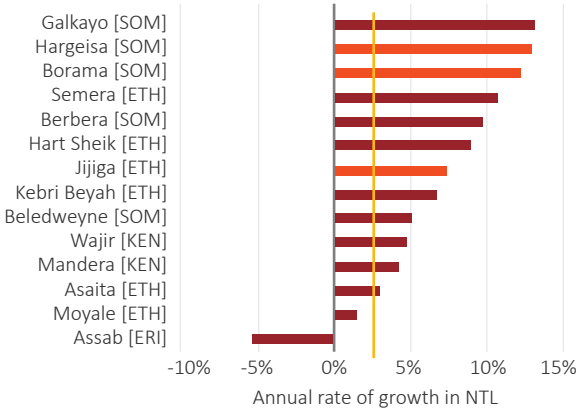
**Since there is no standardized definition of urban agglomerations, we rely on a spatial-demographic approach to classifying them.** This is an approach used widely in the urban studies literature where some minimum threshold of population density is applied to distinguish between urban and rural settlements (Bundervoet et al., 2017). For this report, we apply a threshold of a minimum of 5,000 persons living at a minimum density of 1,000 persons per kilometer (km) to make this distinction. We used two sources of gridded population data: WorldPop (for Djibouti, Ethiopia, Eritrea, and Kenya) and Global Human Settlement (GHS) database (for Somalia). GHS is used for Somalia because WorldPop detects only a few urban settlements in the country. This is perhaps due to the fact that population estimates are smoothed too thinly across space that only few grids pass the threshold of 1,000 persons per km to qualify for urban settlements in the context of Somalia. GHS allows us to detect many more urban settlements in Somalia, which appear to be more sensible.

### Figure 35: Estimated population in urban agglomerations of the borderlands


Sources: WorldPop.

Notes: Population estimates are based on WorldPop estimates of 2020 population at a resolution of 100 meters.

### Figure 36: Annual rate of increase in nighttime light in select cities in the borderlands




Sources: WB staff calculations based on Li et al. (2020).

Notes: The vertical line shows the average rate of growth in nighttime light across all urban agglomerations.

### c. Leveraging deeper integration across the border areas

**Reducing the distance to economic density is the priority for the border areas in the HoA.** Economic density does need to be restricted to the leading areas of the same country, however. People in the northeastern Afar region of Ethiopia, for instance, are much closer to the capital of Djibouti than they are to their national capital, Addis Ababa. Similarly, people in Mandera county of Kenya are closer to Mogadishu than they are to Nairobi. Closer integration and *thinning* of the borders between the HoA countries has significant potential to create more economic opportunities and improve welfare, not only for people living in the border areas but the populations at large. For urban centers located in the border areas, closer integration and removing barriers to cross-border trade are likely to spur economic activity and growth, creating more opportunities for both the urban inhabitants and the surrounding rural populations.

# References


Asher, Sam; Lunt, Tobias; Matsuura, Ryu; Novosad, Paul. 2021. Development Research at High Geographic Resolution : An Analysis of Night Lights, Firms, and Poverty in India Using the SHRUG Open Data Platform. Policy Research Working Paper;No. 9540. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/35132 License: CC BY 3.0 IGO.

Barro, R. J. and Sala-i Martin, X. (1991). Convergence across States and Regions. Brookings Papers on Economic Activity 22 (1): 107-182.

Bloom, D.E., Canning, D., and Sevilla, J. 2003. *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*. Santa Monica, CA; Arlington, VA; Pittsburgh, PA: RAND Corporation. Accessed May 27, 2021. http://www.jstor.org/stable/10.7249/mr1274wfhf-dlpf-rf-unpf.

Bruederle A, Hodler R (2018) Nighttime lights as a proxy for human development at the local level. PLoS ONE 13(9): e0202231. https://doi.org/10.1371/journal.pone.0202231.

Bundervoet, T., Parby, J. I., Nakamura, S., and Choi, N. 2017.Reshaping urbanization in Rwanda : economic and spatial trends and proposals - note 1 : urbanization and the evolution of Rwanda's urban landscape (English). Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/875101513836698339/Reshaping-urbanization-in-Rwanda-economic-and-spatial-trends-and-proposals-note-1-urbanization-and-the-evolution-of-Rwanda-s-urban-landscape.

Center for International Earth Science Information Network (CIESIN), Columbia University, CUNY Institute for Demographic Research (CIDR), International Food Policy Research Institute (IFPRI), The World Bank, and Centro Internacional de Agricultura Tropical (CIAT). 2017. Global Rural-Urban Mapping Project, Version 1 (GRUMPv1): Urban Extent Polygons, Revision 01. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). http://dx.doi.org/10.7927/H4Z31WKF. Accessed May 26, 2020.

Ghosh, T., Powell, R. L., Elvidge, C. D., Baugh, K. E., Sutton, P. C., and Anderson, S. 2010. The Open Geography Journal 3: 147-160.

Halderman, M. 2005. *The Political Economy of Pro-Poor Livestock Policy-making in Ethiopia.* PPLPI Working Paper, 19. Rome: Food and Agriculture Organization of the United Nations, Pro-Poor Livestock Policy Initiative.

Henderson, J. V., Squires, T., Storeygard, A., and Weil, D. 2018. The Global Distribution of Economic Activity: Nature, History, and the Role of Trade, The Quarterly Journal of Economics, Volume 133, Issue 1, February 2018, Pages 357–406, https://doi.org/10.1093/qje/qjx030.

Jarvis, A., Reuter, H.I., Nelson, A., Guevara, E. 2008, Hole-filled SRTM for the globe Version 4, available from the CGIAR-CSI SRTM 90m Database (http://srtm.csi.cgiar.org).

Jedwab, R., Kerby, E., and Moradi, A. 2017. "History, Path Dependence and Development: Evidence from Colonial Railroads, Settlers and Cities in Kenya." *The Economic Journal* 127 (August), 1467-1494.

Klein Goldewijk, K., Beusen, A., Doelman, J., and Stehfest, E.: Anthropogenic land use estimates for the Holocene – HYDE 3.2, Earth Syst. Sci. Data, 9, 927–953, https://doi.org/10.5194/essd-9-927-2017, 2017.

Little, P. (2005). Unofficial trade when states are weak: The case of cross-border commerce in the Horn of Africa. United Nations University

(UNU).

Little, P. 2009. *Hidden Value on the Hoof: Cross-Border Livestock Trade in Eastern Africa*. Policy Brief 2. Common Market for Eastern and Southern Africa (COMESA) Comprehensive African Agriculture Development Programme.

Mason, A., and Lee, R. D. 2006. "Reform and Support Systems for the Elderly in Developing Countries: Capturing the Second Demographic Dividend." *GENUS* 62 (2): 11–35.

Meijer, J.R., Huijbegts, M.A.J., Schotten, C.G.J. and Schipper, A.M. (2018): Global patterns of current and future road infrastructure. Environmental Research Letters, 13-064006. Data is available at www.globio.info.

Roberts, Brian Herbert; Hohmann,Rene Peter.2014. The systems of secondary cities : the neglected drivers of urbanising economies (English). CIVIS notes series;no. 7. Sharing knowledge and learning from cities Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/400881468181444474/The-systems-of-secondary-cities-the-neglected-drivers-of-urbanising-economies.

Schmidt, E., Dorosh, P., Jemal, M. and Smart, J. 2018. Ethiopia's Spatial and Structural Transformation. ESSP Working Paper 119. International Food Policy Research Institute (IFPRI).

Tesfaye, A., and Amaha, Negassi. 2018. "A Review on Cross-Border Livestock Trade Across Dry Land Borders of Ethiopia: The Trends and Implications." Journal of Scientific and Innovative Research 7(2): 36-42.

World Bank. 2009. World Development Report 2009: Reshaping Economic Geography. World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/5991 License: CC BY 3.0 IGO.

World Bank. 2016. Kenya Urbanization Review. Washington DC: The World Bank

World Bank. 2019. Transport note for the high-level conference on promoting economic integration in the Horn of Africa, February 2019. Unpublished.

World Bank. 2020. From Isolation to Integration : The Borderlands of the Horn of Africa. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/33513 License: CC BY 3.0 IGO.

# Appendix A

## A.1 Main correlates of economic densities and poverty

To assess key correlates with economic densities, we perform a simple OLS regression. The unit of analysis here is the mixture of first-order and second-order administrative areas where the latest household survey is representative. Our dependent variable is the level of economic density measured by estimated GDP per sq. kilometers averaged across those subnational areas.[31] Our key covariates include: population density (or size of population per sq. kilometers), poverty (or share of people living under the international $1.9 poverty line), borderlands (a dummy variable coded 1 if a given area is part of the borderlands as defined in this note), market accessibility,[32] elevation[33] (in km) and share of cropland and grazing/pastoral land.[34]

A simple diagnostic of bivariate relationships between economic densities and other socio-economic indicators after controlling for country-fixed effects suggest that variation in economic densities are strongly correlated with population densities, poverty, market accessibility, and agricultural production. The Shapley decomposition based on Model 7 reveals that population densities account for about half of the overall variation in economic densities (0.454), followed by market access (0.140), share of cropland (0.139) and poverty (0.052).

Table A1: **Regression analysis of economic geography in the Horn of Africa**

| Models | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Population density *(ln)* | 1.163*** (0.0362) | | | | | | 1.044*** [0.454] (0.0645) |
| Poverty | | -4.107*** (0.880) | | | | | -0.985*** [0.052] (0.273) |
| Borderland | | | -2.143*** (0.354) | | | | -0.0253 [0.049] (0.156) |
| Market access | | | | 15.45*** (2.968) | | | 3.084*** [0.140] (0.831) |
| Elevation | | | | | 1.720*** (0.265) | | 0.0278 [0.062] (0.129) |
| % of cropland | | | | | | 6.080*** (0.629) | 0.0474 [0.139] (0.382) |
| % of pastoral grazing/land | | | | | | 1.187 (0.936) | -0.184 [0.029] (0.540) |
| Observations | 155 | 155 | 155 | 155 | 155 | 155 | 155 |
| R-squared | 0.917 | 0.282 | 0.436 | 0.503 | 0.189 | 0.367 | 0.929 |

Notes: Robust standard errors are reported in parentheses and Sharpley values reported in brackets for Model 7 report the marginal contribution of each variable to the overall R2. All regressions control for country-fixed effects. *** p < .01 ** p < .05 * p < .1.

31 Calculated based on Ghosh et al. (2010).

32 See Box 3 for the definition of MAI.

33 Calculated based on SRTM data Version 4 (Jarvis et al. 2008).

34 Calculated based on the data of anthropogenic land use estimates for the Holocene – HYDE 3.2 (Goldewijk et al. 2017).

A similar diagnostic is also undertaken to understand key correlates with subnational poverty rates. For this analysis, we include the same set of covariates as used in Table A 1 but now replace the dependent variable with subnational poverty rates while using subnational GDP as one of the key predictors. The results are reported in Table A 2. The results suggest that poverty is more pronounced in areas that are characterized by low economic densities and poor accessibility. The Shapley values indicate that economic densities account for about 8 percent of spatial variation in poverty, followed by population density (0.053).

Table A2: Regression analysis of subnational poverty in the Horn of Africa

| Models | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Population density *(ln)* | -0.036*** (0.010) | | | | | | 0.064** [0.053] (0.032) |
| Economic density *(ln)* | | -0.038*** (0.007) | | | | | -0.093*** [0.076] (0.022) |
| Borderland | | | 0.005 (0.043) | | | | -0.067 [0.007] (0.051) |
| Market access | | | | -0.784*** (0.226) | | | -0.150 [0.015] (0.184) |
| Elevation | | | | | -0.040* (0.023) | | 0.009 [0.050] (0.031) |
| % of cropland | | | | | | -0.150** (0.074) | 0.031 [0.021] (0.115) |
| % of pastoral grazing/land | | | | | | 0.031 (0.136) | -0.012 [0.004] (0.135) |
| Observations | 155 | 155 | 155 | 155 | 155 | 155 | 155 |
| R-squared | 0.314 | 0.360 | 0.240 | 0.314 | 0.252 | 0.258 | 0.412 |

Notes: Robust standard errors are reported in parentheses and Sharpley values reported in brackets for Model 7 report the marginal contribution of each variable to the overall R2. All regressions control for country-fixed effects. *** p < .01 ** p < .05 * p < .1.

# Appendix B

## B.1 Convergence or divergence in local economic growth in the Horn of Africa

To understand the spatial dynamics of local economic growth across the Horn of Africa, we apply Barro and Sala-i-Martin's (1991) framework on β-convergence. More formally, the following regression model is estimated:

$$G_{jct1\text{-}t0} = \alpha + \beta_1 \ln(Light_{jct0}) + \beta_2 Border\ Areas_{jct0} + C_c + \varepsilon_{jct} \quad (1)$$

where $G_{jct1\text{-}t0}$ corresponds to annual growth rate in nighttime light intensity between year t0 and year t1 in ADM2 area $j$ in country c. More formally:

$$G_{jct1\text{-}t0} = \ln(Light_{jct1} / Light_{jct0}) / (t1\text{-}t0) \quad (2)$$

where $Light_{jct0}$ denote the initial level of nighttime light at t0 and $\beta_1$ essentially captures the rate of convergence after accounting for other confounding factors $X_{jct0}$. We add a constant of 1 to the values of nighttime lights so that when these variables are log-transformed, those areas with no luminosity would still stay in the sample. There is conditional convergence (divergence) if $\beta_1$ is statistically significant and negative (positive). Also included in this regression is a dummy variable ($Border\ Areas_{jct0}$) coded 1 if a given urban agglomeration lies within the border areas, 0 otherwise. In essence, if $\beta_2$turns out to be statistically significant and positive (or negative), it shows that urban agglomerations in the border areas experienced faster (or slower) growth in nighttime light vis-à-vis other parts of the countries.

According to our results, we find that the estimated coefficient for $\beta_1$ is positive and statistically significant. More substantively, changes in the level of economic densities proxied by mean of nighttime light grew more quickly in more-developed areas by an annual divergence rate of 0.5 percent between 1992 and 2013 (Column 1 in Table A-1). On the other hand, the effect of border areas turns out to be negative and statistically significant. More substantively, areas in the borderlands grew slower the rest of the countries by an annual rate of 0.6 percent even after controlling for the initial level of development. These findings attest to the widening spatial gap both between lagging and economically-dense regions and also between the border areas vis-à-vis other areas. These results stand robust to simply using change in the value of mean nighttime light (instead of annual rate of change) (Column 2) or using annual growth rate in building density based on the Global Human Settlement database (Column 3).

## Table B1: Results from the β-convergence model

| Dependent variable | Annual growth rate in nighttime light (1992-2013) | Change in nighttime light (1992-2013) | Annual growth rate in built-up density (1990-2014) |
|---|---|---|---|
| Model | (1) | (2) | (3) |
| Ln(Light) at t=0 | 0.005*** | 3.786*** | |
| | (0.001) | (0.513) | |
| Ln(Built-up density) | | | 0.015*** |
| at t=0 | | | (0.002) |
| Border | -0.006*** | -0.169** | -0.001*** |
| | (0.001) | (0.081) | (0.001) |
| Observations | 515 | 515 | 515 |
| R-squared | 0.164 | 0.534 | 0.487 |

Notes: Robust standard errors are reported in parentheses. All regressions control for country-fixed effects. *** p < .01 ** p < .05 * p < .1.

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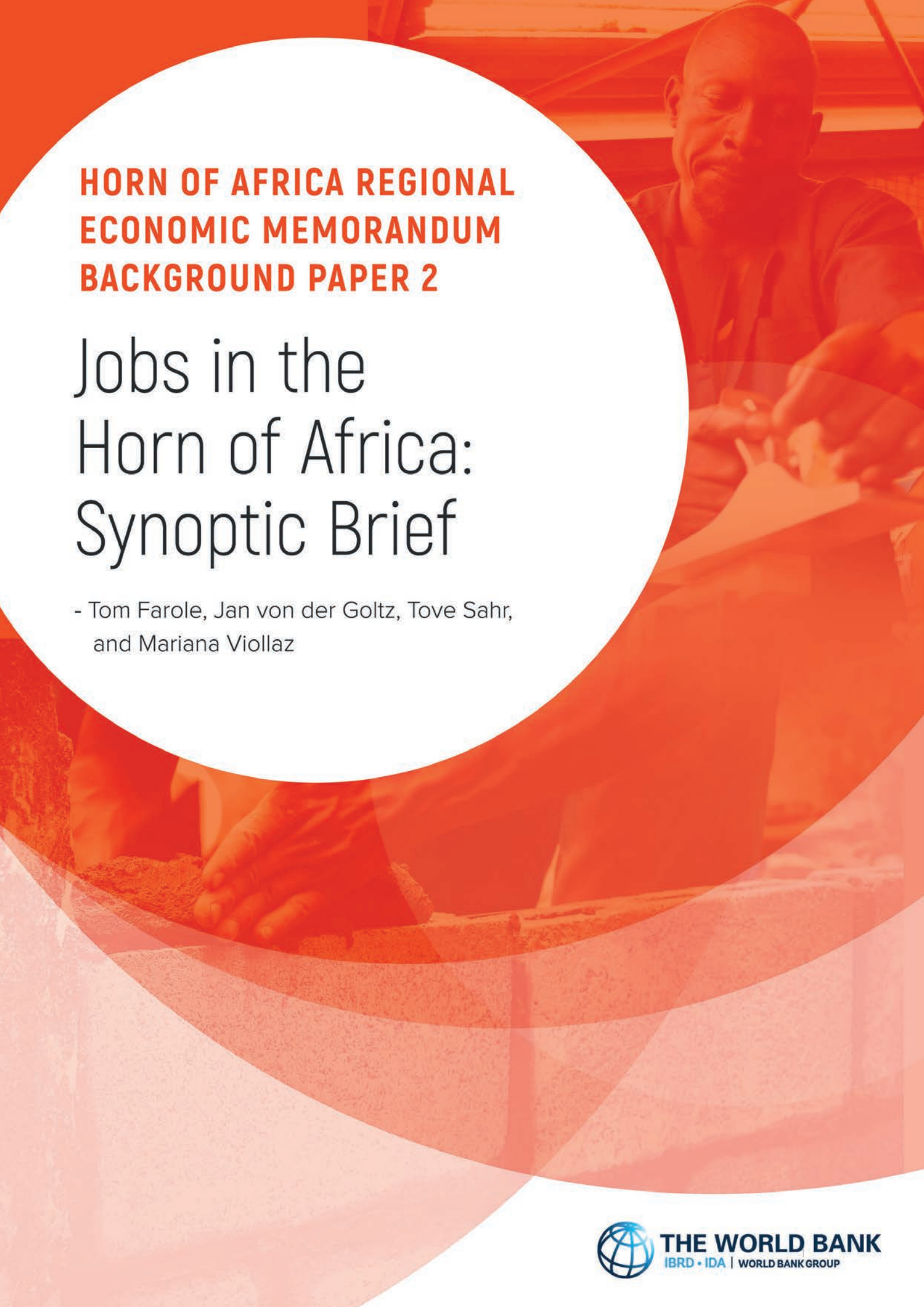

HORN OF AFRICA REGIONAL ECONOMIC MEMORANDUM BACKGROUND PAPER 2

# Jobs in the Horn of Africa: Synoptic Brief

- Tom Farole, Jan von der Goltz, Tove Sahr, and Mariana Viollaz

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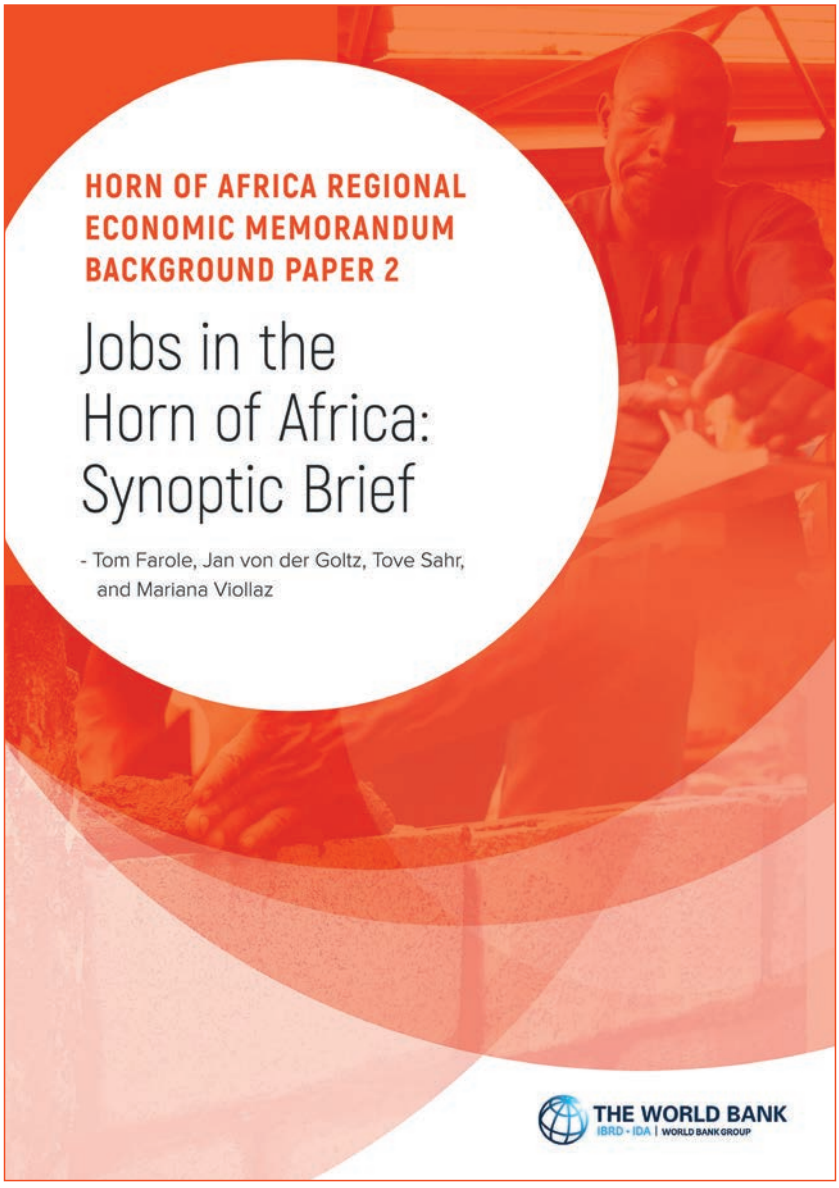


# CONTENTS

SECTION 1

# Introduction

**This note provides an overview of labor markets and job outcomes in the Horn of Africa.** This background note was prepared for the Horn of Africa Regional Economic Memorandum.[1] It provides an overview of issues related to jobs in the five countries of the region, Djibouti, Eritrea, Ethiopia, Kenya, and Somalia. It first discusses labor market characteristics, notably labor force participation, unemployment and under-employment, as well as demographics of the labor force. Secondly, it compares employment patterns, focusing on the type and sector of employment. Finally, it looks at the limited information available on jobs outcomes – notably, wage levels. It seeks to provides a relatively succinct synoptic summary of the common trends among the five countries as well as some distinct features. With the exception of Eritrea, the World Bank has recently analyzed jobs outcomes in all countries of the region (World Bank 2018b, 2019a, 2020a, *forthcoming*). This note references these analyses, and the reader can consult them for additional detail.

**The analysis draws upon the most recent representative employment data available for each country, but data are dated in some cases.** Apart from Eritrea, the analysis presented in this note is based upon the most recent primary data on employment available at time of writing. In the case of Ethiopia, this is a 2013 Labor Force Survey; in Djibouti, Kenya, and Somalia, data comes from household surveys (2017, 2015, 2017). For Eritrea, no suitable primary data were accessible. The report therefore presents statistics published in the summary report on the most recent (2015/16) Labor Force Survey (Government of the State of Eritrea, 2018). Throughout this note, where no separate source is indicated, statistics shown in Figures and Tables or cited in the text are based on the authors' calculations from the databases shown in Table 1. It is worth noting that data for Ethiopia as well as Eritrea and Kenya were already quite dated at time of writing, and can neither account, for instance, for continued manufacturing growth in Ethiopia and Kenya, nor for Ethiopia's recent macroeconomic challenges.

**Statistics shown in this note are largely consistent with prior analyses of the underlying data, but sometimes diverge due to the need to apply consistent methods to all surveys.** There are well-defined standard indicators to describe labor markets and job outcomes. However, the ways indicators are computed in an individual report depends on the idiosyncrasies of available labor market data (for instance, categories used to record educational attainment or describe levels of formality), and sometimes, also on adjustments countries make to indicator definitions (for instance, in the way unpaid work in household activities is treated, or in cutoff ages for respondents considered 'youth'). To facilitate comparisons, this report applies consistent definitions across the surveys analyzed. Because of this approach, statistics shown here sometimes diverge from results published in assessments of a single labor market in the region, though they are always consistent in approximate magnitude.

[1] The note was prepared by Tom Farole, Jan von der Goltz, Tove Sahl, and Mariana Viollaz (Jobs Group). Ian Walker (Manager, Jobs Group) supervised the team.

Table 1: Data sources used

| Country | Data source |
|---|---|
| Ethiopia | 2013 Labor Force Survey |
| Djibouti | 2017 household data (GMD) |
| Kenya | 2015 KIHBS |
| Somalia | 2017 High Frequency Survey – Wave 2 |
| Eritrea | Reported results from 2015/16 Labor Force Survey (ELFS) – no access to raw data |

Source: World Bank.

**The economies of the region are diverse, and labor markets reflect their structure.** The economies of the region have been characterized elsewhere in the REM (see especially HoA REM Background Paper 1 on the Economic Geography of the Horn). As background for the discussion of jobs outcomes, it is worth recalling some of the basic features of the five countries. Of the five economies studied here, three are low-income countries: Eritrea, Ethiopia, and Somalia.[2] Both Eritrea and Ethiopia remain quite heavily reliant on agriculture. Starting from a very low base, Ethiopia has in recent years had significant success in raising productivity in the agriculture sector, and in fostering some industrial development. Eritrea remains characterized by a highly regulated economy and large state presence in production. Decades of conflict have given Somalia's economy some features that are unusual for an economy with a very low income level, including relatively high urbanization and reliance on the services sector. Djibouti and Kenya are both lower middle-income countries; Kenya has over the past 15 years seen robust growth across sectors, including in manufacturing. Djibouti also has seen a remarkable growth episode, and its income level is approaching the upper middle-income threshold. However, growth has been far less balanced, driven strongly by investments in the port and transport infrastructure, with few other strong developments.

[2] This report occasionally makes statements as to whether jobs patters observed in the data are commonly observed in other countries of similar income levels; in these instances, it refers to the five countries together as "lower-income countries".

SECTION 2

# An overview of the labor markets in the Horn of Africa

## Population dynamics

**With high population growth, about half of the population is of working age, and age dependency ratios remain high despite recent declines.** In all five countries, a little more than half of all residents are of working age, as is typical of societies with high population growth (Figure 1). Among the five countries, Djibouti and Somalia stand somewhat apart in that they have, respectively, by far the largest and smallest share of working age population. This results from fertility rates of six births per woman on average in Somalia compared to just under three in Djibouti (WDI). With the exception of Somalia, dependency ratios have fallen over the past 20 years. Yet, age dependency ratios remain elevated, with about 80 persons who are not of working age for every 100 working-age residents (Figure 2). High age dependency ratios imply that welfare levels will be lower for an equal number and quality of jobs.

**Very large cohorts of young workers are entering the labor market each year.** With overall high population growth, the labor force in the countries of the region is also experiencing a period of rapid growth. Projected annual rates of increase over the coming five years are at three percent or higher in all countries except Djibouti (Table 2). As many young workers join the labor force, there are important opportunities for development and poverty reduction. However, economies also face the challenge of creating sufficient and good-enough jobs for a large number of young workers who are eager to contribute and hungry for a better life. We illustrate the scope of the challenge further below.

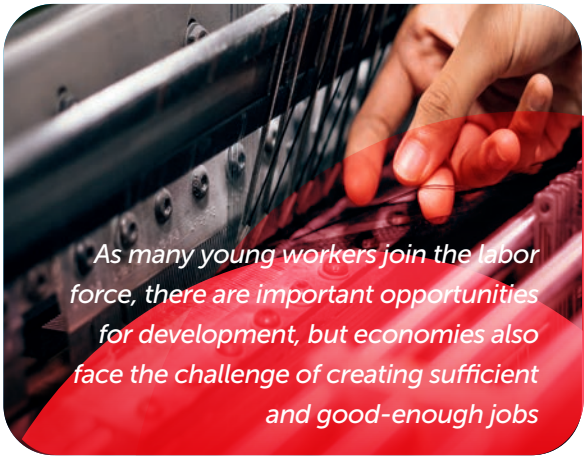
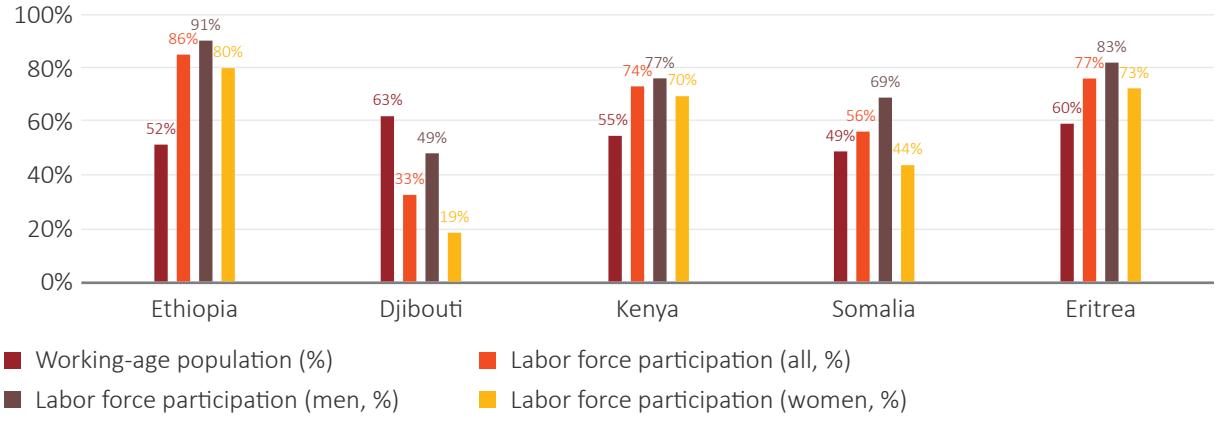



Table 2: Expected labor force growth

| | Annual growth rate 2020-2025 | Absolute annual increase 2020-2025 |
|---|---|---|
| Djibouti | 1.9% | 5,000 |
| Ethiopia | 3.1% | 1,832,000 |
| Kenya | 3.2% | 793,000 |
| Somalia | 3.4% | 161,000 |
| Eritrea | 3.0% | 49,000 |

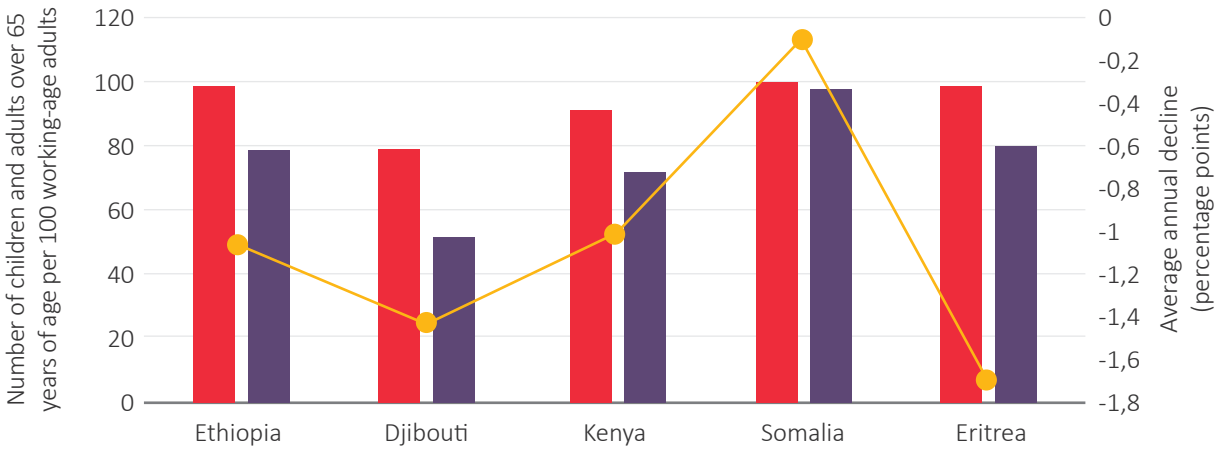
Source: World Bank staff calculations.

Figure 1: Share of working-age population and labor force participation rate




Source: World Bank staff calculations.

Figure 2: Change in age dependency ratio since 2000




Source: World Development Indicators. Note: reference years for Eritrea are 2000 and 2011.

## Labor force participation

**Labor force participation is high, with the exception of Djibouti and Somalia.** Labor force participation in Eritrea, Ethiopia, and Kenya is quite high (67-86%; Figure 1), in line with what is common in economies at a similar income level. A far lower share of youth and adults are active in Somalia (56%), and remarkably few in Djibouti (33%). (This report defines 'youth' as the age group between 15 and 24 years, compared to older adult workers of 25 to 65 years.) In both countries, there is also a striking gap in the rate at which men and women participate in the labor market.

**Barriers to women working account for low participation rates in Somalia.** Lower labor force participation in Somalia is largely due to the barriers women face in working. In Eritrea, Ethiopia, and Kenya, the gap between men and women in labor market participation varies from seven to ten percentage points. This is a meaningful difference, but still implies that about three in four women of working age are active. By way of contrast, in Somalia the gap is 25 percentage points. Conversely, participation among men in Somalia is reasonably similar to other countries – eight percentage points below the level in Kenya. Yet, participation among women is far less

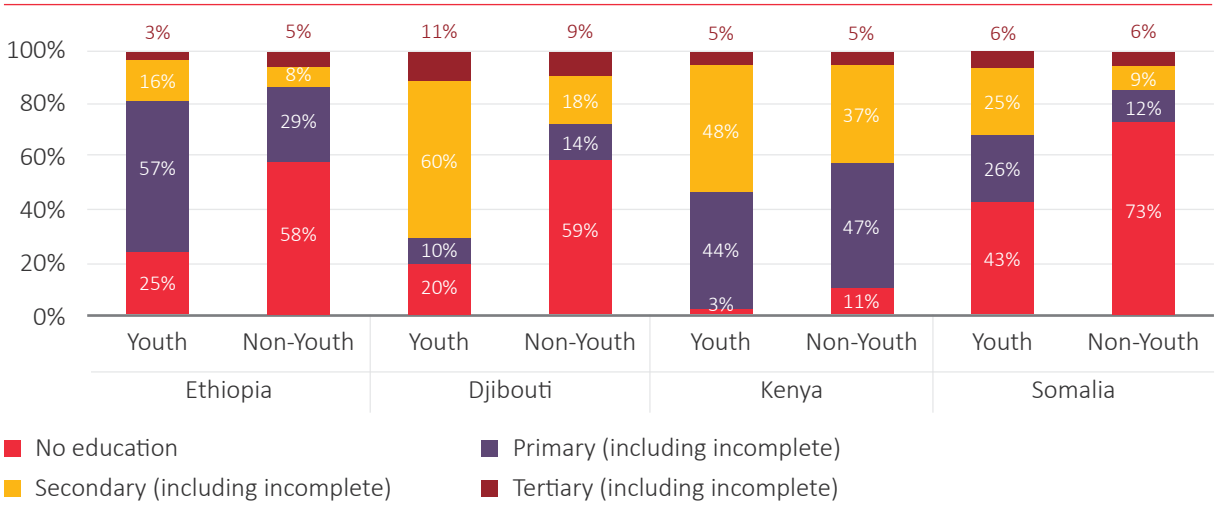
aligned, at 26 percentage points below the level in Kenya. Cultural barriers to women being active are the most compelling explanation for this gap. Thus, "entrenched social norms often prescribe heavier domestic responsibilities to women and largely relegate their roles to the private sphere [...] Women's economic opportunities are also inhibited more directly by social norms, such as needing to have their husband's signature to do business, though this is slowly changing with men's absences from home..." (WB 2020a, p.10).

**In Djibouti, cultural barriers to women combine with a job-poor growth pattern to account for exceptionally low participation rates.** In Djibouti, the gap between women and men is larger still than in Somalia, at 30 percentage points. Women are less than half as likely to be active than men. At the same time, however, participation among men is also remarkably low (49%). In addition to cultural norms that make it difficult for women to participate, low activity rates have been ascribed to a capital-intensive development pattern that has yielded high growth, but without creating many jobs. Thus, "the job creation potential of ports, transport and logistics sectors is becoming more limited as port services are increasingly automated and rely less on unskilled labor. Outside of ports and logistics, the private sector is a small employer and dominated by services." In addition to a limited number of good private sector jobs, public jobs provided incomes that large households with inactive workers depend upon. (World Bank, 2018b).

## Education levels among the workforce

**Educational achievement of the workforce remains limited, but young workers have much better access to education than older cohorts.** In all countries of the region, education levels remain low: the median worker has no more than primary education. However, two distinctions must be made. Firstly, education levels vary significantly among the five countries. A far higher share of workers has more than primary education in Djibouti (41%) and Kenya (46%) than among workers in Eritrea[3] (31%), Ethiopia (15%), and Somali (20%). Secondly, there has been very important progress in raising education levels. Thus, with the exception of Somalia (where gains are sizeable but lower), young workers in each country are less than half as likely as their elders to have no education (Figure 3). In all five countries, more than two in five young workers have at least completed primary school.

Figure 3: Educational attainment among the working age population by age group




Source: World Bank staff calculations.

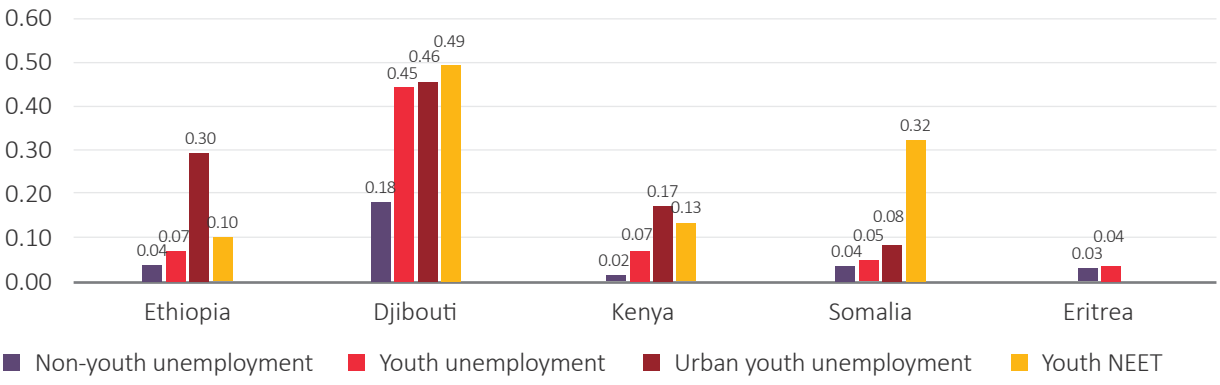
[3] A breakdown of educational achievement in Eritrea is not available using the same categories shown in Figure 3.

**Gains in education represent an opportunity for development, but limited access to good jobs and skills mismatches may frustrate well-trained young workers.** At a time of rapid labor force growth, it is good news that workers entering the job market bring with them greater skill levels than is common among older workers. However, a challenge lies in satisfying the aspirations young workers rightly have for a job that makes use of their skills. Currently, mismatches between workers' skills and what is required for their jobs arise by no means only due to a lack of training. Thus, while in Kenya, 40% of workers reported that they felt underqualified for their job, 30% believed they were overqualified (World Bank 2019b). Similarly, in Somalia, "over 50 percent of firms in Mogadishu indicate their employees have [various] skills ... that are above what is required for their business needs" (World Bank 2020a, p.15).

## Unemployment

**With the exception of Djibouti and urban Ethiopia, unemployment is low, as is typical of lower-income economies.** Except for Djibouti, unemployment narrowly defined is low in the region. Among older workers, between two and four percent are unemployed, as is typical of lower-income economies in which work is quite immediately tied to household survival. Unemployment is slightly higher among young workers, at between four and seven percent in the four countries excluding Djibouti (Figure 4). Unemployment tends to be concentrated among urban, young, and better-trained workers – groups that are more likely to be able to afford a period of idleness while queueing for jobs. This pattern is particularly pronounced in Ethiopia, where more than one in five urban workers are unemployed (22%), compared to five to six percent in Eritrea, Kenya, and Somalia. Youth unemployment in urban Ethiopia is very significant, at 30%, and it is also elevated in urban Kenya, at 17%. Speeding the school to work transition is thus a legitimate policy concern in the two countries. However, it is also worth recalling that young urban workers account for only two percent and seven percent of the labor force in Ethiopia and Kenya, respectively.

Figure 4: Unemployment and share of youth not in employment, education, or training (NEET)




Source: World Bank staff calculations.

**Discouragement from participation mostly affects better-off groups, while underemployment is a widespread concern.** Alternative measures of labor force use provide a somewhat more nuanced picture of the degree to which workers are able to be as active as they would prefer. Unemployment combined with discouragement (LU3) affects somewhat more workers than outright unemployment; yet, it is also concentrated among better-off groups that are in principle able to compete for good jobs and afford periods of idleness. Unemployment combined

with underemployment (LU2) – a measure of job quality rather than solely of access to jobs – is of concern for significantly more workers, including many in agriculture and other self-employed activities. For instance, in Ethiopia and Somalia more than one in five workers of all ages report being underemployed (22 and 23 percent, respectively), compared to one in twenty-five who are outright unemployed (four percent).

**The chief jobs policy challenge is to make job activities more productive.** As is common in lower-income countries, it is more helpful to frame the jobs policy challenge as one of finding better, more productive work for the many workers whose activities do not provide a very good living, rather than one of finding jobs for workers who are truly idle. For instance, it has been observed that, in Ethiopia, "despite the lower incidence of open unemployment in rural areas, employment is clearly more precarious there, characterized by risky own-account agriculture and unpaid work (mainly for women and youth) … poverty rates are far higher, and consumption levels far lower…" (World Bank, *forthcoming*).

**In Djibouti, high rates of outright unemployment are an immediate concern and require policy action.** Djibouti stands apart from the other countries in the region in that it does registers significant unemployment. Nearly one in five adult workers are unemployed (18%). Youth unemployment is very high, with nearly every other young worker reporting that they are unable to find a job (46s%). These are numbers that call for a direct policy focus. Prior analyses have argued that high wages in Djibouti's large public sector combined with low skill levels among workers lead to a labor market that clears at high wages but low employment rates (World Bank, 2018b).

**In Ethiopia and Kenya, few youths are neither employed nor in education or training, but in Somalia and Djibouti, many fall in this category, in particular among young women.** In Ethiopia and Kenya, the region's two largest labor markets, between one in eight and one in ten youth are idle – neither employed nor advancing their education ('NEET' – Figure 4). This is a moderate level of NEET youth. By stark contrast, in Somalia, one in three youth neither work nor study, and in Djibouti, every other young person shares the same fate. In Somalia, the very high share of NEET workers is in significant part due to the very low employment rate among young women (40% of young women are NEET, compared to 24% of young men), mirroring the patterns in labor force participation described above. In Djibouti, the NEET rate is similarly high among young men (46%) as among young women (52%), again pointing to problems in encouraging activity that go beyond barriers specific to women.

**Labor market characteristics and challenges mirror the features of the different economies in the region.** Viewed together, the features of the labor market reflect the larger development challenges of each of the countries in the region. Among the five countries, labor markets in Eritrea and Ethiopia look most like what is typical in low-income countries, with broad participation, low education levels, and modest gender gaps. For broad-based improvement in jobs outcomes, support to higher productivity in agriculture and other self-employed activities remains a priority. Kenya has achieved higher education levels and significant manufacturing growth and is at a point where productivity investments balanced with actions to improve access to wage employment can benefit significant numbers of workers. Djibouti's labor market is shaped by the successful but unbalanced growth strategy of the past decades, with policy priorities on broadening job opportunities beyond the public sector and activities linked to the port and improving access for women. Somalia faces very low income levels alongside low participation and extreme gender gaps and will need to focus on promoting entry into self-employed activities and gradual progress on access for women, in addition to productivity.

Table 3: Overview of labor market characteristics

| | Labor Force Participation | Unemployment | NEET | Education | Gender gaps |
|---|---|---|---|---|---|
| Djibouti | Low | High | Very high | Moderate | Very high |
| Eritrea | High | Low | Low | Low | Moderate |
| Ethiopia | High | Low | Low | Low | Moderate |
| Kenya | High | Low | Low | Moderate | Moderate |
| Somalia | Low | Low | High | Moderate | Very high |

Source: World Bank staff calculations.

SECTION 3

# Employment Patterns

## Type of employment

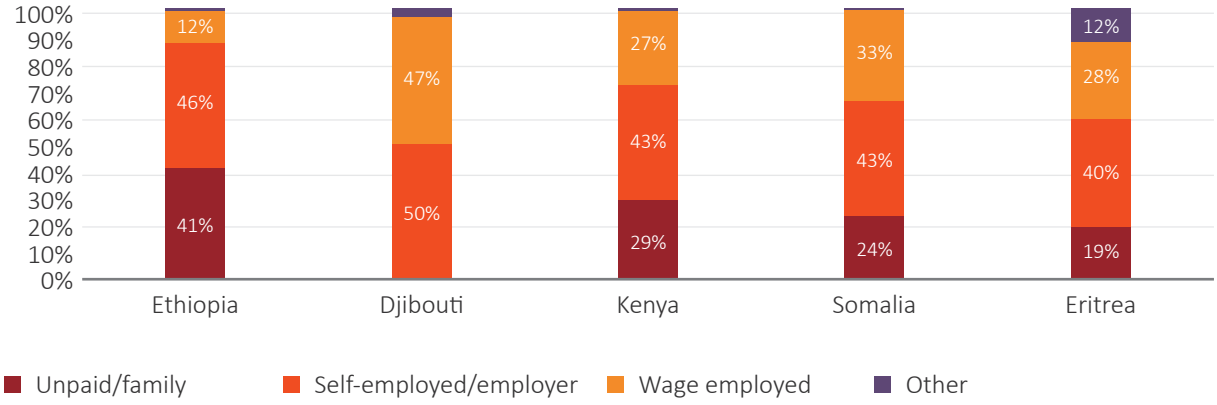
**For most workers in each of the countries of the region, a job still is self-employment or work in household activities.** Self-employment contributes between two in five and one half of all jobs in each of the countries of the region (Figure 5). An additional 19-41% of jobs are in family activities, and are often unpaid. It is a well-known weakness of employment data in low-income countries that they do not always distinguish reliably between self-employment, household work, and waged work. Misunderstandings arise easily in survey enumeration in economies where much economic activity consists of household members jointly carrying out a basket of income generating activities for the household's gain. In the data used for this report, such concerns arise for Djibouti, where the survey records no unpaid work at all. It is likely that such employment is instead mistakenly coded as self-employment, wage employment, or perhaps, as inactivity. A similar, if lesser, concern arises in Kenya, where the share of wage work may be somewhat underestimated in our indicator definition.[4]

**Outside of Ethiopia, wage employment is attainable for a meaningful share of the work force, and accounts for about one quarter to one third of all jobs.** Wage employment remains the exception rather than the rule in the region. As is expected, it is heavily concentrated in urban areas: nearly half of all urban workers are wage-employed (47% in the weighted average of the five countries), compared to fewer than one in ten in rural areas (9%). Wage jobs are available to an estimated one in three workers in Somalia (33%), and about one in four workers in Kenya (27%) and Eritrea (28%; Figure 5).[5] The share of wage employment in Somalia in strikingly high for a very low-income economy. It is best seen in the context of strong urbanization secondary to displacement, and of low reported participation rates. As noted, the 47% wage employment in share in Djibouti may be over-reported. Yet, a relatively high share of wage work – and queueing for such jobs – is a consistent mirror image of an urban economy in which there is high public employment, very low participation and significant youth unemployment. In Ethiopia, about one in eight workers hold waged jobs (12%), as is consistent with low incomes and a continued reliance on agriculture.

[4] The KIHBS 2015/16 survey distinguishes between paid employment outside of the household and paid employment within the household. We report only the former as wage employment. If paid employment within the household is included, the share of wage employment is 46%. However, most of those workers are related to the household head, and are active in agriculture or housekeeping, suggesting jobs that are more commonly thought of as household work.

[5] The Government of Eritrea's report on the 2015/16 labor market survey shows conflicting statistics on the prevalence of wage work. The share shown in Figure 5 is the lower estimate, given in the report's Table 4.12, which is more in line with what is typical of countries with similar incomes as Eritrea. Elsewhere, the report provides a higher estimate of a 42% share of wage employment.

Figure 5: Jobs by employment type




Source: World Bank staff calculations.

**Young workers are most likely to start out helping in household activities; while most older men transition to paid work, about three in ten employed women do not take up an independent activity.** Lifecycle transitions matter for the kind of jobs workers hold. As a stylized fact, most workers in the Horn of Africa begin their working lives helping in household activities. This is true for between one third and one half of young men, and about one half of young women in Ethiopia, Kenya, and Somalia (Figure 6).[6] As workers get older, most men transition into independent activities, and few men over 25 years of age remain in household activities. Older women who remain in the labor market are also more likely to have job activities independent of their households than younger women. Yet, the share who remain in unpaid work is much higher than among men, and between one in four and one in three do not work independently. This further compounds lower labor force participation among women, an implies that a far lower share of women than men ever undertake their own independent activities.

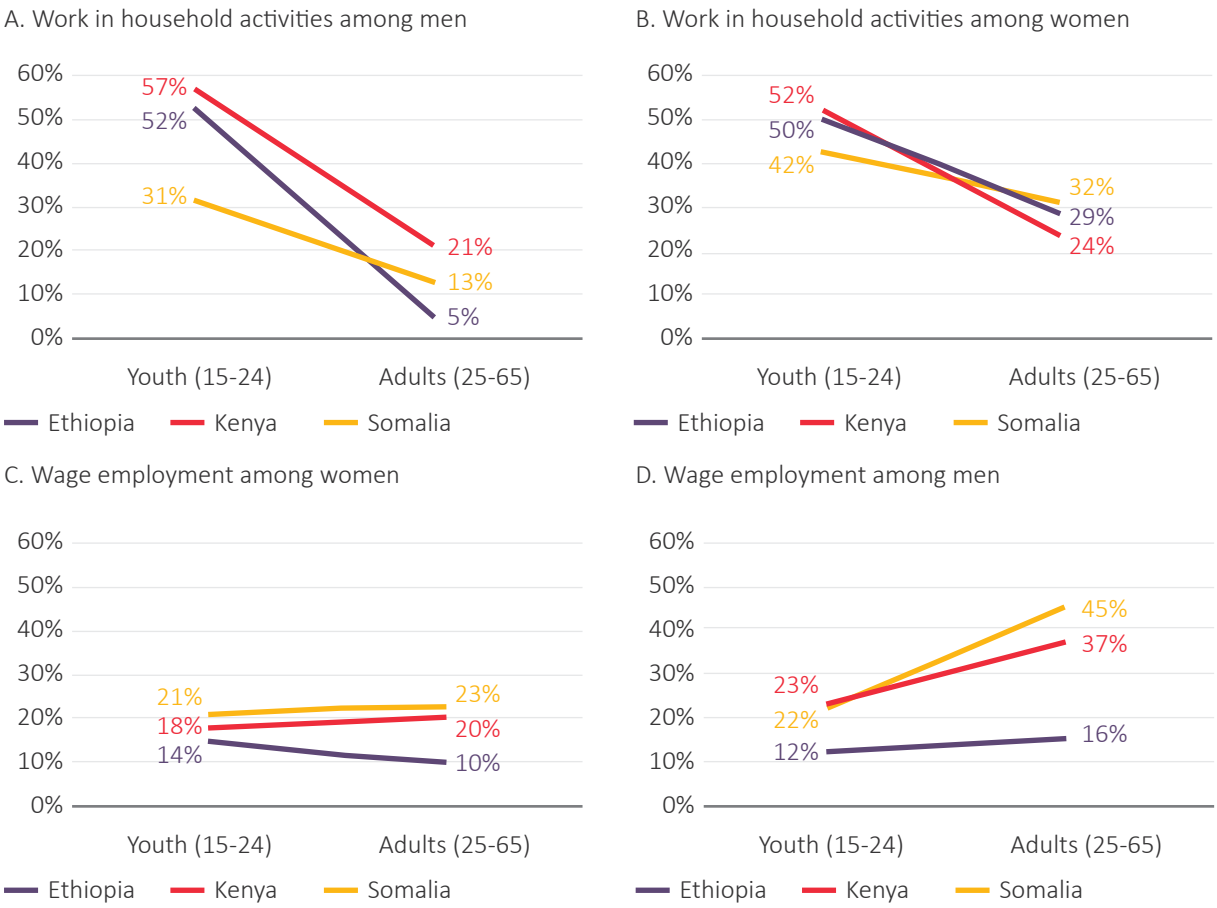
**Women are much less likely than men to have wage jobs, but young women fare far better in accessing wage employment than older women.** When looking at all age groups together, women hold far fewer waged jobs than men – about one in three in the weighted average of all five countries (36%; Figure 7). Wage work also accounts for a smaller share of jobs held by women (14%, compared to 22% among men). This pattern holds in each country in the Horn of Africa. However, it is noteworthy that young women are much closer to parity with their male counterparts among wage workers: in Ethiopia, young men and women are equally likely to hold a wage job (50%), and in Kenya and Somalia, their share approaches parity (41% and 43%).

**Among men, a transition into wage employment among older workers is consistent with queueing, but young women are as likely as older women to have wage jobs.** In Kenya and Somalia, wage employment is far more prevalent among older male workers than younger workers (a differential of 14 and 23 percentage points, respectively). This is a familiar pattern, often associated with queueing for attractive but scarce wage jobs. The comparison between younger and older workers is notably different for women. In Kenya and Somalia,

6 Patterns in Djibouti differ, but are hard to interpret due to the difficulty in distinguishing unpaid work from other activities; no data are available for Eritrea.

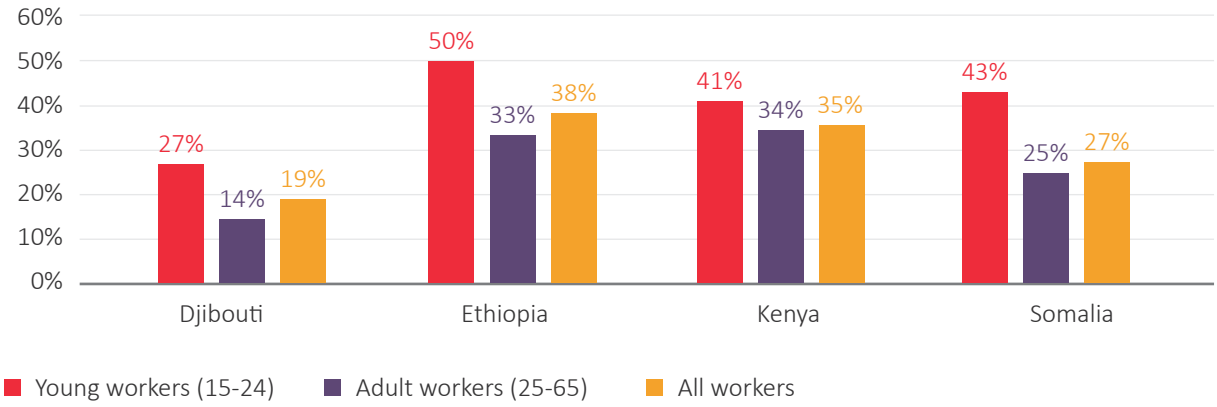
the share of wage workers among young and older women is virtually the same, and in Ethiopia, a higher share of young working women holds wage jobs (14%) than among older workers (10%). Such a shift could be related to rising education levels among women, but also to cultural shifts. The data may be consistent with the latter, in that education levels are higher among older wage-employed women than among older wage-employed men.

**Figure 6:** Life cycle transitions between job types




Source: World Bank staff calculations.

**Figure 7:** Share of women among wage workers




Source: World Bank staff calculations.

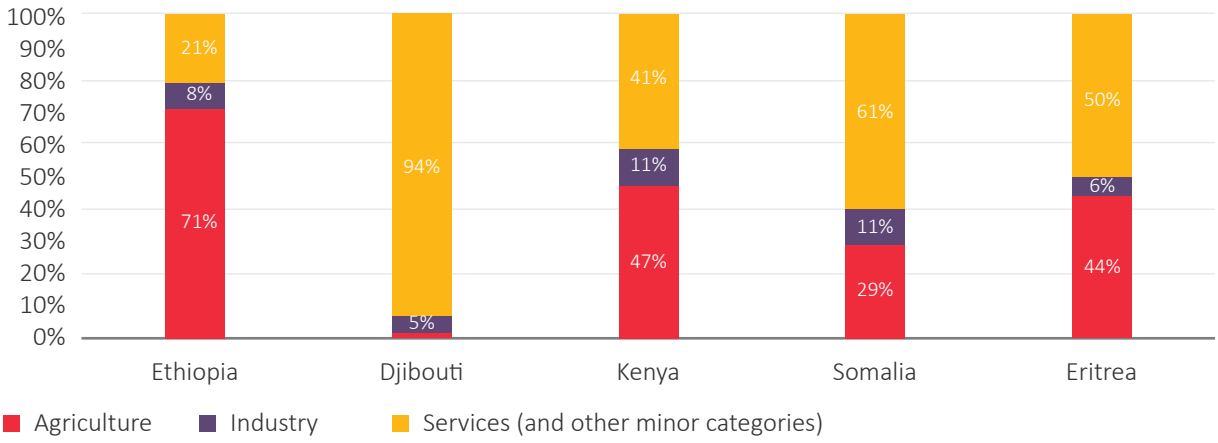
## Sectors of employment

**Industry remains a minor employer in all of the countries of the Horn of Africa, despite high and sustained growth in Ethiopia and Kenya.** Kenya has East Africa's largest industrial sector in terms of value added, and the sector's share of employment has nearly doubled between 2005 and 2015. Ethiopia's industry value added has grown about ten-fold in the past twenty years, reaching similar size as Kenya's (World Bank, 2019a and *forthcoming*; WDI). Yet, industry still employs only between one in nine and one in twenty workers in the countries of the region (Figure 8). This is a familiar and regrettable pattern in lower-income countries and reflects the difficulty of translating success in industrial development into a decisive shift in job patterns when the baseline is low and population growth is high.

**Most jobs remain in agriculture and services, but their importance varies across the countries of the region.** Agriculture remains by far the largest employer in Ethiopia, where more than two in three workers depend on the sector (71%), a moderate decrease from a decade earlier, when agriculture accounted for 78% of all jobs (World Bank, *forthcoming*). Agriculture also remains a key source of employment in Kenya, where about half of all employment is in agriculture (47%), and about two in five in services (41%). Jobs in Eritrea come about equally from agriculture (44%) and services (50%), while Djibouti's port economy is almost entirely based on work in the services sector (94%). In Somalia, the share of workers in agriculture of 29% is surprisingly low for a fragile country with very high poverty; the importance of employment in the sector has fallen in part due to the displacement of currently 2.6m Somalis, many of them from rural areas (World Bank, 2020a; UNICEF, 2020).

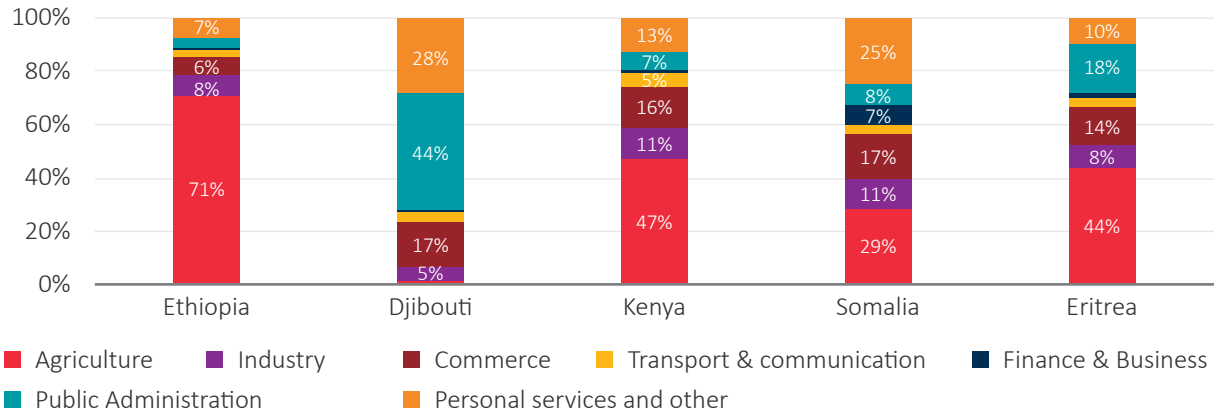
**The sector breakdown of primary employment activities does not fully capture the diversity of job strategies in lower-income countries.** It is common for households to jointly carry out several activities, including those that are part-time or seasonal, in order to make a living. For instance, in Kenya, one in four rural households (25%) have activities in both agriculture and non-agriculture (World Bank, 2019a). The sectoral breakdown shown here is most likely to approximately hold among the poorer households, in which workers tend to rely on single activities due to poor access to assets, as well as among the better-off, where full-time wage employment is most common.

Figure 8: Distribution of employment by sector




Source: World Bank staff calculations.

Figure 9: Distribution of employment by sub-sector




Source: World Bank staff calculations.

**Outside of agriculture, commerce and personal services dominate private sector employment.** As is common in lower-income countries, most private-sector jobs outside of agriculture are in commerce and in personal services (such as for instance hospitality, tailoring, cellphone charging, or mechanical repairs). Commerce consistently provides about one in six jobs (14-17%; Figure 9), with the exception of Ethiopia, where far fewer are active in trading. Personal services are particularly important in Djibouti and Somalia, where they provide at least one quarter of all employment, and also account for many jobs in Kenya.

**Work on the public payroll remains very important in Djibouti and Eritrea, in particular for men.** It is worth noting that public sector jobs contribute a very high share of employment in Eritrea, where just below one in five workers are in the public sector (18%), but especially in Djibouti, where more than two in five jobs are classified as being in public administration (44%). Indeed, the 2018 Djibouti SCD (p.54) estimated that including state-owned enterprises, nearly three in five jobs are in the public sector. Public administration public sector is a much less prominent employer in Ethiopia and Kenya, with 5% and 7% of all employment, respectively. However, it has been estimated public sector employment accounts for nearly half of all wage jobs in Ethiopia (46%, or about 5% of all employment; World Bank, *forthcoming*). Work in the public sector remains more accessible to men in both countries. In both Djibouti and Eritrea, there are four men on the public payroll for every woman, similar to the gender ratio in private wage employment Djibouti, but considerably below the wage work gender ratio in Eritrea.

SECTION 4

# Job Outcomes

**In all countries of the region, there is a lack of good jobs that allow for a life free of poverty.** There are various meaningful approaches to defining what is a 'good' job. In a lower-income setting, the most immediate and compelling criterion is whether a worker's income-generating activities are productive enough to allow her to live a life free of poverty. By this yardstick, there is still a pronounced lack of good-enough jobs in the countries of the Horn of Africa. Poverty rates remain high (Table 4), and with most households economically active, so does the share of the working poor. At survey time, poverty was particularly widespread in Somalia, where more than two in three residents lived on less than USD1.90 per day. Ethiopia and Kenya both recorded poverty rates of about one in three residents (33% and 37%), while in Djibouti, one in six residents remained in poverty, despite an GNI per capita that approached the upper middle-income threshold.

Table 4: Poverty levels

| Poverty headcount rate at USD 1.90 PPP | | | |
|---|---|---|---|
| Djibouti | 17% | 2017 | Povcalnet |
| Ethiopia | 33% | 2015 | Povcalnet |
| Kenya | 37% | 2015 | Povcalnet |
| Somalia | 69% | 2017 | World Bank 2019b |

Source: World Bank staff calculations.

**In Ethiopia and Kenya, wage jobs paid about I$130-170 (2010) per month at the median.** Data on wages and earnings are available from two surveys, in Ethiopia and Kenya respectively. The median monthly wage was $130 (2010 PPP) in Ethiopia, and median earnings were $168 (2015 PPP) in Kenya, or about $6.50 and $8.40 per day respectively (Table 5). The relatively small difference between the two economies is due to the fact that the Kenya data capture non-wage employment in agriculture, which pays less than most wage jobs. As is expected, wages in professional services and in public administration tended to be among the highest, and those in agriculture, among the lowest. Thus, in Ethiopia, those in public administration could expect to be paid about half more than the median wage, while wages in agriculture barely reached half of the median, with a daily rate of about $2.60. The majority of wage workers active in commerce, manufacturing, transport and construction saw an intermediate level of wages, around $5 per day. Wages in Kenya were significantly higher, including in agriculture (around $5 per day) and industry, commerce, and personal services (around $10 per day).

Table 5: Wages and earnings by activity and type of employer (Ethiopia and Kenya)

| | Ethiopia (2013) | | | Kenya (2015) | | |
|---|---|---|---|---|---|---|
| | Median monthly wage (2010 I$) | | Number of observations | Median monthly earnings (2010 I$) | | Number of observations |
| All | $ | 130 | *26,997* | $ | 168 | *25,678* |
| Agriculture | $ | 52 | *1,394* | $ | 96 | *10,697* |
| Industry | $ | 117 | *6,869* | $ | 240 | *3,008* |
| Commerce | $ | 91 | *1,390* | $ | 216 | *4,336* |
| Transport & Communication | $ | 117 | *3,452* | $ | 360 | *1,506* |
| Finance & Business | $ | 224 | *2,766* | $ | 781 | *214* |
| Public Administration | $ | 186 | *7,957* | $ | 552 | *2,454* |
| Personal services and other | $ | 52 | *3,169* | $ | 192 | *3,463* |

| | Kenya (2015) | | |
|---|---|---|---|
| Employer | Median monthly earnings (2010 I$) | | Number of observations |
| Civil service ministries | $ | 853 | *407* |
| State owned enterprise | $ | 720 | *254* |
| Teachers service commission | $ | 850 | *637* |
| County government | $ | 240 | *1276* |
| School Boards (BOM) Employees | $ | 168 | *310* |
| International NGO | $ | 1,081 | *84* |
| Local NGO/CBO | $ | 360 | *84* |
| Faith based organization | $ | 240 | *163* |
| Private sector enterprise | $ | 216 | *5,507* |
| Self-employed modern sector | $ | 384 | *635* |
| Informal sector (employee) | $ | 202 | *2,335* |
| Self-employed informal | $ | 216 | *5,061* |
| Self-employed small-scale agriculture | $ | 96 | *6,121* |
| Pastoralist activities (employee) | $ | 58 | *545* |
| Self-employed pastoralist activities | $ | 108 | *924* |
| Individual/private household | $ | 96 | *3,032* |

Source: World Bank staff calculations.

**Wages and earnings in Ethiopia and Kenya reflect a considerable education premium.** In both Ethiopia and Kenya, there is a marked premium for higher education. In Ethiopia, wages for the roughly two in five workers who have primary education are higher by one third than wages for the third of the working population that has no schooling. The premium is about twice as high for the one in ten Ethiopian workers who have secondary education. Likewise, in Kenya, roughly half of all worker report that they have some secondary

education, and they command more than double the wage premium of those with primary education. Fewer than one in twenty workers in either country have post-secondary education, but among them, wage premia are very high – a bit less than twice as high as for those with secondary education in Ethiopia, and more than three times as high in Kenya.

**Young workers and women earn significantly lower wages than older workers and men with comparable education levels.** We previously discussed that there are some encouraging signs that young women have greater success than their older peers at finding wage employment. However, among those who find a waged job, significant wage differentials persist. Young workers and women both earn up to half less than their older peers and men, with larger wage differentials in Kenya than in Ethiopia.

### Box 1: What might regional integration mean for jobs?

**Better infrastructure and trade facilitation could increase employment outside of agriculture, grow productivity, and raise incomes.** CGE modeling suggests that investments in infrastructure and trade facilitation could economic transformation both through sectoral employment shifts and productivity gains (see HoA REM Background Paper 5 on Enhancing Intraregional Connectivity in the Horn). The analysis simulates significant investment in road rehabilitation along with a halving of border transit times. Such policies would be associated with an increase in the share of employment outside of agriculture by 3.5 percentage points, and a four percent increase in real incomes. While modest in absolute terms, the predicted additional shift out of agriculture amounts to nearly one tenth of current employment in other sectors. The increase in income is about the equivalent of a good year's growth. Because earnings are higher for workers outside of agriculture (see Table 5), some of this rise in incomes comes from the shift of employment into other sectors. Without any changes in productivity within each sector, this predicted shift alone would account for a 2.6 percent increase income. The additional increase is explained by an expected rise in productivity within sectors.

| | Predicted change in employment share outside agriculture (ppt) | Current share of employment outside agriculture | Predicted change in real income (ppt) | Predicted change in real income due to inter-sectoral shifts (ppt) |
|---|---|---|---|---|
| All Horn of Africa | 3.5 | 39% | 4.3 | 2.6 |
| Ethiopia | 0 | 29% | 5.3 | 0.0 |
| Kenya | 10.7 | 56% | 6.3 | 12.2 |
| Somalia | 0.8 | 71% | 4.9 | 0.8 |

Note: predicted changes in employment share and real income from Chapter INFRA. Predicted change in real income due to inter-sectoral shifts obtained from predicted change in employment shares and mean sectoral earnings in Ethiopia and Kenya from data shown in Table 1, assuming no change in mean earnings.

**With complementary strengths in agriculture and manufacturing, Ethiopia and Kenya stand to gain most from productivity gains, while Kenya could expect further structural transformation.** Trade between Ethiopia and Kenya, the two largest markets of the region, currently shows agricultural products flowing from Ethiopia to Kenya, and manufactured goods flowing back (see HoA REM Background Paper 3 on Cross-Border Trade in the Horn). CGE modeling suggests that the complementarity between the two economies could lead to further welfare gains with better integration. Thus, Kenya is predicted to experience a large additional shift of jobs out of agriculture (eleven percentage points – compared to a 14 percentage point decline over the years 2006-2016), along with income gains of six percent that are entirely due to this shift. By way of contrast, no additional shift out of agriculture is predicted for Ethiopia. However, modeling suggests that real incomes in Ethiopia would rise by more than five percent. In the absence of shifts between sectors, this would be entirely due to productivity gains within sectors.

Figure 10: Determinants of monthly wages in Ethiopia and Kenya


Note: OLS regression of log monthly wages on worker characteristics.

SECTION 5

# A Labor Demand Perspective

**While this report does not analyze enterprise data, labor market outcomes shed light on the level and evolution of labor demand from businesses.** This report is limited to analyzing jobs outcomes among workers as they are observed in household surveys. It does not use data collected from businesses to directly describe labor demand. Still, individual jobs outcomes reflect labor demand, and it is possible to point out some major features.

**Despite growth in business employment, labor demand still relies heavily on self-employment and household work, and the public sector continues to play a large role in the demand for wage work.** As shown above, about two-thirds to three quarters of the work force of the region do not hold a wage job (Figure 5). The share is higher in Ethiopia, where seven in eight workers are not in waged employment. What is more, much existing demand for wage employment still relies on the public sector. Nearly half of all wage employment in Ethiopia remains in the public sector (46% – World Bank, *forthcoming*), including in state-owned enterprises which

"continue to play a considerable role in key areas of the Ethiopian economy, including in telecoms, finance, energy, logistics and transport, as well as in manufacturing, leaving little space for the private sector" (World Bank, 2019e). In Eritrea, the public sector accounts for about two in three wage jobs (64%), while in Djibouti, public sector employment provides six in seven formal wage jobs (86% – World Bank, 2018b).

**With a low starting base, even high growth in modern private businesses can only gradually change the structure of labor demand.** The economies of the region have made strides in fostering private business growth. Yet, with a rapid increase in the labor force and little initial employment in formal private business, the structure of labor demand will change only gradually. This dynamic is palpable in the Kenyan labor market. There is significant progress, and "the Kenyan economy is well diversified, boasting a major regional financial center in Nairobi, … a large manufacturing sector, … and Africa's largest exporter of agricultural products such as tea and horticulture." (World Bank, 2019d) Among manufacturing sub-sectors, food processing recorded more than six percent annual growth over the years 2009-2016, and the textiles, pharmaceuticals, and furniture sub-sectors each achieved double-digit growth rates. Yet, despite these strong dynamics, formal private sector wage employment remains limited to about one in every ten jobs (10%). Further persistent effort is needed to continue to bend the curve. Similarly, nearly half of all businesses interviewed for the 2019 *Enterprise Survey* in the Somali cities of Bosaso and Mogadishu reported that they had hired during the two years preceding the survey (World Bank, 2020c); yet, formal private wage employment remains at three percent of all jobs.

**Individual entrepreneurship and household enterprises are significant potential sources of labor demand that could provide a 'step up' from more basic job activities.** With most jobs in self-employment, it is important to consider the potential for the self-employed to create additional jobs. An analysis in Kenya finds that currently, only two percent of the self-employed hire additional workers (World Bank, 2019a). Yet, it also notes that two in five self-employed workers live in non-poor households and are the main breadwinners of their households (40%), two characteristics that may suggest that they are more likely to hire helpers in the future than other self-employed workers. Since the self-employed account for such a large share of the workforce, it would be sufficient for one in seventeen of these 'potential entrepreneurs' to hire a helper to create as many jobs as would result from a ten percent growth in formal private employment.[7] Similarly, an analysis of the Ethiopian labor market shows that in 2016, the 4.3m household enterprises active in the country had created about 4.4m jobs for workers other than the owners – one in ten jobs in the economy, and nearly twice as many as there are currently formal private sector jobs (World Bank, *forthcoming*).

[7] With a self-employment share of 43%, of whom 44% are 'potential employers', and a formal private sector employment share of 10%.

SECTION 6

# Labor Market Patterns and Job Outcomes in the Border Areas

**Border regions are distinct in their remoteness as well as other factors – this section describes how jobs outcomes differ at the border, but does not suggest that differences are necessarily due to remoteness.** In the region's three countries that are large in terms of surface area, border regions are more remote than other regions by meaningful measures (HoA REM Background Paper 5). Yet, they also differ in other important facets of geography and politics. For instance, all of Kenya's counties on the borders with Ethiopia and Somalia are arid, compared to only three of the country's other 42 counties; the potential for agriculture is limited.[8] Ethiopia's borderlands host the vast majority of the country's over 750,000 refugees (UNHCR, 2020). Such differences matter for jobs outcomes. This section describes jobs outcomes in the border areas; it does not seek to disentangle the effect of remoteness on jobs outcomes from the effect of other features of border regions.

**Only in Somalia are border areas home to a large share of the overall working-age population, as well as a sizeable urban population.** Among the four countries for which data are available, regions bordering another country have by far the highest population share in Somalia, where they are home to half of the working-age population (54%; Table 6). By way of contrast, Ethiopia's and Kenya's population is concentrated away from border areas; only about one in twenty residents of working age live near neighboring countries (5%). Kenya's and Somalia's border-region populations are about as likely to live in urban areas as in other parts of the country, but due to the low overall population share in Kenya, only Somalia's border regions account for a large share of the urban working-age population. Somalia's border areas are thus home to an urban working-age population of about two million, compared to about half a million in Kenya, and far fewer in the other countries. In Djibouti, about one in six working-age residents live in border regions, but the designation does not carry the same notion of remoteness due to the small size of the country. It is worth noting, however, that most of Djibouti's disadvantaged rural population lives in border areas.

[8] Following the classification of the Ministry of Devolution and the Arid and Semi-Arid Lands.

Table 6: Population characteristics of border areas

| | Working-age population in border areas | | Share of the working-age population living in border areas | | | Urban share of WAP | |
|---|---|---|---|---|---|---|---|
| | All | Urban | Rural WAP | Urban WAP | Overall WAP | Non-border | Border |
| Djibouti | 0.1m | 0.04m | 79% | 8% | 17% | 97% | 41% |
| Ethiopia | 2.8m | 0.1m | 6% | 2% | 5% | 10% | 4% |
| Kenya | 1.4m | 0.5m | 5% | 5% | 5% | 33% | 33% |
| Somalia | 4.0m | 2.0m | 52% | 56% | 54% | 45% | 49% |

Source: World Bank staff calculations.

**The working-age population in border areas is slightly less youthful and there are fewer young women among it.** With the exception of Somalia, the share of youth among the WAP is somewhat lower in border regions than in other areas of the countries, presumably reflecting migration. The differential in the youth share is two to three percentage points in rural areas, but in urban areas, the gap is quite large, between seven and ten percentage points. In Ethiopia and Kenya, men also make up a substantially larger part of the urban WAP in border areas. This is particularly notable among youth, with a differential of seven percentage points between border areas and other regions in Ethiopia and a gap of 13 percentage points in Kenya.

**The workforce in border area is less well-educated, with very large differentials among young urban workers.** Differences between border regions and other areas are yet more pronounced in education levels. Young urban workers, in particular, are much less likely to have more than primary education, with gaps of between twelve and 33 percentage points in Ethiopia, Kenya, and Somalia. This differential could reflect migration as well as poorer access to education. These are large differences. In each country, they exceed the gains in education between young workers and their older peers, and in Kenya and Somalia, they are of similar magnitude as the gap between rural and urban areas.

**Border regions tend to have a lower share of active workers, a higher share of NEETs, and less wage employment, all consistent with a comparative lack of attractive job opportunities.** Among different characteristics of the labor market, labor force participation is most consistently affected in border areas, potentially due to more conservative social attitudes as well as a dearth of opportunities (Figure 11). A similar pattern prevails in the share of NEETs and those in wage employment. It is worth noting that unemployment is quite consistently lower in border areas. However, to the degree that unemployment in the countries of the Horn of Africa chiefly reflects queueing among the well-educated for good jobs, lower unemployment in border regions may speak to a dearth of well-paid opportunities, rather than a vibrant labor market.

**In Kenya's border areas, rural jobs outcomes may be most affected, while in Ethiopia and Somalia, urban border communities appear to see the least favorable outcomes.** In Kenya's border regions, outcomes are most unambiguously negative in rural areas, where in addition to low participation, there is less wage employment, and those who have a waged job have lower average wages. In Ethiopia, lower urban wage employment alongside higher average wages among those who do hold wage jobs may speak to less vibrancy in border region businesses. Outcomes in rural areas are more mixed. Somalia's large population in border

areas has mixed outcomes, with a lower share of waged employment and greater reliance on non-agriculture self-employment in rural areas. It is worth recalling that this comes before a background of poor job opportunities and high poverty throughout the country. The small labor market in Djibouti's borderlands shows a divergence between urban and rural areas.

Figure 11: Labor market characteristics of border areas compared to non-border regions

Panel A – All border areas

| | LFP | Unemployment | NEET | Wage Employment | Agriculture Share | Low Wages |
|---|---|---|---|---|---|---|
| Ethiopia | Lower | Slightly lower | Slightly higher | Slightly lower | Similar | Much higher |
| Djibouti | Lower | Much lower | Much higher | Slightly higher | lightly higher | |
| Kenya | Much lower | Slightly lower | Higher | Lower | Similar | Much lower |
| Somalia | Slightly lower | Similar | Slightly higher | Much lower | Lower | |

Panel B – rural areas

| | LFP | Unemployment | NEET | Wage Employment | Agriculture Share | Low Wages |
|---|---|---|---|---|---|---|
| Ethiopia | Lower | Similar | Higher | Similar | Slightly lower | Much higher |
| Djibouti | Lower | Lower | Much higher | Lower | Higher | |
| Kenya | Much lower | Slightly higher | Slightly higher | Lower | | Much lower |
| Somalia | Slightly higher | Similar | Slightly higher | Much lower | Much lower | |

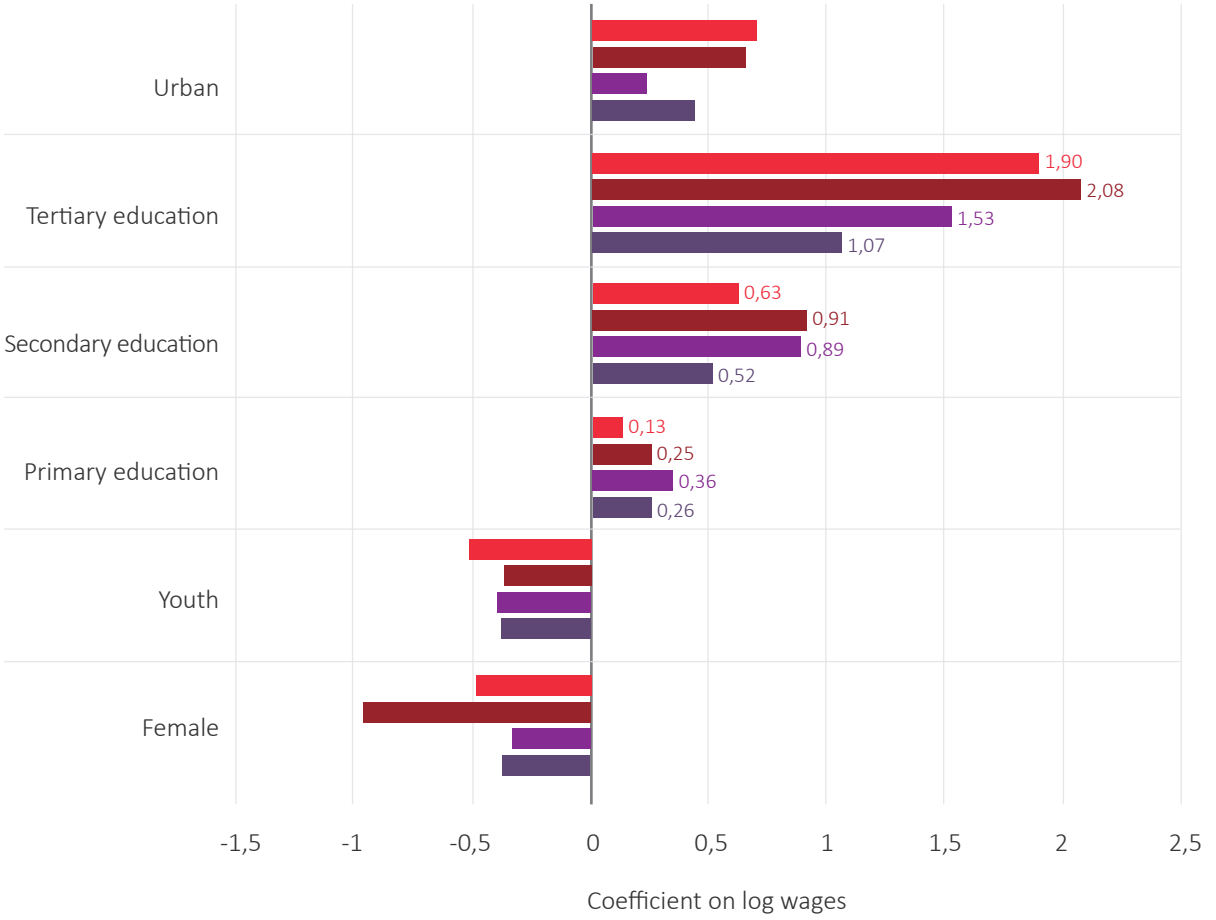
Panel C – urban areas

| | LFP | Unemployment | NEET | Wage Employment | Agriculture Share | Low Wages |
|---|---|---|---|---|---|---|
| Ethiopia | Much lower | Lower | Higher | Much lower | Similar | Much higher |
| Djibouti | Similar | Lower | Lower | Higher | Similar | |
| Kenya | Much lower | Slightly lower | Slightly higher | Slightly lower | | Much lower |
| Somalia | Much lower | Similar | Slightly higher | Lower | Slightly lower | |

Note: saturation of shading indicates the magnitude of the gap between border and non-border areas; non-shaded cells record differences that are not statistically significant at the 95% level.

**Despite differences in education achievement and access to opportunities, education wage premia persist in border areas.** In Ethiopia, wage premia are consistently smaller in border areas, by around one third of the premium in non-border areas (Figure 12). However, premia are nonetheless very meaningful in magnitude (as well as statistically significant), with increments of about one quarter and one half at the mean for those with primary and secondary education, and double among those with post-secondary training. In Kenya, premia are at least slightly larger in border areas (and statistically significantly larger for secondary and higher education.

Figure 13: Correlates of wage levels in border and non-border areas




Source: World Bank staff calculations.

SECTION 7

# Youth Cohorts

**With youthful populations, labor forces in the region are expected to grow at high rates in the coming decade.** As noted, population growth rates are high in the region. Over the coming decade and beyond, the labor force is projected to expand rapidly as large cohorts of young workers being to be active, while comparatively smaller cohorts of older workers stop work. Table 7 shows estimates of this evolution, based on UN population projections, and assuming that age and gender-specific labor force participation rates remain as measured in the survey data. With the exception of Djibouti, all countries are expected to see labor force growth rates around 3% per year. This translates into some very large net increases in the number of people available to work. In Ethiopia, by far the region's most populous nation, nearly two million more workers may be looking for a job each year over the coming decade. In Kenya, the net increase is not far from a million potential workers per year. Because of the significant opportunities and challenges associated with such growth, it is worth illustrating the scale of these changes relative to current employment patterns.

Table 7: Labor force projections 2020-2030

| | Labor force | | | Average annual net increase | | Growth rate |
|---|---|---|---|---|---|---|
| | 2020 | 2025 | 2030 | 2020-2025 | 2025-2030 | 2020-2030 |
| Djibouti | 255,000 | 280,000 | 300,000 | 5,000 | 4,000 | 1.7% |
| Ethiopia | 55,578,000 | 60,930,000 | 70,173,000 | 1,832,000 | 1,995,000 | 3.0% |
| Kenya | 23,472,000 | 27,438,000 | 31,574,000 | 793,000 | 827,000 | 3.0% |
| Somalia | 4,373,000 | 5,180,000 | 6,098,000 | 161,000 | 184,000 | 3.4% |
| Eritrea | 1,562,000 | 1,806,000 | 2,057,000 | 49,000 | 50,000 | 2.8% |

Source: World Bank staff calculations.

**In each country, the labor force is projected to grow within two to three years by as many workers as are currently employed in industry.** The number of workers entering the work force each year looms large in comparison to limited current employment in industry. In Eritrea, the number of workers is expected to increase within two years by the number of workers active in industry today. In the other countries of the region, it will take a bit less than three years for an equivalent number of workers to enter. In Ethiopia, a single year's increase exceeds the current estimated number of wage jobs in industry (the projected annual increase is 113% of current wage employment in industry).

**Even with continued growth in industry, many of the additional jobs needed will be in agriculture and services, requiring continued attention to productivity in these sectors.** It is notable that, despite Ethiopia's success in creating robust numbers of jobs in the industrial sector through focused support, the manufacturing share of urban employment has reportedly fallen from 12% in 2010 to 9% in 2018 (Table 8). This illustrates the difficulty of maintaining broad access to opportunities in the sector among a steep increase in labor supply. Conversely, while the share of employment in agriculture declined from 78% in 2005 to 71% in 2013, it is worth that the sector still accounted for

by far the largest increase in jobs. Other countries in the region rely less heavily on agriculture, but it is clear that the agriculture and services will have to provide the bulk of new jobs, even if industrial policy continues to succeed – and that hence, productivity in these sectors deserves undiminished attention.

Table 8: Labor force increase compared to current employment patterns

| | | Annual net increase as a share of... | |
|---|---|---|---|
| | Absolute annual increase 2020-2025 | Employment in industry | Formal private sector wage employment |
| Djibouti | 5,000 | 37% | 65%[a] |
| Ethiopia | 1,832,000 | 39% | 52% |
| Kenya | 793,000 | 29% | 34% [b] |
| Somalia | 161,000 | 34% | 89% |
| Eritrea | 49,000 | 53% | 25% [b] |

[a] Increase shown relative to all current private wage employment, including informal.

[b] Increase shown relative to all current formal private employment, including self-employment.

Source: World Bank staff calculations.

**Annual labor force growth is expected to be the equivalent of all current formal private sector wage employment within one to four years.** Formal sector wage employment is often among the most desirable jobs available but remains the preserve of the lucky few in the countries of the Horn of Africa. While in Djibouti and Eritrea, the public sector provides many wage jobs, further growth in public employment is problematic. A comparison of current private sector wage employment and the expected labor force growth suggests that competition for these attractive jobs is likely to intensify. Thus, the number of (net) entrants is equivalent to all current formal wage employment in private business within one year in Somalia, two years in Ethiopia, and three years in Kenya.

**Expected labor force growth among women is equally significant and reducing the employment gender gap poses an additional challenge, in particular in Djibouti and Somalia.** There is no comparable data available on formal private sector wage employment of women. However, the number of young women expected to enter the labor force is significant even compared to all current private-sector wage employment of women, including informal wage jobs. The net increase amounts to the entire current number of these jobs within one to four years (Table 9). What is more, these projections assume that women and men maintain their respective current disparate levels of participation. It is worth considering what would be needed for further progress – for instance, reducing the current youth gender gap by half. In Djibouti, achieving this goal would mean tripling the number of additional jobs for young women; in Somalia, it would require increasing them by about one third. With lower gender gaps in the other countries of the region, the goal could be more easily achieved.

**Recent performance confirms that even maintaining the current level of access to formal wage employment will be no easy feat.** A recent analysis from Kenya suggest that over the years 2014-2017, a period of strong GDP growth, the economy created on average about 107,000 additional formal-sector jobs (including the public sector) per year (World Bank, 2019a). If this pace were maintained over 2020-2025, it would amount to about 14% of the net increase in workers. The overall rate of formal employment in the economy was 17% 2015, so that the share of formal jobs would slowly decrease. In Ethiopia, it has been estimated that employment growth in

the formal private sector was 2.4% on an annual basis between 2011 and 2018 – a period of very robust growth (World Bank, *forthcoming*). This growth rate is substantially below the expected 3% annual increase in the work force, so that if these trends continue, the share of workers in formal private employment would likewise fall.

**The challenge of labor force growth is compounded if Djibouti and Somalia hope to address the challenges of low employment rates.**

The analysis shown here may appear to suggest that Djibouti faces a lesser challenge of creating good jobs than other countries in the region. However, this is purely due to the fact that the labor force projections assume that Djibouti maintains its very low participation and high unemployment rates. In Somalia, it bears highlighting that the considerable increases projected here are also based on the assumption that participation remains below the rates more typical of low-income countries (and within the Horn of Africa).

Table 9: Labor force increase among women compared to current employment patterns

| | Women in LF annual net increase 2020-2025 | | | |
|---|---|---|---|---|
| | ... maintain current LFP | ... reduce youth LFP gender gap by half | Additional increase to reduce youth gender gap | Annual increase as a share of current private wage employment among women (maintain current LFP) |
| Djibouti | 1,000 | 3,705 | *270%* | 85% |
| Ethiopia | 843,800 | 941,650 | *12%* | 66% |
| Kenya | 378,400 | 407,978 | *8%* | 34% |
| Somalia | 64,600 | 87,598 | *36%* | 25% |
| Eritrea | 22,800 | 25,036 | *10%* | 52% |

[a] Increase shown relative to current wage employment excluding work in public administration.

Source: World Bank staff calculations.

SECTION 8

# Policy recommendations

**With few productive jobs and high population growth, the region must balance policies for broad-based productivity growth in the short term with policies to foster economic transformation.** Most workers in the region remain in activities that do not provide good incomes, with high levels of self-employment and family work in agriculture and casual services activities (chiefly, commerce and personal services). There are important gains to be had from a gradual shift toward higher-productivity work – including wage jobs – in manufacturing, services jobs with higher productivity, and market-oriented agriculture. Policy should vigorously support such structural transformation. However, with high population growth and a small base of high-productivity businesses and jobs, self-employment in agriculture and services will remain a crucial source of jobs for the foreseeable future. It remains important for policy to support productivity gains in these jobs, including in smallholder agriculture.

**At the economy-wide level, effective policy for jobs and economic transformation in the Horn of Africa can focus on macro-fiscal stability, infrastructure and access to finance, and education.** As the World Bank's policy framework for Jobs and Economic Transformation points out, "the list of policies to achieve JET is long and prioritization should reflect country contexts" (World Bank, 2019c). Given the endowments and current economic performance of countries in the Horn of Africa, policies that deserve attention at the cross-cutting, economy-wide level, include (1) macro-fiscal stability, better governance and a more favorable investment climate, as well as (2) investments in infrastructure and access to finance, and in (3) education. The form such policies should take to be effective depends on the state of the individual economies. For instance, in terms of promoting better access to finance, a cooperative banking sector such as Kenya's offers a platform to reach farmers, while in Somalia, support to the livestock sector may have to start from small grants before the basis for more sustainable financial services can be established.

**Jobs policy must take account of the differences in economic structure between the countries of the region.** While the countries of the Horn of Africa face some common challenges, differences are pronounced, and their analysis must inform policy design. Prior World Bank assessments have provided a full assessment of appropriate policies in individual countries (World Bank 2018b, 2019a, 2020a, *forthcoming*). Broadly, labor markets in Eritrea and Ethiopia look most like what is typical in low-income countries, with high participation, low education levels, and modest gender gaps. While it is important to foster Ethiopia's recent success in promoting its industrial sector, support to higher productivity in agriculture and other self-employed activities remains a priority for broad-base progress toward better jobs. Kenya has achieved higher education levels and strong manufacturing growth, and actions to improve access to wage employment can benefit increasingly large numbers of workers. Djibouti's labor market is shaped by the successful but unbalanced growth strategy of the past decades, and policy priorities include broadening job opportunities beyond the public sector and activities linked to the port and improving access for women. Finally, Somalia faces the legacy of conflict, very low income levels alongside low participation and extreme gender gaps. In addition to policies to restore productivity after conflict (see also World Bank, 2020b), will need to focus on promoting entry into self-employed activities and gradual progress on access for women.

**Jobs policies can align with and complement investments in regional integration.** As discussed, further integration of the markets of the Horn of Africa promises better jobs for many in the region, both through structural shifts and productivity gains within sectors. Infrastructure investment and trade facilitation are both needed to achieve these goals (see HoA REM Background Paper 5). Sectoral policies can support such investments and seek to ensure that there is an impact on jobs. For instance, investments could seek to support farmers in Ethiopia, herders in Somalia, and manufacturers in Kenya in seizing the opportunities better market access provides – whether through financing, capacity building for producer cooperatives, or business development services to help navigate product quality requirements.

**Despite recent gains, jobs outcomes for women remain inferior, and deserve dedicated support.** Young women in the Horn of Africa fare better in some aspects of working life than their older peers. However, a wide gender gap remains; in Djibouti and Somali, it is stark. Policy can target explicit barriers to women's full participation in economic life and build capacity in women's cooperatives and trade associations. Further, it can support women in building livelihoods that work within the persistent cultural constraints, for instance, by providing funding, training, and advisory services for jobs that can be done from home, Continued efforts to improve access to education for girls also remain crucial.

**Borderlands offer fewer job opportunities, but while investment in human capital should not lag other areas, other policy initiatives dedicated to local development need scrutiny.** While border areas in the Horn of Africa are not dramatically disadvantaged in terms of the job opportunities they offer, there are perceptible differences to less-remote areas of the five countries. Investment in education is a no-regret policy to promote job outcomes for residents of border areas; higher skill levels will benefit them whether they decide to look for job opportunities locally or to migrate internally. However, investment programs dedicated to boosting local production need to be carefully scrutinized. They may be justified by externalities that relate, for instance, to stability or the inclusion of disadvantaged groups living in border areas, or by special fixed cost associated with operating in remote areas. Yet, they must also consider the cost of investment in lagging regions and ask whether there is a viable path for local industries. Somalia has by far the largest population share in border areas, and the case for explicit spatial development policies is arguably stronger.

# References


Government of the State of Eritrea (2018). *Eritrea Labor Force Survey 2015/16.*

World Bank (2018a). *Somalia Systematic Country Diagnostic.*

World Bank (2018b). *Economic Transformation in Djibouti. Systematic Country Diagnostic.*

World Bank (2019a). *Kenya Jobs Diagnostic 'Light'. Unpublished manuscript.*

World Bank (2019b). *Somali Poverty and Vulnerability Assessment: Findings from Wave 2 of the Somali High Frequency Survey.*

World Bank (2019c). *Jobs and Economic Transformation (JET) – Drivers, Policy Implications and World Bank Group Support.*

World Bank (2019d). *Creating Markets in Kenya – Unleashing Private Sector Dynamism to Achieve Full Potential.*

World Bank (2019e). *Creating Markets in Ethiopia – Sustaining Progress Towards Industrialization.*

World Bank (2020a). *Improving Access to Jobs for the Poor and Vulnerable in Somalia.*

World Bank (2020b). *Improving Access to Jobs for the Poor and Vulnerable in Somalia.*

World Bank (2020c). *Somalia Urbanization Review: Fostering Cities as Anchors of Development.*

World Bank (forthcoming). *Ethiopia at Work. Unpublished manuscript.*

UNICEF (2020). *Somalia Humanitarian Situation Report No. 7.* July 2020.

UNHCR (2020). *Ethiopia Country Refugee Response Plan 2020-2021.*

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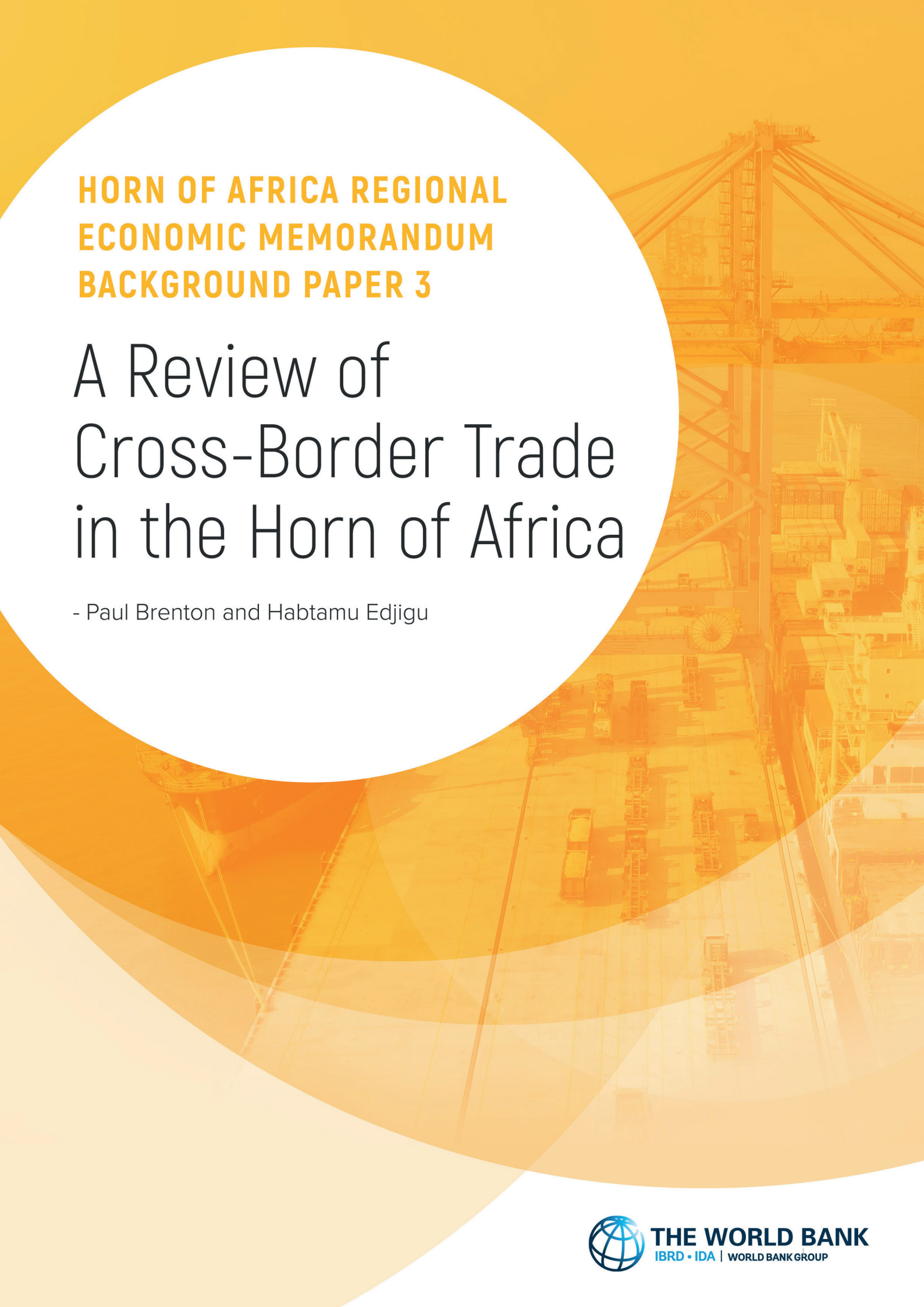
HORN OF AFRICA REGIONAL ECONOMIC MEMORANDUM BACKGROUND PAPER 3

# A Review of Cross-Border Trade in the Horn of Africa

- Paul Brenton and Habtamu Edjigu



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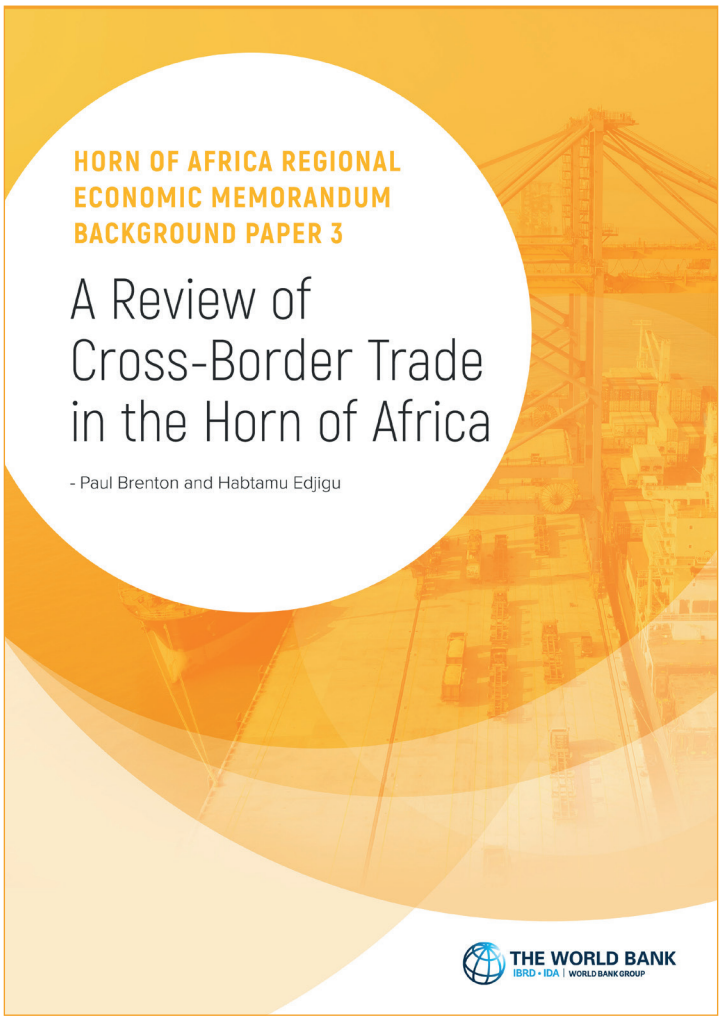
HORN OF AFRICA REGIONAL ECONOMIC MEMORANDUM BACKGROUND PAPER 3

# A Review of Cross-Border Trade in the Horn of Africa[1]

- Paul Brenton and Habtamu Edjigu




[1] For the purposes of this paper the Horn of Africa is deemed to comprise Djibouti, Eritrea, Ethiopia, Kenya and Somalia, sometimes referred to as the "little" Horn of Africa. This allows focus on those countries where actual and cross-border trade is strongest and is consistent with the emerging political economy of regional integration in the area following the recent agreement by these five countries to take forward discussions on fostering economic integration and regional cooperation, with the support of the European Union, African Development Bank, and the World Bank.

# CONTENTS

SECTION 1

# Introduction

**Informal cross-border trade is an important feature of trade in the Horn of Africa. In many instances the value of informal cross-border trade exceeds the value of official trade.** For example, official annual exports of cattle from Ethiopia, home to the largest cattle inventory in Africa, are less than 2,000 heads, when more than 25 times this amount are typically exported across borders (Little, 2005). For some commodities, like maize, dry bean, and sorghum, unrecorded exports of Ethiopia to neighboring countries exceed officially recorded trade by a factor of 30 or more (Little, 2015).

**There is a need to understand more about the common challenges and opportunities for cross-border trade in the HoA.** Because a large part of cross-border trade and movement of people is unrecorded, knowledge about market networks and integration in the Horn of Africa countries is limited. There is a need to identify key catchment areas, trade routes, markets and commodities handled; and investigate major challenges, particularly in cross-border areas. Such understanding will provide context for the extent of regional integration, analysis, and response planning.

**This paper provides a review of existing literature on cross-border trade among the Horn of African countries Djibouti, Eritrea, Ethiopia, Kenya and Somalia.**[2] It offers analysis on key traded products particularly food crops and livestock, a review on main trade routes and border marketing centers; the operation of cross-border value chains in the borderlands, including the economic impact on border communities and a summary of common challenges facing cross-border trade within the region. The review is augmented with analysis of available data on trade between these countries from UN COMETRADE, FEWS NET and FAO.[3] To put cross-border trade in context, the paper starts by reviewing the available information from officially recorded trade data.

[2] There appears to be no information on cross-border trade in services and so we concentrate on trade in goods. Limited information from other borders in Africa suggests that such trade could be important and should be an issue for data collection and analysis.

[3] The FEWS Net provide a survey of cross-border trade data collected by Food Security and Nutrition Working Group (FSNWG), through its Market Analysis Sub-group in East African countries. The survey covers 88 food commodities and livestock. However, it does not completely capture all cross-border trade in the region because collection is limited to selected borders. In addition, the data are not collected 24 hours per day, 7 days per week or for all traded commodities.

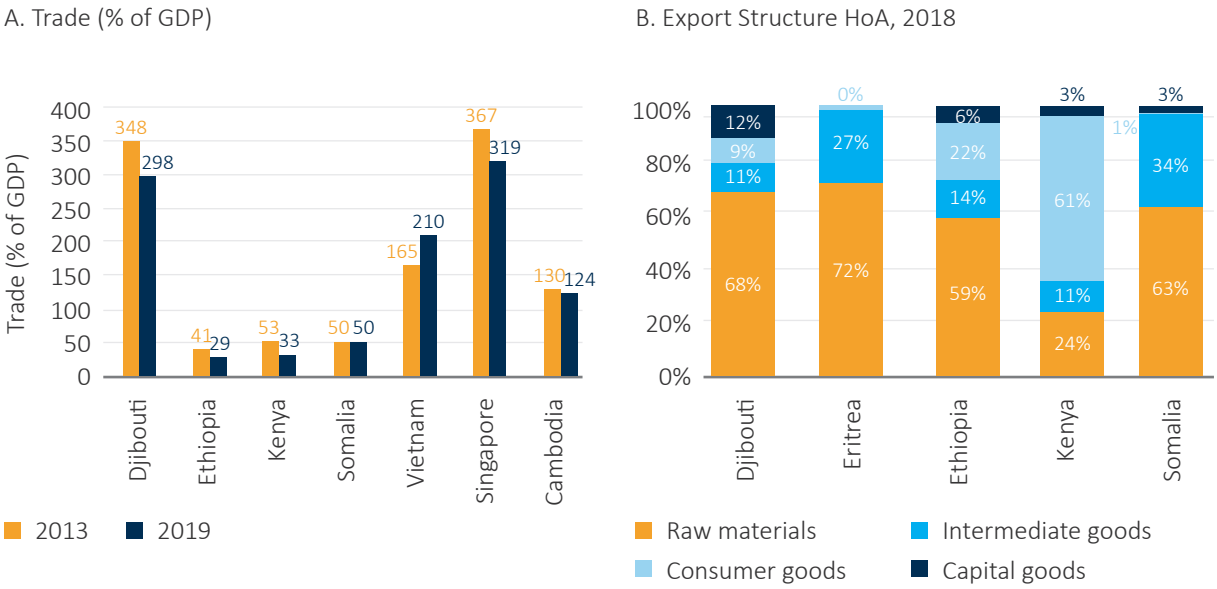
SECTION 2

# The Structure of Trade in the Horn of Africa

## 2.1 Officially Recorded Trade

**Officially recorded information suggests that trade is underperforming as a driver of growth, job creation and poverty reduction in the Horn of Africa.** The degree of integration with the global economy, as measured by the ratio of exports and imports to GDP decreased between 2013 and 2019 in four out of the five HoA countries for which data are available.[4] The largest declines were in Djibouti (-50 percentage points of GDP). However, Djibouti still remained the country with the highest trade-to-GDP ratio, at 298% in 2019, due to the magnitude of port related services (Figure 1A). Low-value products are dominate the structure of trade in the region. Except for Kenya, exports from HoA countries have a relatively high proportion of raw materials (Figure 1B).

Figure 1: Trade-to-GDP and trade Structure in HoA, 2018




Source: staff calculation using data from United Nations Comtrade Database.

**The Middle-east and North Africa region is an important destination for goods exports for all five countries.** For Djibouti and Somalia over half of their recorded exports to this region comprise animals, which as discussed below are likely to be the result of value chains that cross borders with other countries in the HoA (Figure 2). China is a major export destination for Eritrea's exports. The EU, although declining, is a key market for Ethiopia and Kenya, accounting for over a quarter of exports. For Ethiopia and Kenya, the US has become a more important destination in recent years reflecting the

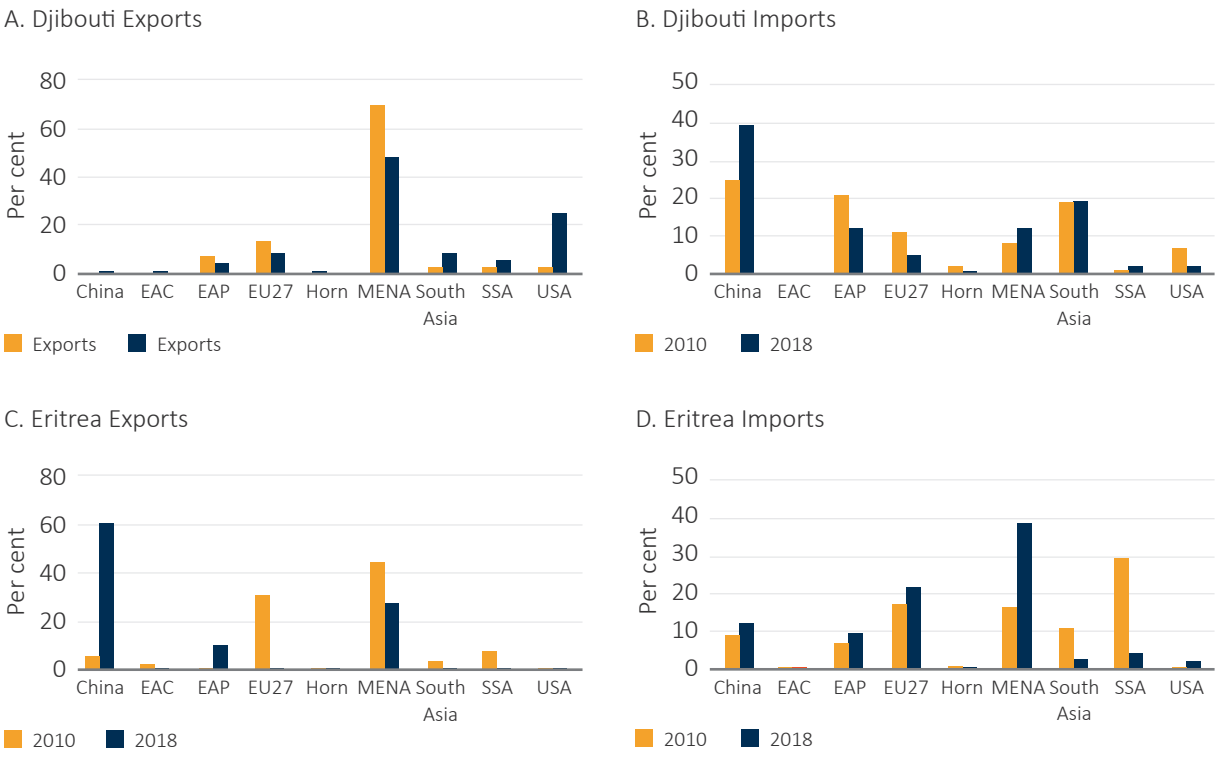
[4] Eritrea has not provided trade data to the UN statistical agencies since 2003.

rising importance of apparel exports. Exports to other African countries are small or negligible.

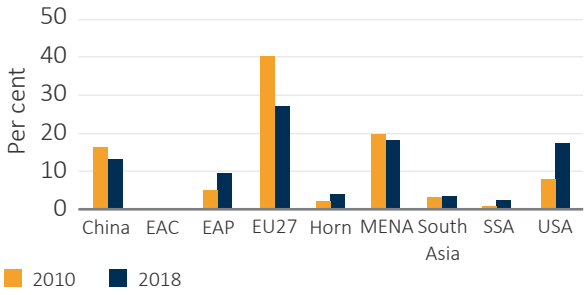
**With regard to imports of goods, China is a major and increasingly important supplier.** Between 2010 and 2018, China's share of the total imports of all 5 HoA countries increased from just under 20 percent to over 30 percent and is the dominant supplier of imports to the region. The EU is still a major supplier but has declined in importance, accounting now for around 15 percent of the imports of the Horn compared to 20 percent in 2010. However, this is not consistent across the countries and is driven mainly by Kenya. Eritrea, Ethiopia and Somalia have seen an increasing share of the EU in their imports. The Mena region is also an important source of imports, especially for Eritrea and Somalia.

**Recorded intra-regional trade remains marginal and erratic.** Figure 2 suggests that for most countries (the exception is Somalia's imports) the Horn of Africa countries are not significant trade partners for each other. To some extent this reflects that officially recorded data for trade between HoA countries is not consistently available. Ethiopia is the only country for which data are reported on a regular annual basis. Figure 3 shows the trend in Ethiopia's reported imports and exports with other HoA countries. Exports on the whole are tending to increase but are somewhat erratic at the country level, with exports to Somalia increasing substantially in 2018 while those to Kenya declined. Following this surge in exports to Somalia, Ethiopia's exports to the Horn countries exceeded USD 100 million in 2018. Ethiopia's imports from HOA countries are dominated by Kenya, amounting to around USD 40 million each year. Kenya has reported trade data only in 2010, 2013 and 2017 to 2018. Figure 4 shows the information for 2010 and 2018. Recorded imports from HoA countries are negligible. Exports are dominated by Somalia, amounting to over USD 120 million in 2018. Kenya's exports to Ethiopia amounted to about one quarter of total exports to HoA countries. Hence, Somalia is now the largest market for recorded intra-HoA exports, accounting for two-thirds of the total in 2018.

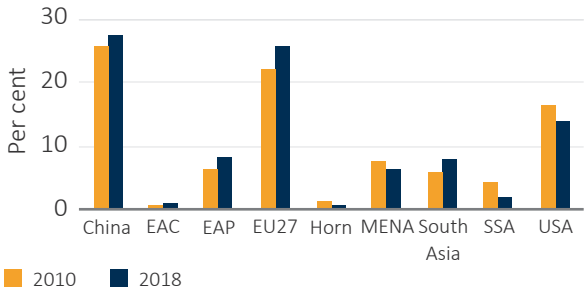
Figure 2: Horn of Africa Countries Recorded Global Trade: 2010 and 2018



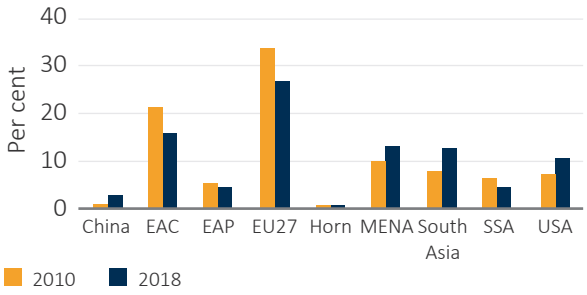
E. Ethiopia Exports



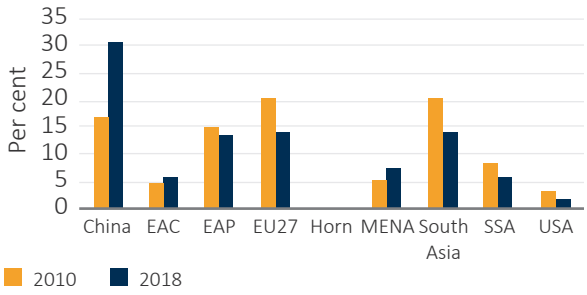

F. Ethiopia Imports



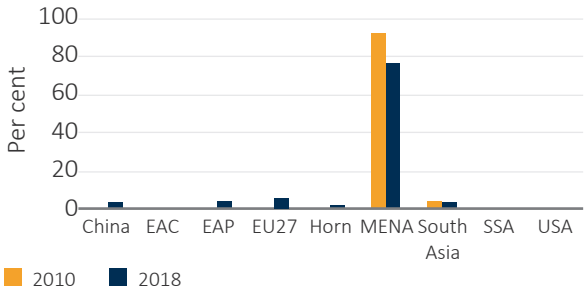

G. Kenya Exports



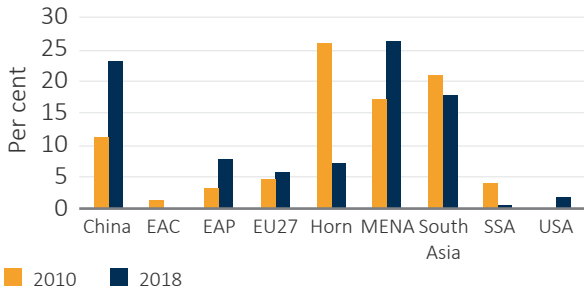

H. Kenya Imports




I. Somalia Exports



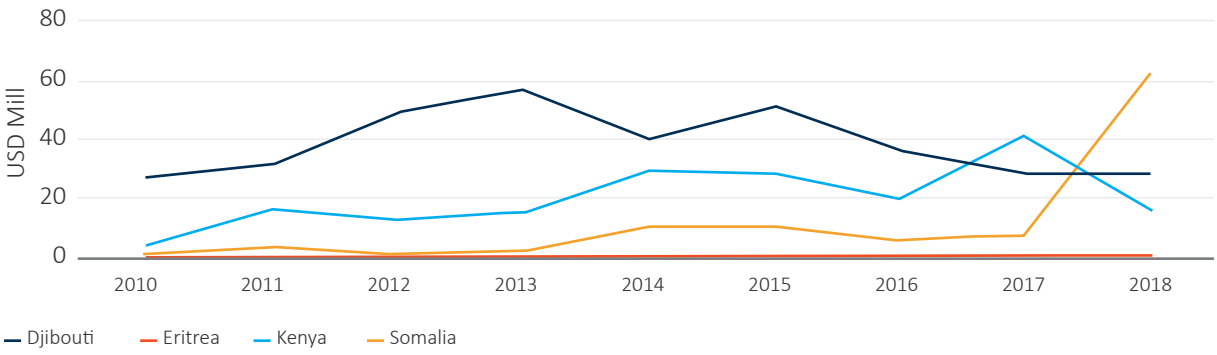

J. Somalia Imports



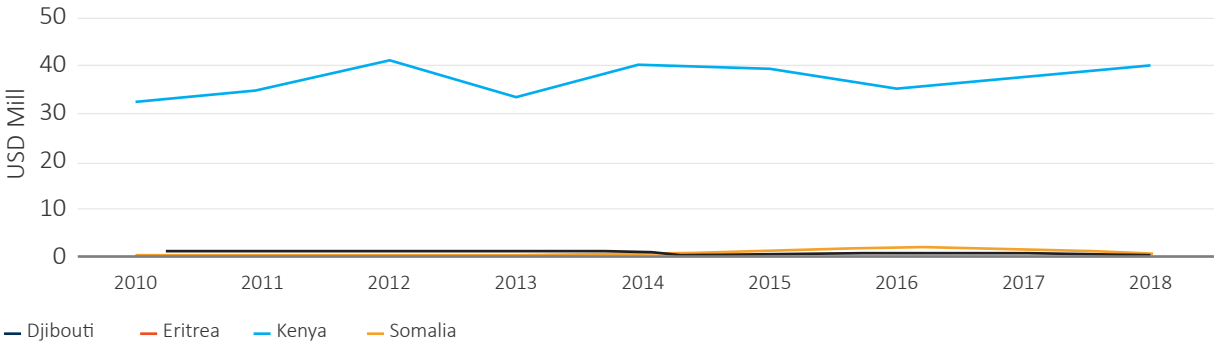

Notes: Data are mirror statistics (partner country reporting) from UN Comtrade via WITS
EAC = East Africa Community minus Kenya
EAP = East Asia and Pacific minus China
Horn = Djibouti, Eritrea, Ethiopia, Kenya, Somalia
Mena = Middle East and North Africa minus Djibouti
SSA = Sub-Saharan Africa minus Horn of Africa countries and EAC

## Figure 3: Ethiopia's Trade with HOA Countries: 2010 to 2018

A. Exports to HoA Countries

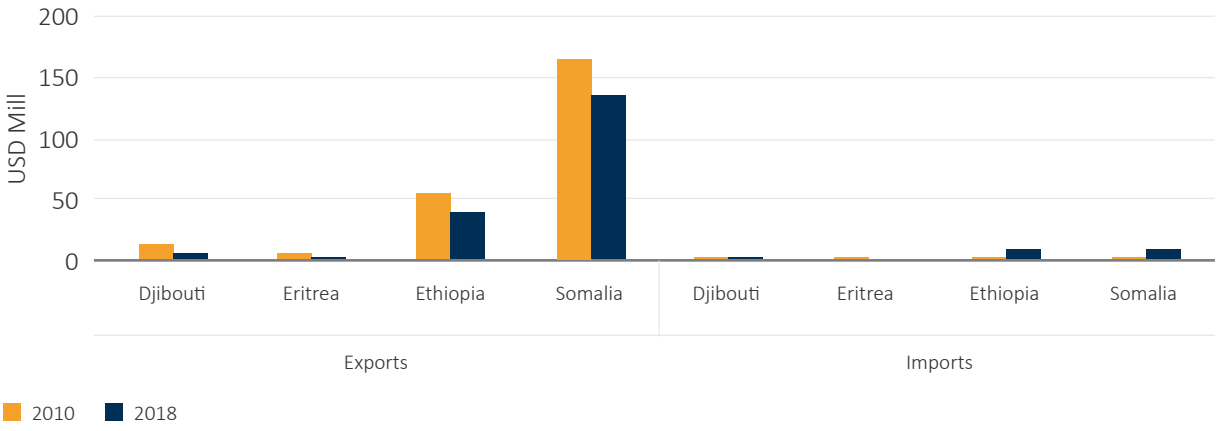



B. Imports to HoA Countries




Source: staff calculation using data from United Nations Comtrade Database.

## Figure 4: Kenya's Exports and Imports with HoA Countries: 2010 and 2018




Source: staff calculation using data from United Nations Comtrade Database.

**In general, HoA countries export agricultural products to the global economy and primarily import manufactures.**[5] Table 1 shows the sector composition of officially recorded exports and imports with the global economy in 2018. Exports are concentrated on agricultural products for Ethiopia, Kenya and Somalia while imports are mainly industrial products. Eritrea's exports are currently dominated by mineral products. For Djibouti and Somalia exports of animals are important, many of which are destinated to the middle-east. Vegetable products comprise a high share of exports from Ethiopia and Kenya reflecting the importance of coffee, tea and sesame.

Table 1: Sector Composition of Global Export and Imports of HoA Countries in 2018

| | Exports | | | | | Imports | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Djibouti | Eritrea | Ethiopia | Kenya | Somalia | Djibouti | Eritrea | Ethiopia | Kenya | Somalia |
| Agriculture | 41.92 | 0.51 | 72.92 | 62.03 | 59.96 | 20.33 | 36.35 | 6.96 | 14.89 | 46.89 |
| Industrial | 33.88 | 99.46 | 23.96 | 36.38 | 40.00 | 78.93 | 62.75 | 80.40 | 83.29 | 52.65 |
| | | | | | | | | | | |
| Animals | 27.84 | 0.04 | 4.20 | 2.02 | 53.09 | 0.66 | 1.39 | 0.23 | 0.86 | 3.98 |
| Vegetables | 13.50 | 0.39 | 67.88 | 54.71 | 13.87 | 12.78 | 24.96 | 5.14 | 9.57 | 18.70 |
| Food Products | 0.54 | 0.26 | 0.78 | 6.04 | 0.19 | 6.90 | 9.99 | 1.54 | 5.04 | 24.55 |
| Minerals | 0.08 | 71.59 | 0.72 | 4.35 | 0.06 | 0.27 | 1.77 | 0.04 | 1.02 | 0.96 |
| Textiles and Clothing | 0.55 | 0.51 | 8.11 | 8.18 | 0.06 | 10.41 | 1.53 | 8.75 | 8.65 | 9.00 |
| Footwear | 0.13 | 0.00 | 2.11 | 0.53 | 0.01 | 2.18 | 0.02 | 0.53 | 1.64 | 3.34 |
| Machinery and other manufactures | 57.37 | 27.22 | 16.21 | 24.17 | 32.72 | 66.80 | 60.34 | 83.77 | 73.22 | 39.48 |

Source: Insert source here.

Table 2: Sector Composition of Exports and Imports of Ethiopia and Kenya to HoA Countries in 2018

| | Exports | | | | | Imports | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Djibouti | Eritrea | Ethiopia | Kenya | Somalia | Djibouti | Eritrea | Ethiopia | Kenya | Somalia |
| Agriculture | 30.72 | 15.63 | 53.33 | 11.96 | 1.22 | 47.62 | 74.57 | 17.56 | 79.79 | 72.44 |
| Industrial | 69.28 | 84.37 | 46.09 | 86.64 | 98.71 | 27.63 | 25.43 | 82.44 | 20.20 | 27.54 |

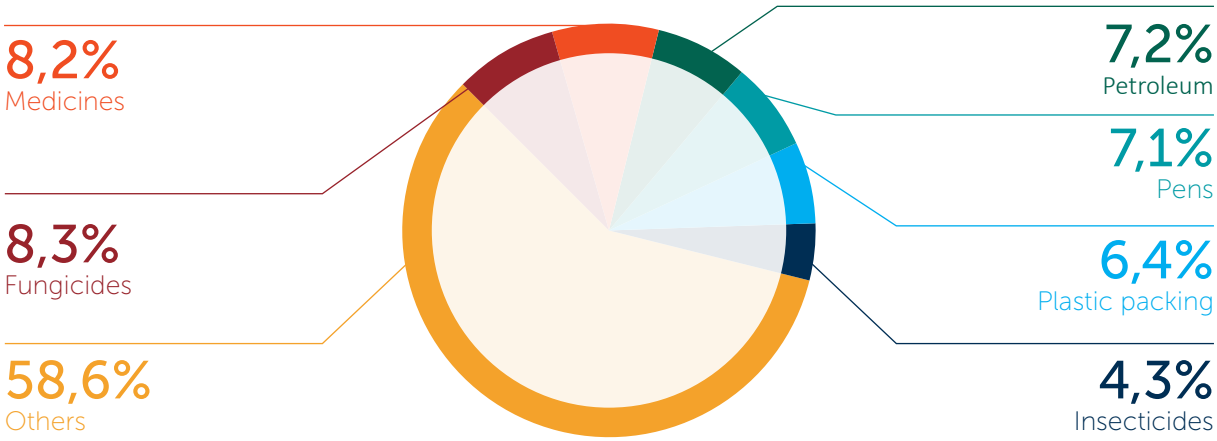
Source: Insert source here.

[5] Note again that this is based only on import and export data for Ethiopia and Kenya.

**For recorded intra-HoA trade, manufactured exports are typically more important that agricultural exports.** The share of manufactures in both Ethiopia's and Kenya's exports to HoA countries is almost double that in trade with the rest of the world. Almost all of Kenya's exports to the region are industrial products. At the same time, with the exception of Ethiopia, most countries are also primarily importing agricultural products from other HoA countries. Given the limited data, this shows that Ethiopia is the major market in the region for HoA countries exports of manufactures and the main exporter of agricultural products to the region. Somalia, the main import market for intra-HoA trade, primarily purchases vegetable products and processed food from the region.

**The product composition of Ethiopia's recorded exports to Kenya is highly variable over time.** In 2018 the leading exports of Ethiopia to Kenya consisted of beans (26.75%), cotton fabrics (11.2%), vegetables (11%), and Rye (5.2%). In 2017, Ethiopia's second largest export was maize accounting for 28% of total exports to Kenya. Prior to 2017, however, Ethiopia's official exports of maize to Kenya were negligible and the main exports were beans, footwear, cement, fruits and vegetables (Appendix 2). The surge in maize exports in 2017 was due to a huge maize shortage in Kenya following the drought crisis in that year (USAID, 2018). However, it may also be that in 'normal' times maize exports are not captured in official statistics. The officially recorded value of Ethiopia's live animal and meat exports to Kenya is almost zero. Ethiopia has an enormous supply of livestock and is major cross border livestock exporter to countries like Kenya. However, this is not being captured in official statistics. We will discuss below the available evidence on the magnitude and structure of trade flows across the Kenya-Ethiopia border that does not rely on official data. The leading exports of Kenya to Ethiopia are manufactured goods. Kenya's exports consisted of medicines (7.5 million or 11.3% exports to Ethiopia), pens (7.4 million or 11 %), petroleum (7.24 million or 10.9%), fungicides (3.4 million or 5%) and surfactant (3.42 million or 5%) (Figure 5).

Figure 5: Kenya Export to Ethiopia, 2018




Source: staff calculation using data from United Nations Comtrade Database.

**Vegetables dominate Ethiopia's recorded exports to Somalia and Djibouti.** The four leading exports of Ethiopia to Somalia in 2018 were vegetables (79%), cements (5.4 %), potatoes (4.5%) and bovine (3%). The small recorded imports of Ethiopia from Somalia show that the main traded product is soap, which accounts for 82 percent of the total in 2018. Fish and chemical products are also recorded in Ethiopia's imports. It is noteworthy, that trade in livestock between these two countries appears to

be negligible in the official statistics. Vegetables and fruits are also the main recorded export from Ethiopia to Djibouti, accounting for 20% of the total in 2018. Other products that appear in recorded exports are salt and cement (20%), road vehicle (8%) and sesame seed (3%). The very small recorded imports of Ethiopia from Djibouti include moto vehicles (40%) and sauce and preparations (31 and carboard packing containers (7%).

**Kenya's main export to Somalia in 2018 was tobacco.** Tobacco and tobacco products accounted for 28% of the total bilateral flow from Kenya to Somalia followed by vegetables (10%), edible preparations (8%) and pharmaceutical products (7%). as shown in Table 13. Kenya's recorded imports from Somalia in that year were negligible.[6]

[5] Note again that this is based only on import and export data for Ethiopia and Kenya.

[6] There was a recorded import flow of USD 8.5 million related to tanks and other armoured vehicles which is likely to be a non-market transaction.


Pampers
baby-dry
canbebe
JUMBO
Anchor
NIDO
Tasty
Chocolate

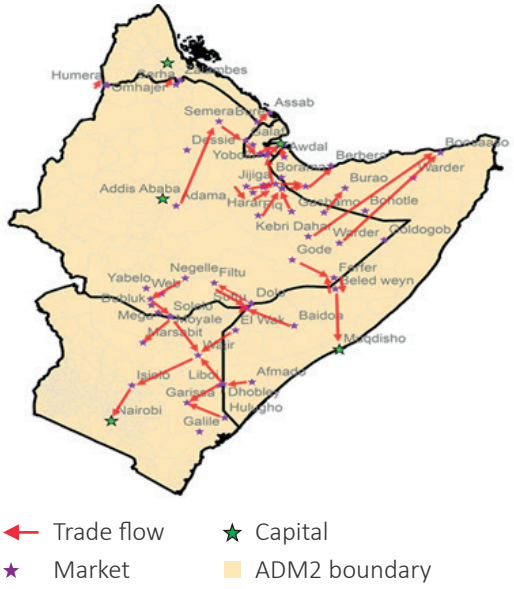
SECTION 3

# Unrecorded Cross Border Trade

## 3.1 Overview of the Region

**Unrecorded cross-border trade (UCBT) is an important phenomenon in the Horn of Africa.**[7] Studies suggest it supports about 17 million people along the different value chains, including crop farmers, brokers, crop traders, livestock-keepers, fodder suppliers, ranch owners, itinerant traders, large livestock traders and transporters ( Tesfaye and Amaha, 2018). It is estimated that this cross-border trade accounts for more than 95 per cent of total (officially recorded and unrecorded) intra-regional trade in the Horn (Little, 2007 and 2009). During 1993-2000, for example, the total value of Ethiopia's unofficial cross-border trade in livestock in the region is estimated to have averaged $105 million, 100 times greater than the average annual official livestock export trade (Halderman, 2005). Similarly, a more recent study by Habtamu et al., 2016 shows that the annual value of Ethiopia's cross-border trade in livestock with Somalia, Kenya and Puntland during 1998-2014 was estimated approximately to be at $25, $9 and $10.5 million respectively, considerably higher than the officially recorded livestock trade. Map 1 provides a snapshot of the main border crossings and documented trade routes, particularly for livestock.

Map 1: **Commodities and livestock trade routes in the HOA**

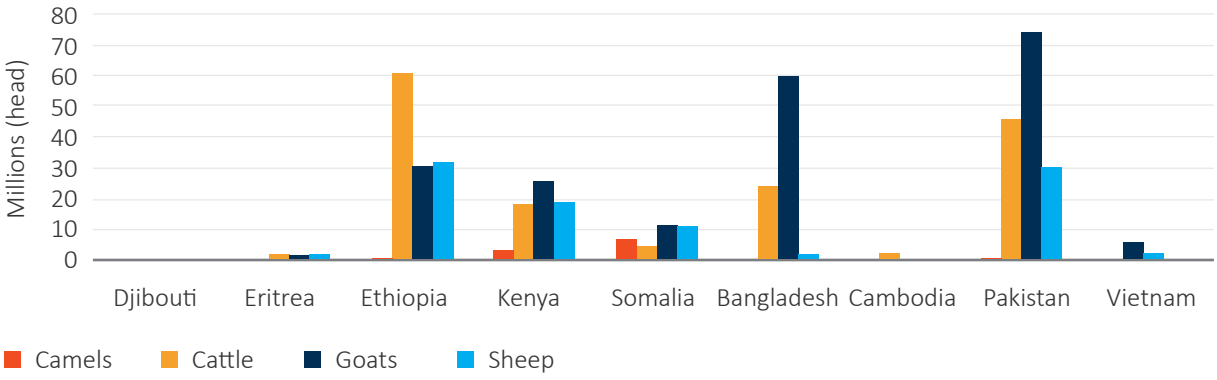



Source: staff calculation using data from United Nations Comtrade Database.

**Horn of African countries have a large potential to increase trade in livestock, both within the region and with third countries.** Figure 6 illustrates the magnitude of livestock production in Djibouti, Eritrea, Ethiopia, Kenya and Somalia. The region's highest concentrations of cattle, sheep, goats and camels are found in Ethiopia. In fact, Ethiopia has the largest cattle inventory in Africa and the 5th largest globally, behind Brazil, India, China and the United States. Kenya and Somalia have also considerable herds of cattle with 20 million and 4.7 million respectively. Somalia is home to the world's largest camel population of around 7 million. Hence, there is a huge trade potential in livestock between HoA countries.

[7] In the existing literature, many sources refer to the phenomenon described in this paper as "informal cross-border trade (ICBT)". However, this often carries a negative and unwarranted connotation as "informal" can be easily confused with "illegal". It also inaccurately reflects the reality of trade flows on the ground, as traders may indistinctly use both formal and informal crossing channels depending on a variety of factors, such as the nature of the goods, the value of their consignment, the length of the queue at the border, or the mood of the individual official on duty. The preferred terminology for this paper is "unrecorded trade" as this commerce is either missed or under-represented in official (customs) collected data at the border.

Figure 6: Livestock population of HoA versus peer countries, number of heads, 2018

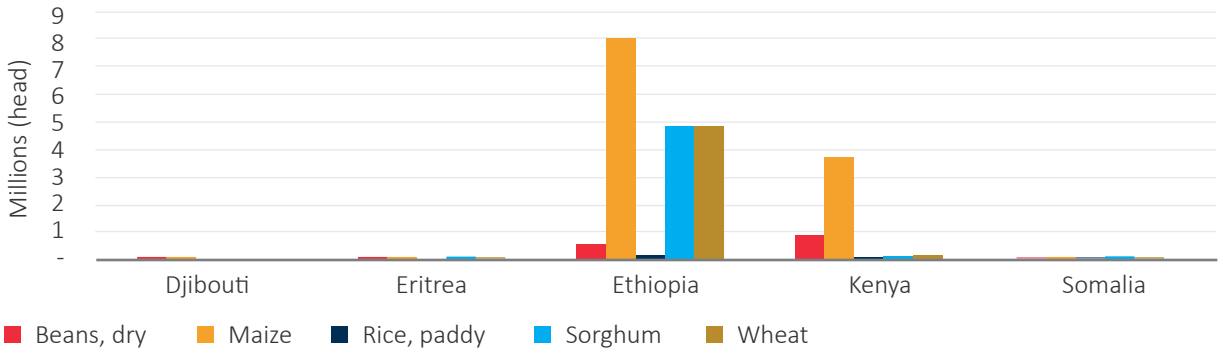



Source: FAOStat, 2020

**There is substantial potential for intra-regional trade to bring agricultural commodities to rapidly urbanizing towns and cities.** The Horn of Africa exhibits a complex structure of agriculture, within and across countries. Figure 4 shows the production of key food grains including maize, wheat, sorghum, beans and rice across the Horn counties in 2018. The region's highest concentrations of maize, wheat and sorghum are found in Ethiopia. Around 8 million tonnes of maize were produced in Ethiopia, which ranks third largest in Africa next to South Africa and Nigeria and the 14th largest globally. Ethiopia was also the second largest sorghum producer in Africa and the third in the world next to the United States and Nigeria with a production of 4.8 million tonnes. Looking at wheat, Ethiopia was the second largest producer in Africa and the 18th in the world, producing 4.8 million metric tonnes in 2018. In Kenya, maize is the principal stable food and the country produced around 3.6 million metric tonnes in 2018, makes the 6th largest maize producer in Africa. Nevertheless, Kenya faces an increasing structural deficit in maize as domestic production is unable to satisfy local demand. This is typically met by imports from regional neighbours such as Tanzania and Uganda but also by Ethiopia. Dry bean is the most important legume and second to maize as a food crop in Kenya. In 2018, the country's total dry bean production was beans (0.86 million metric tonnes) the largest in the Horn of Africa.

**Official export and import statistics do not capture the magnitude and importance of trade in livestock and food crops between the Horn countries.** Figure 7 indicates the total value of import and export in live animals and cereals within the region in 2017. Ethiopia's official live animal export in the Horn was only to Djibouti ($2.3 million) and Somalia ($1.4 million). Though there is a huge cross-border trade in live animal between Ethiopia and Kenya, there is no official bilateral trade between the two countries in 2018 (latest available data). Looking at cereals, the only official trade was Ethiopia's maize exports to Kenya amounting $13 million.

Figure 7: Food crop Production in HoA, 2018




Source: FAOStat, 2020

The paper now proceeds to provide an overview of unofficial bilateral trade between the Horn of African countries. We discuss the available information on catchment areas, main trade routes and border markets of the region. The paper then focuses on the livestock and food crop value chains in the borderlands of the region and seeks to draw attention to the economic implications of cross-border trade in the region and then finally the current state of knowledge on the major challenges that traders in the region face.

## 3.2 Ethiopia-Kenya Cross-Borders Trade

**Informal cross-border trade between Ethiopia and Kenya is substantial and vital for both countries.** A 2011 survey by the Kenyan National Bureau of Statistics (KNBS) shows that informal cross border trade with Ethiopia represents more than 25 percent of total trade between the two countries.[8] Table 3 shows the key products that are traded in the borderlands of Ethiopia and Kenya. Ethiopia's main exports include livestock, livestock products and cereals. On the other hand, Kenya's exports to Ethiopia are manufactured products including processed food.

[8] The KNBS survey covered 15 of the 24 official border stations in the country

Table 3: Goods Traded in the Ethiopia-Kenya Borderlands

| Ethiopia to Kenya | Kenya to Ethiopia |
|---|---|
| Livestock<br>Cattle<br>Goats<br>Camel<br>Sheep | Construction materials<br>Veterinary drugs |
| Livestock products<br>Milk<br>Hides and skins | Foods<br>Rice<br>Biscuits<br>Flour<br>Edible oil<br>Sugar |
| Agriculture commodities<br>Maize<br>Beans<br>Sorghum<br>Chat | |

Source: FEWS NET, 2018

## A. Livestock

**Most cross-border trade in livestock in the borderlands of Ethiopia and Kenya is unrecorded.** The pastoral communities in southern Ethiopia are closely linked with northern Kenya's markets. The incomes from livestock sales are usually used to buy finished goods and food commodities. Cattle, camels, small ruminants and recently donkeys are the main live animals traded in Ethiopia-Kenya borders.

**Ethiopia is a key source of cattle for Kenya.** Ethiopia has a strong advantage in the rearing of livestock and this is reflected in cattle prices that are up to 40% lower than cattle price in Kenya, particularly in Nairobi (Little, 2002). Hence, there is substantial scope for cross-border trade. Mohammed (2010) documents that there has been a huge annual flow of cattle from Ethiopia to Kenya through informal cross-border channels since 1970s. The trade through the Moyale trade route is substantial. For example, in 2001 more than 58,000 head of cattle were traded to Nairobi with a market value of about $11 million. More than 70% of livestock trade in Moyale markets originate in Ethiopia. A similar study analyzing livestock marketing in the Ethiopia/Kenya border area by Pavenello (2010) shows that a substantial number of castrated bulls from Ethiopia reach Kenya via the Moyale markets. On average, more than 300 castrated bulls were transiting from Moyale Ethiopia to Moyale Kenya daily during 2004 to 2009 (Table 4). Tesfaye and Amaha (2018) estimated that 70 % of castrated bulls from Borana Zone, one of the largest cattle producing zones of Ethiopia, are trekked to Moyale to be sold in Kenya markets.

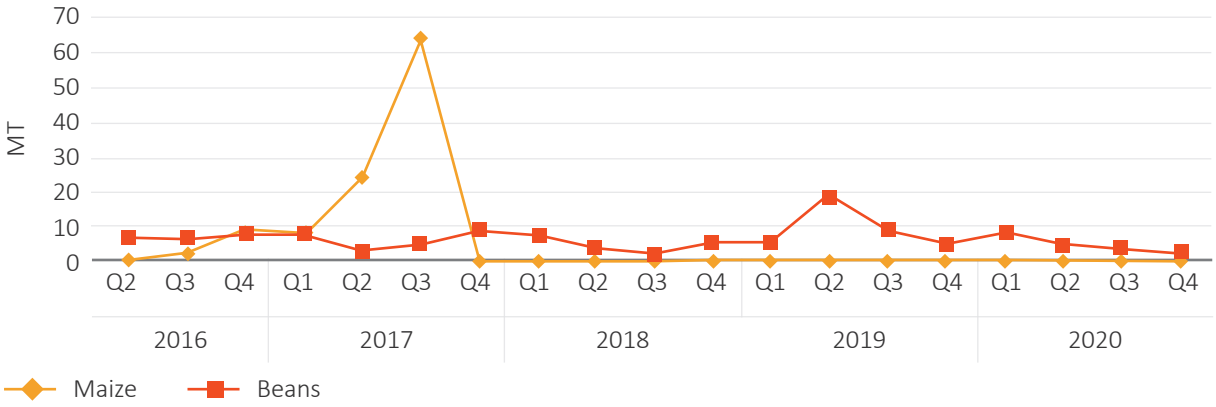
**For other animals, such as camels and sheep and goats, there are extensive regional value chains linking producers to overseas markets.** Little et al. (2015), for example, finds that a large number of goats and sheep that are processed at Ethiopia's abattoirs and then exported to the Middle East are sourced from northern Kenya via unrecorded trade channels. Sheep and goats are moved from northern Kenya into Ethiopia through Moyale and then to Elwaye and Mega in southern Ethiopia. Some of theses animals are trucked to Addis Ababa for final consumption while others are transported to Djibouti for export though series of further transactions (Tesfaye and Amaha, 2018). There is often entails two-way trade in animals across HoA borders. Camels cross from Ethiopia to Kenya while at the same time Kenya is a key source of camels to Southern Ethiopia through Moyale (Tesfaye and Amaha, 2018). The main source markets in Kenya includes Mandera, Wajir, Garisa, Bangale, Isiolo, Marsabit and Moyale. The animals are trucked to destinations in Ethiopia such as Nazaret, for further fattening and then later trucked to Djibouti to be exported.

**Increasing international demand has led to a rise in cross-border trade of donkeys from Ethiopia to Kenya.** Ethiopia's 7.4 million donkeys have increasingly been the focus of attention to fulfil a growing demand for donkey products, especially in China . However, Ethiopia has banned trade in donkey skin and meat since 2017. While Ethiopia and most other African countries have banned donkey slaughter, Kenya, in contrast has licensed donkey slaughterhouses and the export is growing each year. During 2016-2018, Kenya exported a total of 16,544 tonnes of donkey meat valued at KES. 1.72 billion (KNBS, 2019). Studies shows that the donkey population of Kenya has declined since following donkey exports in 2016. As a result, donkey traders are importing from neighboring countries to meet the increasing demand.

## B. Agricultural commodities

**Ethiopia is a major source of food in the borderlands of Kenya, especially during periods of adverse weather.** The main agricultural products traded in the borderlands of the two countries include maize, sorghum and dry beans. Ethiopia can be a particularly important source of maize for Kenya during adverse weather periods. This leads to somewhat erratic trade patterns. For example, in 2017, maize exports from Ethiopia to Kenya reached about 95,000MT, considerably higher than in years before resulting from the drought conditions in Kenya in that year. Ethiopia is also a key source of dry beans. During the period from 2016 to 2020, nearly 122,031MT of beans were exported from Ethiopia to Kenya (Figure 8).

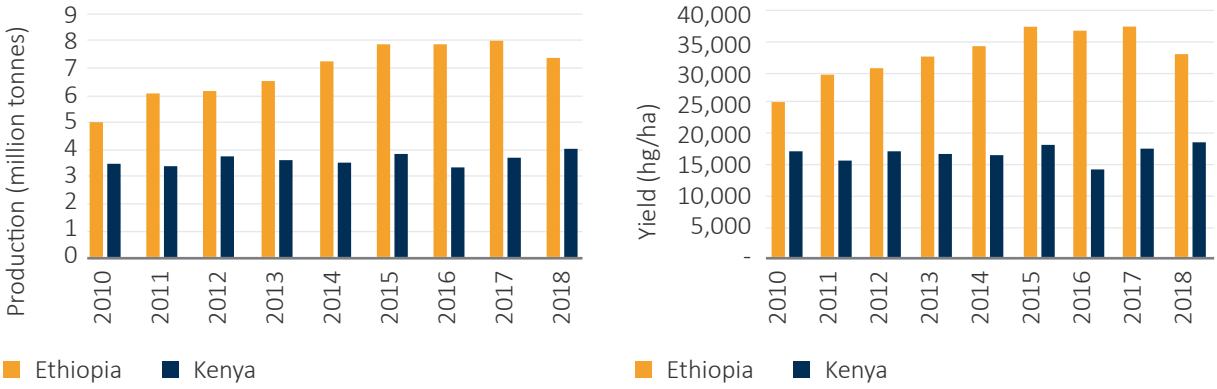
Figure 8: Cross-border maize and bean export from Ethiopia to Kenya: 2016-20




Source: staff calculation from FEWS NET, 2020

**As climate change brings the risk of more frequent extreme weather events, the importance of cross-border trade in maize and other agricultural products is likely to rise.** The scope for cross-border trade between Ethiopia and Kenya reflects the differences in production and consumption of the two countries with Kenya being maize deficient in most years. Figure 9 shows that Ethiopia produces almost twice as much maize as Kenya reflecting a larger area under cultivation but also significantly higher yields. But, measured in consumption of grams per person per day, the available evidence suggests Kenya (171) has much higher consumption per person than Ethiopia (94) (FAO, 2009). Map 2 shows the geographic structure of maize production in the Horn of Africa and the areas with the highest yields.

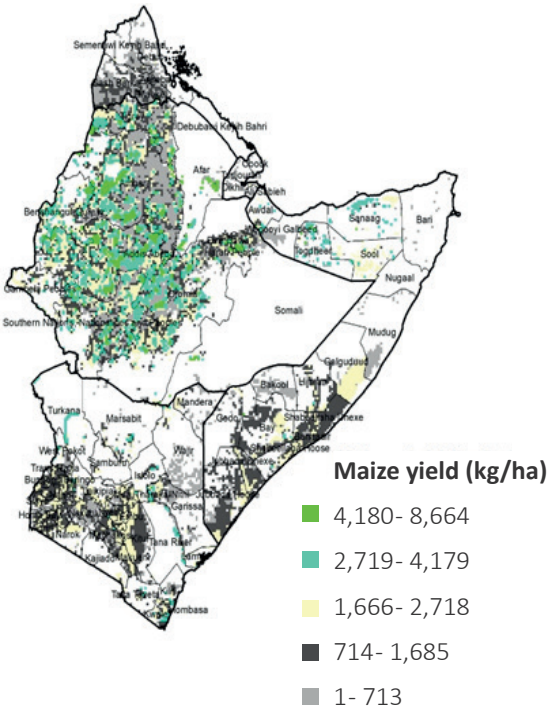
## Figure 9: Maize production and yields



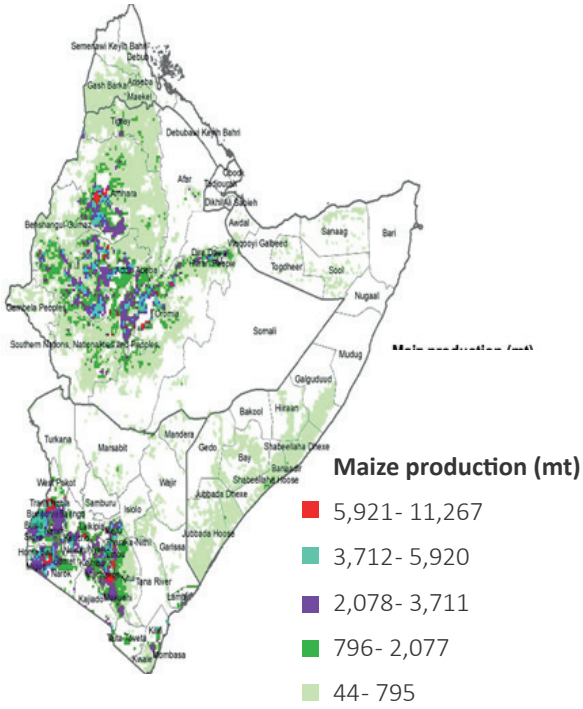

Source: FAO, 2019

## Map 2: The geography of maize production and yields in the Horn of Africa

A. Yield




B. Value of production




Source: Global Agro Ecological Zones (GAEZ), 2010

## C. Main Trading routes

There are two key cross-border trading routes between Ethiopia and Kenya (Tesfaye and Amaha, 2018).

**A. Filtu-Dolo-Suftu- Mandera, Kenya :** This trade route links the southern part of Ethiopia's Somali region to Kenyan livestock markets such as Mandera, Wajir and Garissa.

**B.Negelle-Dubluk-Moyale, Ethiopia-Moyale, Kenya:** This route, on the other hand, links Oromia's region of Ethiopia to Moyale Kenya. The great majority of cattle sold in Moyale Kenya originate from markets mainly in Borana zone in Ethiopia. Among others, Dubluk, Harobake, Arero, Dhas, , Taltale, and Hiddilola are the main cattle marketing centers in Borana zone. Dubluk, located 635km south of Addis Ababa along the main route to Moyale is the largest market in Oromia region, with approximately 1,000 animals offered for sale per market day (Pavallona, 2010).

Table 5: Catchment areas and markets

| | Catchment areas | Markets | Terminals | Net flow |
|---|---|---|---|---|
| Cattle | *Oromia:*<br>• Arero<br>• Dhas<br>• Harobake<br>• Taltale<br>• Dubluk and<br>• Hiddilola<br><br>*Somalia:*<br>• Web<br>• Dolo | *Oromia*<br>• Sololo<br>• Moyale<br>• Somalia<br>• Moyale<br><br>*Kenya*<br>• Moyale<br>• Mandera<br>• Garissa | • Nairobi<br>• Isiolo<br>• Mombasa | Ethiopia-Kenya |
| Camel | *Kenya:*<br>• Mandera<br>• Wajir<br>• Garisa,<br>• Bangale<br>• Isiolo<br>• Marsabit | • Moyale | *Oromia*<br>• Adama | Kenya-Ethiopia |
| Goat and sheep | • North Kenya<br>• Southern Ethiopia | *Borana*<br>• Elwaye<br>• Mega | Addis Ababa Nairobi | Kenya-Ethiopia |

Source: Pavallona, (2010) and Tesfaye and Amaha (2018)

**Moyale and Mendera are the two main livestock trading hubs across the border between Kenya and Ethiopia.**[9] They connect prime livestock-producing areas of southeastern Ethiopia and southern Somalia to Kenya's largest livestock markets, including Garissa, Nairobi and Mombasa. The Moyale trading hub is located in the administrative center for two woredas in Ethiopia;

[9] Moyale is located about 595 km from Nairobi and 675 km from Addis Ababa. It is split between the two countries: the larger portion being in Ethiopia (in the Oromia Region) and the smaller in Kenya (i.e. the capital of the Moyale district).

Moyale of Somali region and Moyale of Oromia and Moyale District of Kenya. Moyala Somalia is a main market for camel while Moyale Oromia is for cattle. Other cross border markets near Moyale are Sessi, Arbale, Somare and Lammi (Tesfaye and Amaha, 2018).

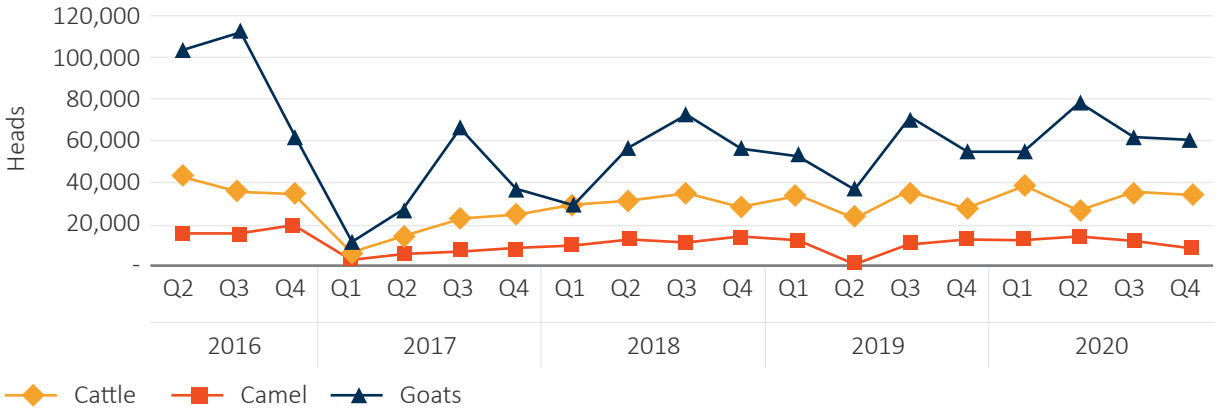
## 3.3 Ethiopia-Somalia Cross-Borders Trade

**The main products traded along the Ethiopia-Somalia border are livestock such as cattle, sheep, goats and camels and commodities such as maize, sorghum, rice, pasta and sugar.** Several studies have documented that the movement of livestock trade in the Somalia corridor is the largest in the world, although the information is dated, the estimated annual trade was $200 million in 2008 (Majid, 2010). Looking at the direction of flows, livestock and food crops flow from eastern Ethiopia to Somaliland. Whereas rice, pasta, wheat flour, sugar and other imported consumer goods flow from Somaliland to eastern Ethiopia (Little, 2002 and FEWS NET, 2020). The main livestock catchment areas in Ethiopia are from Somalia regional pastoralists such as Gode, Liban and Afder. Several reports indicate that besides domestic consumption, cattle crossing eastern Ethiopia to Somalia are then exported to middle eastern markets. Little (2002) and Tesfaye and Amaha (2010) find that approximately 50 percent of livestock exports from the Port of Berbera originated in Ethiopia. In 2011, more than 3 million live animals were exported from Somaliland to Middle Easter countries, a large percentage was originated from Ethiopia (Little 2015). For cross-border trade between central Somalia and eastern Ethiopia, Ethiopia's main export is coffee, goats, sheep, camel and Khat while imports from central Somalia include pasta, wheat flour and food crops ( Little, 2002 and FEWS NET 2020).

**The volume of cross-border livestock trade between Ethiopia and Somalia is substantial, with most of the animals being further exported to the Gulf countries.** Figure 10 presents the volume of unofficial cross-border exports of livestock from Ethiopia to Somalia during 2016-20.[10] Livestock trade in the border increases seasonally in the third-quarter mainly due to extended high demand both regional and in Middle Eastern Gulf States during the Haj festivities in August. Cattle trade has increased substantially in recent years, from 66,000 in 2017 to 131,129 heads in 2020, an increase of almost 100%. Ethiopia is the main source of goats exported to the middle eastern countries via Somalia much of which is unrecorded in official statistics. Exports over the last five years (2016-2020) have averaged above 200,000 head. Somalia is home to the world's largest camel population. Nevertheless, there are still substantial imports of camels from Ethiopia.

[10] These data are based on FEWSNET data from five border crossings, Togwajale (Wajale), Bohotle, Goldogob, Beled weyn and Bula Hawo.

Figure 10: Cross-border livestock exports from Ethiopia to Somali, 2016-20

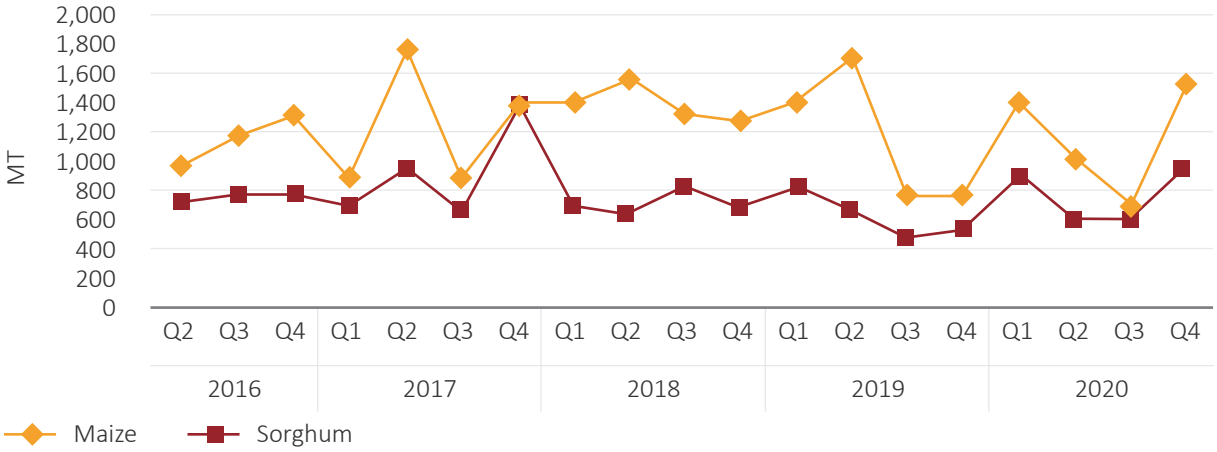



Source: FEWS NET, 2020.

## Maize

Between 2016 and 2020, a total of more than 23, 000 MT of maize was informally imported from Ethiopia to Somalia (Figure 11). The highest import was recorder in 2018 partly due to the fall in domestic production of maize in Somalia in this year. The April-to-June three year average (1,700) MT) was 25 percent higher than the first quarter and 40 percent higher than the third quarter average (Figure 11). In addition to maize, Somalia import sorghum from Ethiopia. Its import was totaled 9131 MT during 2016 and 2020.

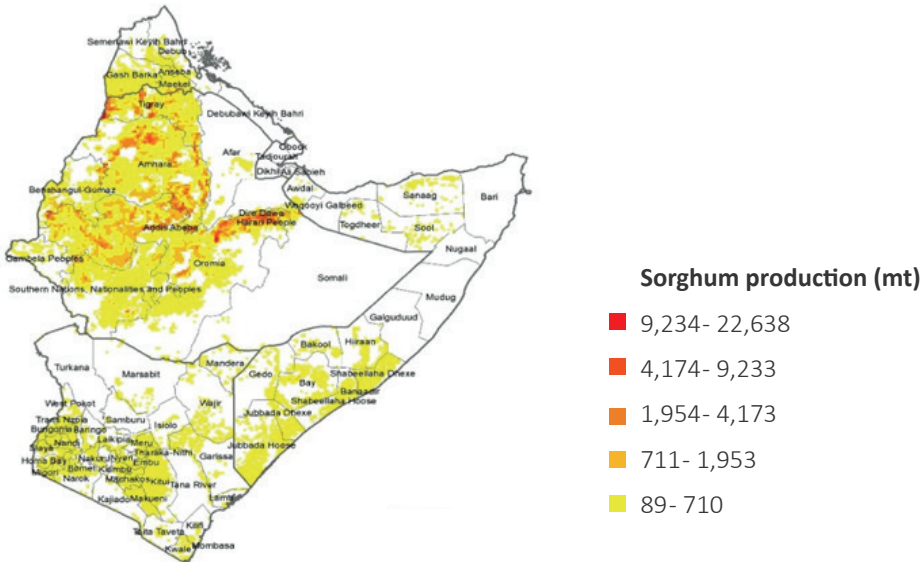
Figure 11: Cross-border maize and sorghum exports from Ethiopia to Somali,2016-20




Source: staff calculation from FEWS NET, 2020

## Map 3: The location of sorghum production in the Horn of Africa

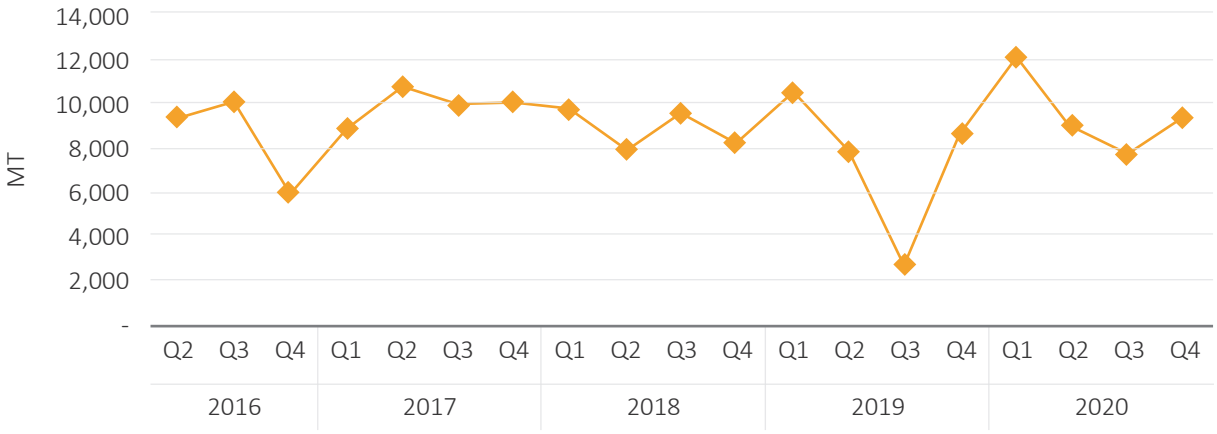
Sorghum production




Source: Global Agro Ecological Zones (GAEZ), 2010

**Ethiopia imports a large amount of rice from Somalia.** The available evidence suggests that this is re-exported rice previously imported from outside of the region (FEWS Net, 2017). Figure 12 shows that between 30 and 40 thousand tons of rice has been imported from Somalia in each of the last three years. However, with the increase in domestic production of rice in Ethiopia, the import has declined by 35 percent between 2017 and 2019 (Figure 12).

## Figure 12: Cross-border rice export from Somalia to Ethiopia, 2016-20




Source: FEWS NET, 2020

## Main Trade Routes

**Unlike Ethiopia-Kenya trade, the Ethiopia-Somalia cross border trade routes are clan based.** A large proportion of livestock especially goats and sheep, come from areas populated by members of the Ogaden clan. The Ogaden clan inhabits much of the interior of Ethiopia Somalia region, while clans such as the Isse, Gadabursi, Isaaq, Dhulbahante and Marehan straddle the borders of Ethiopia and Somalia. The majority of trade in the borders involves the movement of animals across clan and national boundaries.

There are three main cross-border livestock and crops corridors between Ethiopia and Somalia (Umer, 2007; Majid, 2010):

**A. Berbera corridor:** The cross-border trade between the two countries goes through the Berbera corridor, coming from different trade routes. Currently, the main trade routes feeding the Berbera corridor are:

1. Tog wajale-Hargesia-Berbera: this is a route that assembles livestock coming as far as Adama (Nazaret) and the northern parts of Somali region. Tog wajale is a town located in northwest Somalia on the border with Ethiopia, 230 KM from Berbera port. It is a vibrant market that handle both formal and informal trade between the two countries. It has been one of the largest livestock as well as commodities markets center at the border. As such a modern livestock market center was built in 2006, a fenced enclosure for holding animals and a rump for loading livestock onto trucks.

2. Hart Sheikh–Hargeisa: In this route livestock from markets in Somalia region such as Fiq, Kebri Dehar and Degeh Bur are assembled and trekked or trucked to Hart Sheikh and then to Hargeisa, Somaliland. This trading route is also used in reverse direction to bring livestock from Somaliland and sell them in Harta Shiekh market, Somali Region.

3. Dire Dawa/Harar–Jijiga–Hargeisa–Berbera: This route connect traders from Harar and Dire Dawa to Jigjiga which is the largest center of the Somalia region in Ethiopia. It is an important livestock market centers serving as an assembly point for livestock coming from Fiq town and surrounding areas of Jigjiga for export prior to 2010.[11] Another catchment area near to Jijiga is Lefe Isa, an important livestock trading centre, especially for fattened cattle from areas like Adama (Nazret).

4. Gode-Gashamo-Burco-Berbera: This route serves mostly livestock coming from Gode, Afdher and Degeh Bur zones of Somali Region. The livestock that goes through this route passes through Burco town, in eastern Somali before it reaches the port city of Berbera.

**B. Bosasso corridor :** This route connects livestock traders from Ogadeni, Marehan, Dhulbahante and other clans of the eastern Somali Region of Ethiopi with Bessaso, Somalia. The main marketing borderlands are:

- Warder routes - Bosasso
- Kebri Dahar–Bosasso

**C. Mogadisho corridor:** The route is centered on Belet Weyne, an important agropastoral area of Shebelli Valley, central Somalia. It connects Somalia region of Ethiopia and Mogadisho. It has a relatively low cattle price.

[11] Recently, federal authorities in Ethiopia sought to exert greater control over transactions at the Jijiga market and hence the cross-border trade has significantly reduced. The trade has shifted to Kabri-bayah and Harta Shiekh (EID, 2014).

Table 9: The flow of livestock and crops between Ethiopia and Somalia

| Markets in Ethiopia | Markets in Somalia | Ports |
|---|---|---|
| Tog wajale | Hiran | Berbera |
| Jijiga | Galgadud | Bosaso |
| Lafa Isa | Mudug | Mogadisho |
| Gode | Borama | Kismayo |
| Liben | Belete Weyne | |
| Afder | Wajale | |
| Harar | Buholde | |
| Hargeisa | Goldogob | |
| Burco | Bula Hawo | |
| Kebri Dahar | | |
| Teferi Ber | | |
| Fiq, Qoraxay and Degeh Bur | | |

Source: Majid, 2020; Little, 2002

## 3.4 Ethiopia - Djibouti Cross-Borders Trade

**Ethiopia is the main source of livestock for Djibouti's re-exports of animals and livestock products (hide and skins) to the Middle east countries.** While officially recorded trade has been declining, the actual amounts of exports, dominated by livestock, has been increasing (Tesfaye and Amaha, 2018). The main catchment areas in Ethiopia that supply cattle, goats and sheep are Afar and Somali regions. The direction of flow of animals is entirely from Ethiopia to Djibouti. In addition to trade in livestock there are small flows of vegetables and fruits, spices, grained bean and pepper, animal products such as milk, butter and honey (Taka and Azeza, 2002; 20Majid, 2010; Habtamu et al, 2016, Tesfaye and Amaha, 2018).

Table 10: Ethiopia-Djibouti cross-border trade

| Ethiopia to Djibouti | Djibouti to Ethiopia | Catchment area (livestock) | Trade routes |
|---|---|---|---|
| Khat<br>Cattle and Camel<br>Hide and Skins<br>Vegetables and Fruits | Cigarette<br>Cooking oil<br>Pasta, Macaroni, Wheat flour<br>Rice | Dessie, Mille, Semera, Gewane<br>Diredawa , Dewele | Galafi, Yoboki and Dikhil<br>Galile, Ali Sabih, Balbala,<br>Dibouti |

Source: Teka and Azez, 2002, FEWS NET, 2017

**Khat (chat):** Ethiopia's nearly half a million hectares of land are believed to be allocated to Khat production (Feyisa & Aune, 2003). Currently Khat production is estimated to be three times more than it was grown in early 2000s. Many farmers switched to cultivate khat from coffee and other crops, due to its higher and more stable returns. Khat is now among the top export products of Ethiopia. The main trading partners are Djibouti and Somalia. According to the study by Belawi (2014), the daily demand of Chat for Djibouti is more than 20 tonnes. However, the demand fulfilled through informal exporters from Ethiopia (Habtamu et al, 2016). The main collection centers are Awday and Haraghe highlands (Bedessa,, Chelenko, Felana, Karamille, Kobo Kulubi) (Taka and Azeze, 2002). Sorghum is the main stable food exported from Ethiopia to Djibouti amounting to 4000 tons in the first quarter of 2020.

## Main Trade Routes

There are two main trade routes from Ethiopia to Djibouti ((Habtamu et al, 2016).)

**I) Galafi---Yoboki---Dikhil---Balbala:** This route connects the northwestern Ethiopia to Djibout. Galafi is an important livestock market centers serving as an assembly point for livestock coming from Northwestern Ethiopia markets such as Adama, Dessie, and Semera. It is connected to Djibouti's main territory market of Balbala in the capital city of Djibouti by road and rail with Yoboki and Dikhil markets lining this transport corridor.

**II) Galali----Ali Sabih----Balbala:** In addition to Galafi, the cross-border trade between Ethiopia and Djibouti takes place through Galile. This market linked with Balbala (main market) through Ali Sabieh by railway. Dire Dawa and Dewele are among the main assemble point in this trade route.

## 3.5 Ethiopia - Eritrea Cross-Borders Trade

Teff and sorghum were the main staple food traded between Ethiopia and Eritrea before the war and border closure. Following the end of the war, there has been some small-scale cross-border trade, especially the more important informal cross-border exports of teff from villages around Tsorona, Ethiopia to Eritrea (Loura, 2003). The trade takes place through third countries. Majid (2010) documents that teff was being brought from Ethiopia through Djibouti and Dubai to Massawa. Following the Ethiopia-Eritrean peace deal in 2018, both countries reopened border crossings and cross-border trade flourished with no issue of currency exchange. Teff, edible oil, fuel, red pepper, cement, and charcoal were the main products Eritrea imported from Ethiopia (Ethiopia Ministry of Revenue, 2020). Ethiopia was importing sheep, garments and electronics from Eritrea. However, this was short lived as Eritrea closed border crossings in 2019.

## Main Trade Route

The main trading routes between Ethiopia and Eritrea are:

- Djibouti – Massawa
- Dubai- Massawa
- Bure – Assab
- Zalambesa-Serha
- Humera -Omhajer

## 3.6 Somalia - Kenya Cross-Borders Trade

**There is a significant cross-border trade in livestock (cattle, camel, goats and sheep) and agricultural commodities between Somalia and Kenya (Table 14).** Though the volume of cattle traded varies depending on the availability of pasture and water, Awuor (2007) estimated that around 65,000 cattle per year enters Kenya markets from Somalia. Rice, pasta, sorghum and food aid maize are the main primary agriculture commodities traded between Kenya and Somalia (Table 14). Northeastern province of Kenya is pastoralist and hence their agriculture production is very small. Sorghum, imported rice and pasta moves from Somalia to northeastern Kenya.

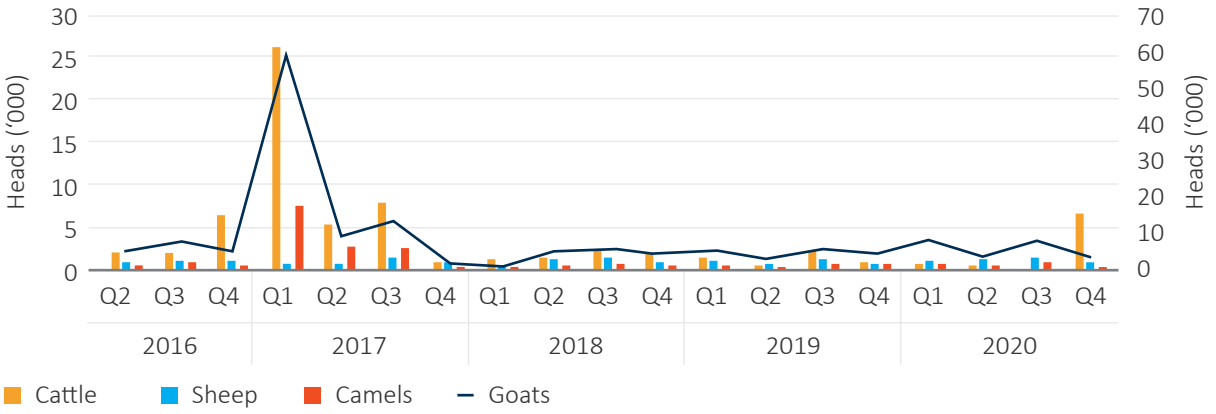
**The main trading border routes between Kenya and Somalia are Bula Hawo-Mandera and Afmadow-Liboi-Garissa.** The Bula Hawo and Mandera trade routes connect Northeastern Kenya and Southwestern Somalia. It is a key route for exporting to Kenyan markets such as Nairobi. Liboi, a town in Southeastern Kenya at the border with Somalia is another major town where cross border trade is important. It connects Afmadow, a prime area for cattle pastoralism in Somalia with Garissa, Kenya's second largest market that hosts animals from Somalia. Little (2012) finds that Afmadow accounted for about 25% of cattle supplied to traders in Kenya during the period between 1996 and 1998. Figure 14 presents the volume of livestock (cattle, camels, goats and sheep traded unofficially across two selected borders, Bula Hawo and Doble, in Somalia and Kenya. Currently cross border trade appears to be suppressed compared to 2016/17. Rice is a key product flowing from Somalia to Kenya but is likely mainly re-exports.

Table 14: Somalia-Kenya cross-border trade

| Somalia to Kenya | Kenya to Somalia | Trading routes |
|---|---|---|
| Cattle<br>camel<br>Goats and sheep<br>Rice<br>Pasta<br>Sorghum<br>Food aid maize | Mirrah[12]<br>Maize<br>Tea<br>Sugar | Bula Hawo-Mendra<br>Afmado-Liboi-Garissa<br>Doble- Garissa |

Source: Little, 2015

Figure 14: Cross-border rice export from Somalia to Ethiopia, 2016-20



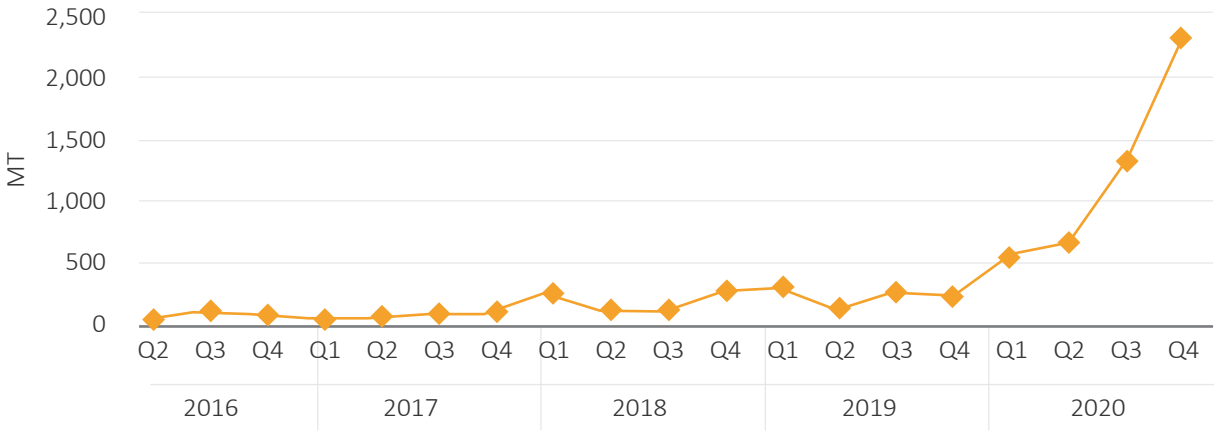

Source: FEWS NET, 2020

12 Mirrah is a mildly narcotic leave (Little, 2015).

## 3.7 Somalia-Djibouti Cross Border Trade

**Sorghum is the main food crop traded between the two countries.** There is no official trade between Djibouti and Somalia. However, there is a large amount of informal cross-border trade between the two countries. For example, about 10 percent of food crops consumed in Djibouti come from Somalia.[13] Sorghum is the main food crop traded in the border areas of the two countries Figure 15 shows that the amount of Sorghum traded between the two countries increased substantially in the period between 2016 and 2020. There are also other food commodities such as lentils, beans, pasta and maize and fruits and vegetables such as mango, watermelon and onions exported from Somalia to Djibouti but the amount is insignificant. Looking at livestock cross-border trade, significant number of cattle, camel and goats were crossing from Somalia to Djibouti for eventual export to Saudi Arabia. However, livestock cross-border trade from Somalia to Djibouti has significantly reduced following Saudi Arabia's lifting of the Somali livestock ban in 2016.

Figure 15: **Cross-border Sorghum export from Somalia to Djibouti, 2016-20**




Source: FEWS NET, 2020

### Main Trade Route

**Loyada – Balbala:** Loyada is the main entry point for staple goods into Djibouti from Somalia. It is located on the border between Djibouti and Somalia, 13 km from Djibouti city. The main commodities traded through this routes include food commodities cereals and legumes (sorghum, lentils, beans, maize) and fruits and vegetables (watermelon, onions). Loyada market plays an important role in enhancing food security in Djibouti.

[13] About 90 % of the food commodities traded come from Ethiopia (FEWS NET, 2010).

SECTION 4

# Value chain in livestock and food crops

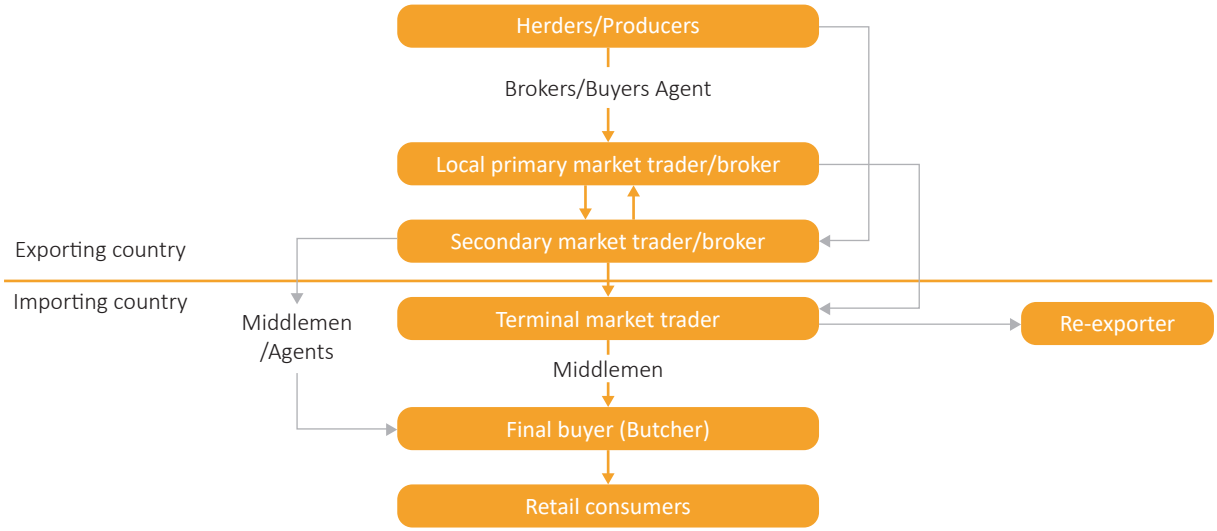
## Livestock value-chain

**The Horn of Africa livestock value chain has developed over the years into a complex structure involving a wide range of stakeholders including producers (herders), brokers, feed and water suppliers, traders, transporters/trekkers, processors, exporters and consumers.** Figure 16 depicts the general value chain for livestock that starts with the collection of animals from farm gates moving on to local primary markets (collection markets), and then to secondary markets (regrouping markets) where livestock are regrouped and sorted into different classes based on appearance, size, color and conditions and then on to terminal markets and final buyers. If a primary market is near a border, cross-border traders purchase animals from farmers

for onward sale in a terminal market, which may be in an overseas country. Secondary markets are relatively larger than primary markets, usually they are the main trading center in a district. The main actors in these markets include pastoralists, local butchers, middlemen and export traders. Pastoralists may directly sell their animals at secondary markets or purchase breeding stock. Brokers purchase animals for reselling to the butchers. Exporters purchase animals and further fatten to export to overseas markets. However, while this summarises the broad structure of the value chain processes and interactions between actors in the value chain are casual and change to suit the nature of the border.

**Pastoralists and agro-pastoralists are the main supplier of livestock in the Horn of Africa.** Smallholder farmers in arid and semiarid areas of the Horn are dependent on trade in livestock and livestock products. They are main supplier of animals at primary or collection markets. Farmers (herders) also sell directly to secondary market traders at secondary or regrouping markets. Pastoralists are often located in remote areas, at times in inaccessible terrain, far from town centers. When primary or secondary markets are far away from the farm gates, farmers hire trekkers to move their animals over several kilometers to reach to these markets. Long distance trekking is common particularly in Kenya-Somalia borders (Little, 2015).

Figure 16: Livestock value chain in the Horn of Africa

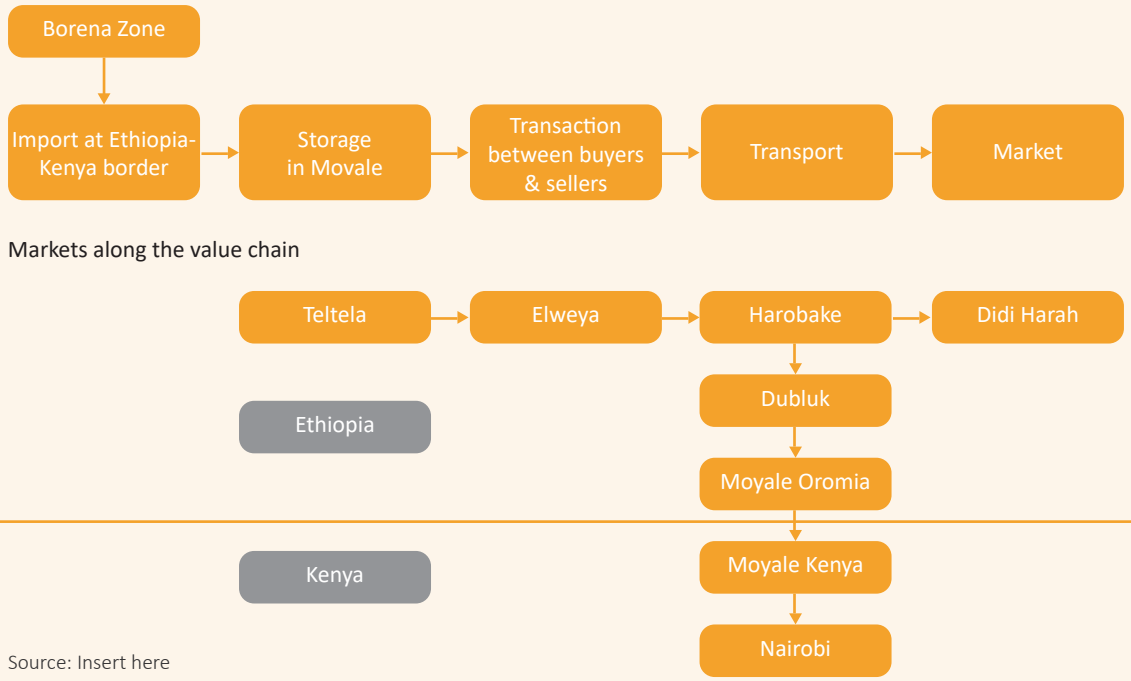



Source: FEWS NET

Box 1: Cattle value chain from the Borana Zone (Ethiopia) to Nairobi (Kenya)

Figure B1 presents the value chain for cattle along the Moyale corridor. The largest share of cattle sold in Moyale, Kenya are supplied from lowland pastoralists in Borana zone, Ethiopia. As shown in the figure, there are at least three primary local markets including Teltele and Elweya markets on the west of Harobake and Didi Hara east of Harobake. Pastoralist or small traders who collect cattle from these markets trek to sell on to medium traders at Harobake livestock market. From there, they are trekked Dubluk for sale to large and cross-border exporters. Large traders then move the cattle again to Moyale Oromia for cross-border trade to Moyale Kenya. From Moyale Kenya, cattle are then trucked to Nairobi, 730km away, where they are finally slaughtered (Pavanello, 2010).

Figure B1: Cattle value chain along the Moyale corridor

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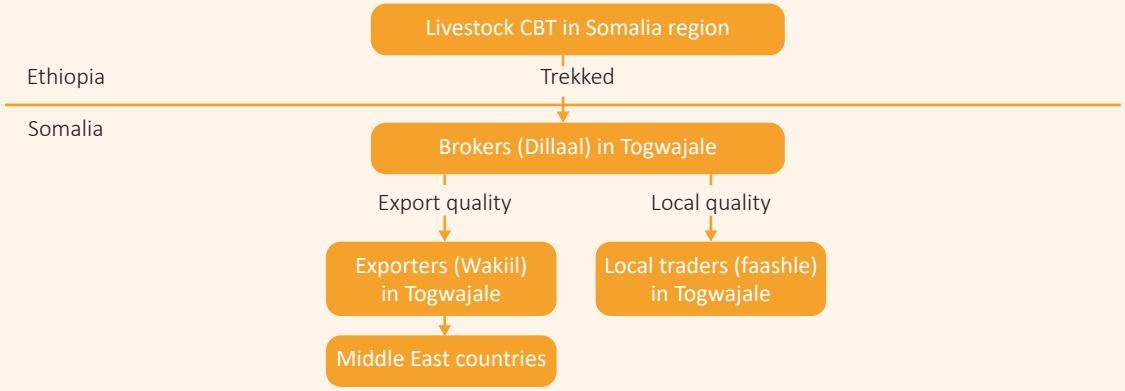
## Box 2: Livestock value chain in Togwajale

Figure B2 present a summary of the value chain for livestock trade along the Togowajale. As shown in the figure, livestock is trekked mainly from Somali region of Ethiopia to Togwajale. In Togwajale market center, livestock are sorted in to two groups: export quality and local quality. The export quality livestock are purchased by export traders or their agents (wakiil), while local quality animals are purchased by local traders (faashle). The trade in livestock between pastoralist and exporters is facilitated by Brokers (Dillaal), who are respected by the community (FEWS NETS, 2013).

Figure B2: Livestock value chain along the Togowajale corridor attle value chain along the Moyale corridor




Source: FEWS NETS, 2013

The key features of the livestock value chain the region include (i) clan-based and trust-based trading (ii) the role of price setters (iii) quality grades and standards (iv) fattening to improve return:[14]

**Clan-based trading:** Cross-border trade in the Horn of Africa is sustained by high levels of social capital among key market actors. Mohamed (2008) document that livestock sales are transacted mainly based on ethnic and familial ties. This could be due to the uncertain business environment, absence of strong institutional or judicial intermediation and formal systems of credit enforcement, weak infrastructure, limited market support services and prevalent insecurity in pastoral areas. In the absence of ethnic ties, a trust-based network of pastoralists, intermediates, traders and final buyers is important (Awour, 2007). Though clan-based and trust-based marketing facilitate trade, they can also distort the livestock market in the region (Little, 2007). It may result clan-controlled monopoly market. For example, in Ethiopia's Oromia region, there are two ethnic communities namely Garri and Borana that are involved in Ethiopia-Kenya cross-border trade. In Ethiopia-Kenya trading routes, traders of Garri ethnicity do not participate in Borana dominated markets such as those at Harobake and Dubluk (Pavanello, 2010).

**Price setting:** There are many factors that determine livestock prices in the Horn of Africa such as drought, holidays, seasons (Awour, 2007, Little 2015). On average, livestock prices decrease during droughts as their weight declines. On the other hands, prices tend to rise during holidays when meat is in high demand. For example, in Somalia the Muslim Hajj period (between July and September) causes sharp increase in price of cattle and small ruminants (Musa et al, 2020). In terminal markets, however, butchers and middleman are the main price setters (Awour, 2007). In general, along the value chain, the price gets lower all the way down to the pastoralist.

**Quality grading and standards:** In spite of constraints related to scientific capacity, livestock collectors in the Horn of Africa grade and standardize animals based on breed. Breed standard covers observable qualities of animal such as color and appearance, size and region of origin. In the case of goats and sheep grading, hair or wool characteristics are used in addition to color, appearance and region of origins (Samuel et al, 2000).

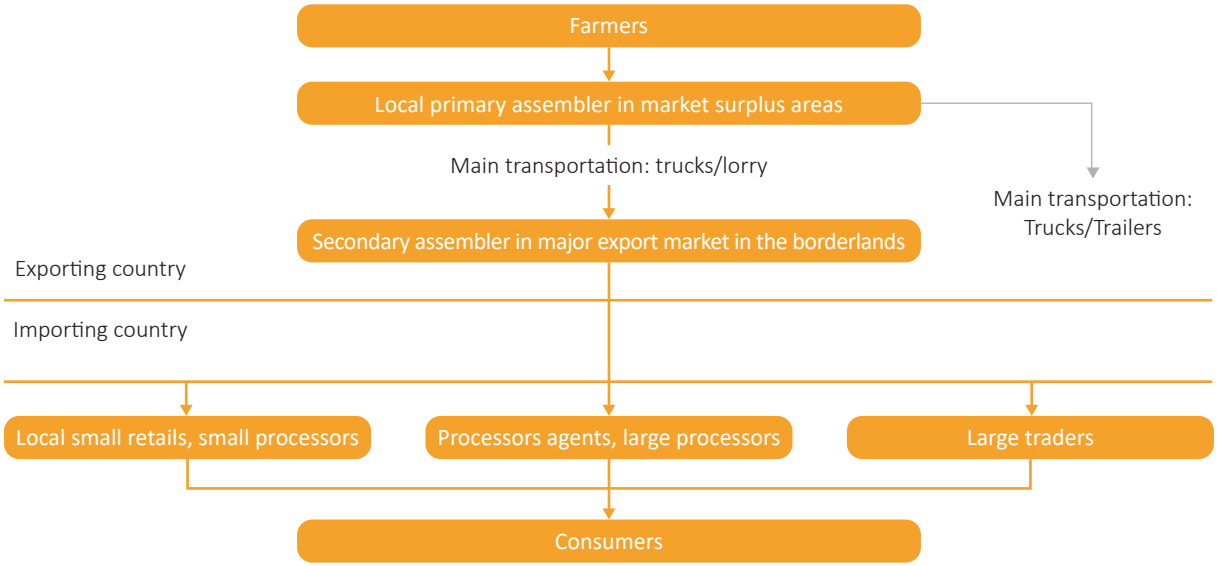
**Fattening:** Along the value chain, small and large livestock traders in the Horn of Africa buy animals from primary and secondary markets for fattening. For example, in Adama city (92 KM away from Addis Ababa), there has been a large private feedlot that buys and fattens cattle for sale for domestic as well as cross-border traders. They use agricultural processing by-products from the flour factory, oil mills, feed shops and crop mills for fattening the cattle ((Akiliu 2002). Similarly, in Somalia, middlemen purchase and fatten animals for up to two years before selling them. Recently, however, fattening practice has been declining due to constraints related to land access and the high cost of fattening products. Moreover, from the demand side, butchers' demand for fattened cattle is low and offer reduced prices compared to pasture-fed cattle on the notion that the meat from these animals has a lower shelf life.

[14] (Little and Mohamoud, 2005, Awour, 2007; Mahmoud, 2008).

## Agricultural commodities value-chain

**The key cross-border agricultural commodities traded between Horn of Africa countries are maize and maize flour, wheat and wheat flour, rice, sorghum and sorghum flour** (East Africa Cross-Border Trade Bulletin, 2019). In general, the process and main actors in the agricultural commodities value chain in the Horn of Africa are shown in Figure 17. The great majority of agricultural commodities are produced by smallholder farmers who sell mainly to local primary assemblers. Local assemblers are small traders who bulk crops, vegetables and fruits from market surplus areas for onward sale to larger domestic and export markets. They may also be agents of secondary markets assemblers. Local assemblers usually purchase commodities on local market days, especially during harvest seasons. They may also collect commodities from farms. In most cases, they use hired vehicles, non-motorized transport (donkey and bicycles) or small trucks to collect commodities from local markets or farms to their stores (Awuor, 2007). Accumulated agricultural commodities from surplus areas are then transported to major export markets near or along borders. These markets usually have storage facilities. Export assemblers in export markets dry, sort, weigh, and package commodities for export. Importers come to these markets to inspect, choose and purchase commodities. Importing traders have at least three options in selling their commodities: i) small retailers some of whom have small millers of maize, millet and sorghum, ii) large processors that usually receive high quality products, iii) large traders for onward sale to processors, humanitarian organizations or reserves (Awuor, 2007).

Figure 17: Value chain in Crops




Source: FEWS NET, 2013

SECTION 5

# Impact of Cross-Border Trade

**Cross-border trade is an important part of the economies of HoA countries.** In the Horn of Africa, it is estimated that cross-border trade supports about 17 million people including pastoralists, agro-pastoralists, small and medium local traders, cross-border traders, brokers, butchers, trekkers and others (OECD, 2017; Tesfaye and Amaha, 2018). Among others, cross-border trade in the region contributes to greater food security, enhanced income earning opportunities and reduced poverty, generating employment opportunity for poor households particularly for women (see for example, Aklilu, 2002, Little, 2005, Mohammud, Mejid, 2010, Pavenello, 2010 Bouet et al, 2018).

**Cross-border trade in the Horn of Africa is crucial for food security, improving food availability, food use and stability in the region.** Little (2010) documents that trade in the border areas facilitates cross-financing in trading agriculture products. In many parts of the region

the income from livestock and livestock products trade is used to subsidize grain and other food consumptions. This is particularly the case for herders living in food deficit zones. For example, along the Ethiopia-Somalia trade routes, income from livestock trade to finance grain imports has improved food security in the area (Umer, 2007). This has been also documented along other routes including southern Ethiopia-northern Kenya (Teka et al 1999; Mahmoud 2003), southern Somalia-northern Kenya (Little 2000; 2006), and eastern Ethiopia-Djibouti (Teka and Azeze, 2002).

**There are three main channels through which cross-border trade affect the food security in the border areas (Take (2001)):** First, cross-border trade increases and broadens available market supply and demand for livestock and food crops in the region. Hence, pastoralists in the borderlands benefit from the increase in demand for their animals and commodities. For example, Togwajale market is key to food security of households in catchment areas of Eastern Somalia region who sell livestock and livestock feeds to Somaliland in order to buy food and non-food items. In addition, imported food and none-food commodities from Berbera port are trucked to Togwajale cross into Eastern Ethiopia (FEWS NET 2013). Second, people in the border consume food items produced in other neighboring countries or imported from elsewhere that could not be supplied cheaply from domestic markets. For example, eastern Ethiopia imports rice, wheat flour, pasta, sugar and vegetable oil form Djibouti and Somalia borders. These products, however, are either unavailable or relatively more expensive in the domestic markets. Thirdly, by generating employment opportunities, cross border trade provides incomes to purchase food (Little, 2015). Improvement of food security is particularly important in food-importing countries suffering from drought which is common in the Horn Africa countries.

**Cross border trade in the Horn has contributed to improvements in smallholder income and poverty reduction.** This trade has been found to enables herders to provide for their children's education, housing and other basic needs. Along the value chain, cross border trade also increases income of traders, trekkers, fodder produces and traders, brokers and other marketing service providers in direct or indirectly (Amhaa and Tesfyae, 2014). Cross-border trade constitutes a vital source of livelihood for the poor, in particular for low-income and low-skilled traders in border districts (UNCTAD, 2019).

**Cross-border trade widens employment opportunities for both men and women in the border areas where there is no alternative employment (Amaha and Tesfaye, 2014).** In the Horn of Africa, although the cross-border trade has been dominated by men, it has contributed to job creation for women who may not have the time or support necessary to enter into formal employment channels (Boute et al, 2018). Comparing employment opportunity in the borderlands, the participation of women is much more prevalent in Ethiopia-Somalia borderlands, where Somali women are very active in small stock marketing, than the Ethiopia-Kenya border areas which is male dominated (Berihanu, 2016). Cross-border benefits women by providing business opportunities for those who engage in the cross-border trade. Tiki (2012) shows that trade in goat and sheep, fruits and vegetables in Moyale is dominated by female traders who buy and sell in the same market. Women are also found working in hotels and restaurants that are linked to cross-border trade. Further, although women are rarely involved with the cattle trans-border trade, they often participate in the value chain such as through fattening animals or engaging in grain production. Finally, women participate in small-scale trade-related activities in the border areas. For example, along the Ethiopia- Djibouti trade routes there are large numbers of women traders in Dire Dawa, Shinnile and Melka Jebdu, who sell food items to traders crossing to Djibouti. (Amha and Tesfaye, 2014). For many women in these towns, cross-border trade activities are the only source of income to contribute to their families' subsistence and wellbeing.

SECTION 6

# Major challenges in cross-border trade in HoA

**The potential for cross-border trade in the Horn of Africa countries is undermined by a range of constraints.** Table 14 summarizes the main challenges facing the different actors involved in the cross-border trade value chain. These barriers are then discussed in more detail below.

Table 14: **Constraints face by pastoralist/agro-pastoralist and cross-border trader in the Horn of Africa**

| | Production | Marketing |
|---|---|---|
| Pastoralists and Agro-pastoralist | • Lack of/limited access to credit<br>• Climate change/Drought<br>• Low adoption of improved technologies<br>• Limited access to feeds in dry season<br>• Animal disease<br>• Water inadequacy<br>• Declining land base<br>• Absence of value-adding practices | • Poor transport infrastructure<br>• Ineffective marketing information systems<br>• Low and variable price<br>• Insecurity<br>• Border closure and domestic movement retraction<br>• Lack of appropriate slaughtering, cold chain storage<br>• Livestock bans |
| Traders | | • Lack of/limited access to credit<br>• Poor transport infrastructure<br>• Lack of appropriate slaughtering, cold chain storage<br>• High tax and transaction costs in market systems<br>• Border closure and domestic movement retraction<br>• No foreign exchange service<br>• Livestock bans |

Source: Little, 2015

**The Horn of Africa's poor road, market and communication infrastructures are key obstacles to cross-border trade in the region** (Akililu et al., 2013). For example, the feeder roads in the northern Kenya that connect Isiolo-Moyale highways are mostly not paved and often get flooded during the rainy seasons, making the markets inaccessible (USAID, 2018). As such the transport cost in northern Kenya accounts for 25 to 40 percent of the total cost of livestock delivered at terminal markets from northern pastoral areas (Awuor, 2007). The market infrastructure on the Kenya side is relatively poor. Comparing infrastructure of two markets, Borena (Ethiopia) and Mendra (Kenya), Pavanello (2010) shows that Mandera had no basic livestock market infrastructure such as fences delimiting the market yards, no holding grounds and partitions to separate small from big ruminants. The region also suffer from shortage of water, fodder and veterinary services particularly along transit routes for trekked animals (Joosten, Muzira and Mintesnot, 2017).

Transporting animals is negatively impacted by both poor road quality as well as lack of designated vehicles for animal transportation. For example, in northeastern Ethiopia animals are taken from collection sites to feed lots and then transported to Djibouti. In most cases, animals are trekked for several kilometers and then loaded on trucks. Because trucks are overloaded and not specifically designed for carrying live animals, transportation causes stress and damage (bruises) to the animals. As a result, cross-border traders face a rejection rate of 2 – 5% of such animals upon inspection at the port of export. Poor road infrastructure and inadequate transport services undermine the exploitation of economies of scale in livestock trade (USAID, 2013).

**Despite an improvement in communications infrastructure, challenges remain especially regarding the expansion of cell phone networks in border regions.** The internet penetration rate in Somalia and Ethiopia is very low at 2 % and 18% respectively in 2017 (latest available data).[15] Expanding access to cell phones would contribute to making cross-border trade more efficient, for example, by increasing access to information on market prices and market demands. Another key infrastructure-related constraint to cross-border trade in the Horn of Africa is the lack of storage and warehouse facilities. Most of the border markets in the region have no modern warehouses. The existing storage facilities are small in size and not well ventilated. In this regard, the Moyale corridor is the exception as there are several storage facilities, most of which are privately owned (USAID, 2018). Finally, of particular importance to livestock cross-border traders is access to veterinary facilities, holding grounds, and water points but these infrastructures are poorly developed in the border areas of most countries in the region.

**Insecurity is one of the major risks facing cross-border traders in the Horn of Africa.** The main source of business insecurity in the region includes ethnic conflict, war, highway robbery, confiscation and business rivalry. There are regular border and ethnic conflicts within the market catchment area in Southern and southeastern Ethiopia, northern Kenya and northern and south eastern Somalia. These conflicts often lead to the closure of the border and disruption to cross-border trade. In recent years, cross-border trade between Somalia and Kenya has ceased several times due to conflict and Kenya's concerns about insecurity in Somalia. In 2019, following a maritime dispute over a 62,000-square-mile triangle of the Indian Ocean, the Government of Kenya closed the border with Somalia with cross-border trade banned in the process. Similarly, trade between Ethiopia and Somalia has been disrupted numerous times due to clan conflict. in 2002, the clash between two sub-clans, Ogaden (Somalia region in Ethiopia) and Isaaq initiated the burning of up to 88 trucks owned by Isaaq businessmen (Eid, 2014).[16] In 2010, conflict spread in Aware area, affecting the Daror/Rabaso and Gashamo trade routes.

**Even in relatively peaceful periods, there is the threat of confiscation of their products by government officials.** This is particularly the case on the Ethiopia side as the government considers this type of trade in commodities and animals as contraband citing tax evasion and consequent loss of local and foreign exchange revenues (Umer, 2007; little, 2015). In addition, there is a mis-placed perception among Ethiopian officials that Kenya is being a sole beneficiary from the cross-border trade between the two counties (Akilu, 2008).

14 (Little and Mohamoud, 2005, Awour, 2007; Mahmoud, 2008).

15 Internet users are individuals who have used the Internet (from any location) in the last 3 months. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV (ITU, 2017)

16 The Somali Regional government at the time accused the Ogden National Liberation Front (ONLF) of being responsible destruction of the trucks (Eid, 2014).

**Lack of access to market information is a well-known constraint to cross-border trade in the Horn of Africa.** Pastoralists and agro-pastoralists in the border areas usually have little information about the price of their commodities or animals in their local and other markets (Adugna, 2006; Awour, 2007, Little, 2007). Hence, livestock or crops pricing is characteristically highly personalized and dependent on the severity and urgency of household needs rather than formal standards. For example, along the Ethiopia-Kenya cross-border trade routes, farmers in Borana zone and in Mandera arrive at markets with no knowledge of the price of their commodities and animals on the day. Instead, they obtain the information from brokers and other producers, either at end markets or at markets in Borana zone itself (Pavenello, 2010). However, some organized cross-border cooperatives and associations in Ethiopia and Kenya have come together to share access to information about prices. In Borena zone, for example, there has been a well-organized system whereby traders' cooperatives and private traders share price information on cattle, goats and sheep. Producers, on the other hand, were excluded from the information loop and hence had very little bargaining power in the price negotiations (Little, 2010).

**An inadequate formal banking system and limited access to credit effectively act as a barrier to entry for small entrepreneurs into the cross-border livestock trade in the region.** Farmers also have limited access to formal credit even though most of them possess a herd of substantial value (Aklilu et al, 2013). As such farmers and small traders rely on a range of different informal financial institutions to support their business. Little (2001) found that about 95 percent of cross-border traders in Southern Ethiopia obtained credit informally from kinsmen, friends, and associates. Less than 10 percent of the total number of traders have access to formal sources of credit. Along the Moyale Corridor, local stakeholders involved in the cross-border trade have not been using formal financial services (USAID, 2018). This is partly due to religious reasons as many of the traders are Muslim.

**Livestock trade in Horn of Africa has been regularly constrained by disease outbreaks** (Akililu 2013, Tiki, 2014). In the south and southeastern Ethiopia, accessing veterinary services for animals crossing the border is minimal. The prevalence of animal disease, absence of robust provision of veterinary services and lack of effective monitoring and sustainable disease reporting systems across countries in the region intensifies the risk of spread of livestock diseases. The occurrence of animal disease across the border affects both exporting and importing countries. Animals disease in the region affects not only the intra-regional trade but also trade to the Middle East. For instance, Ethiopian and Somalia faced three animals export bans from Middle Eastern countries from 1997/8 to 2010 due to an outbreak of Rift Valley Fever.

**Animals and food exports are often subject to high taxes in the region.** In addition to fees, the government of Ethiopia has often applied exports bans and export taxes on agricultural products and products such as hides and skins. For example, at the border town of Moyale, Ethiopia, in addition to municipality tax, local officials collect fees at town markets when an animal is sold and another tax if the animal crosses the border for resale in Kenya. Compared to cattle, tax on goats and sheep is quite high. Based on livestock prices in 2013, tax on goats and sheep was 2.5 times more than tax on cattle or camel traders (Little, 2015). (This section to be updated).

# References


Aklilu, Y. (2002). An audit of the livestock marketing status in Kenya, Ethiopia and Sudan: Volume II: issues and proposed measures.

Aklilu, Y., Little, P. D., Mahmoud, H., & McPeak, J. (2013). Market access and trade issues affecting the drylands in the Horn of Africa. Brief prepared by a Technical Consortium hosted by CGIAR in partnership with the FAO Investment Centre. Technical Consortium Brief, 2.

Awuor, T. (2007). Review of trade and markets relevant to food security in the Greater Horn of Africa. A special report by the Famine Early Warning Systems Network (FEWS NET) for USAID.

Benin, S., Jabbar, M., & Ehui, S. (2003, July). Livestock Marketing in Ethiopian Highlands: Changes in structure and conduct since market liberalization in 1991. In workshop on harnessing markets for agricultural growth in Ethiopia: Bridging the opportunities and challenges, ILRI, Addis Ababa, Ethiopia (pp. 7-8).

Berhanu, W. (2016). Informal crossborder livestock trade restrictions in eastern Africa: is there a case for free flows in Ethiopia-Kenyan borderlands?. Ethiopian Journal of Economics, 25(1), 95-119.

Bouet, A., Pace, K., & Glauber, J. W. (2018). Informal cross-border trade in Africa: How much? Why? And what impact? (Vol. 1783). Intl Food Policy Res Inst.

COMESA (2009) 'Policy Framework for Food Security in Pastoral Areas (PFFSPA). Comprehensive African Agriculture Development Programme (CAADP) Pillar III. Consultative Draft'. Place: COMESA. December.

Eid, A. (2014). Jostling for trade: The politics of livestock marketing on the Ethiopia-Somaliland border. Future Agricultures, 75.

FSNWG (Food Security and Nutrition Working Group) (2010), Impacts of lifting the livestock import ban on food security in Somalia, Ethiopia, and the Djibouti borderland. Cross-border Livestock Trade Assessment Report, Nairobi, Kenya.

FSNWG – Food Security & Nutrition Working Group (2019). East Africa Cross-Border Trade Bulletin. January 2019.

Joosten, K., Muzira, I., & Mintesnot, Z. (2017). Water and fodder availability along livestock trade routes in the Horn of Africa. A baseline report. FAO Regional Office for Africa.

Habtamu, H., Jemal, M., Ashenafi, N., & Mulugeta, G. (2014). Policy Research on Cross Border Trade. Haramaya University, Haramaya, Ethiopia.

Little, P. D. (2002). The global dimensions of cross-border trade in the Somalia borderlands. Globalisation, Democracy and Development in Africa: Future Prospects. Organization for Social Science Research in East and Southern Africa.(OSSREA).

Little, P. (2005). Unofficial trade when states are weak: The case of cross-border commerce in the Horn of Africa (No. 2005/13). WIDER Research Paper.

Little, P. D., Sarris, A., & Morrison, J. (2010). Unofficial cross-border trade in Eastern Africa. Food security in Africa: Market and trade policy for staple foods in Eastern and Southern Africa. Cheltenham: Edward Elgar Publishing, 158-181.

Little, P. D. (2013). Unofficial Trade When States Are Weak The Case ofCross-border Livestock Trade. Pastoralism in Africa: Past, Present and Future, 389.

Little, P. D., Tiki, W., & Debsu, D. N. (2015). Formal or informal, legal or illegal: the ambiguous

nature of cross-border livestock trade in the Horn of Africa. Journal of Borderlands Studies, 30(3), 405-421.

Mahmoud, H. A. (2008). Risky trade, resilient traders: trust and livestock marketing in northern Kenya. Africa, 78(4), 561-581.

Mahmoud, H. A. (2010). Livestock trade in the Kenyan, Somali and Ethiopian borderlands. Chatham House/Royal Institute of International Affairs.

Majid, N. (2010). Livestock trade in the Djibouti, Somali and Ethiopian borderlands. London: Chatham House.

Musa, A. M., Wasonga, O. V., & Mtimet, N. (2020). Factors influencing livestock export in Somaliland's terminal markets. Pastoralism, 10(1), 1-13.

OECD. Publishing. (2017). Aid for Trade at a Glance 2017-Promoting Trade, Inclusiveness and Connectivity for Sustainable Development. OECD Publishing.

Pavanello, S. (2010). Livestock marketing in Kenya-Ethiopia border areas: A baseline study.

Teka, T., & Azeze, A. (2002). Cross-border livestock trade, and food security in the Ethiopia-Djibouti, and Ethiopia-Somalia borderlands. Organization for Social Science Research in Eastern and Southern Africa.

Teka, T., Azeze, A., & Gebremariam, A. (1999). Cross-Border Livestock Trade and Food Security in the Southern and Southeastern Ethiopia Borderlands.

Tiki, W. (2012). Climate-induced vulnerability and pastoralist livestock marketing chains in southern Ethiopia and Northeastern Kenya (chains): first year report. Addis Ababa, Ethiopia and Atlanta, GA, USA.

Tesfaye, A., & Amaha, N. (2018). A Review on Cross-Border Livestock Trade Across Dry Land Borders of Ethiopia: The Trends and Implications. Journal of Scientific and Innovative Research, 7(2), 36-42.

UNCTAD, (2019). Informal cross-border trade for empowerment of women, economic development and regional integration in Eastern and Southern Africa

USAID (United States Agency for International Developments) (2018). Study of the Kenya – Ethiopia trade corridor a pathway to agricultural development, regional economic integration and food security.

USAID (2013). Value Chain Analysis for Ethiopia: Meat and Live Animals Hides, Skins and Leather Dairy.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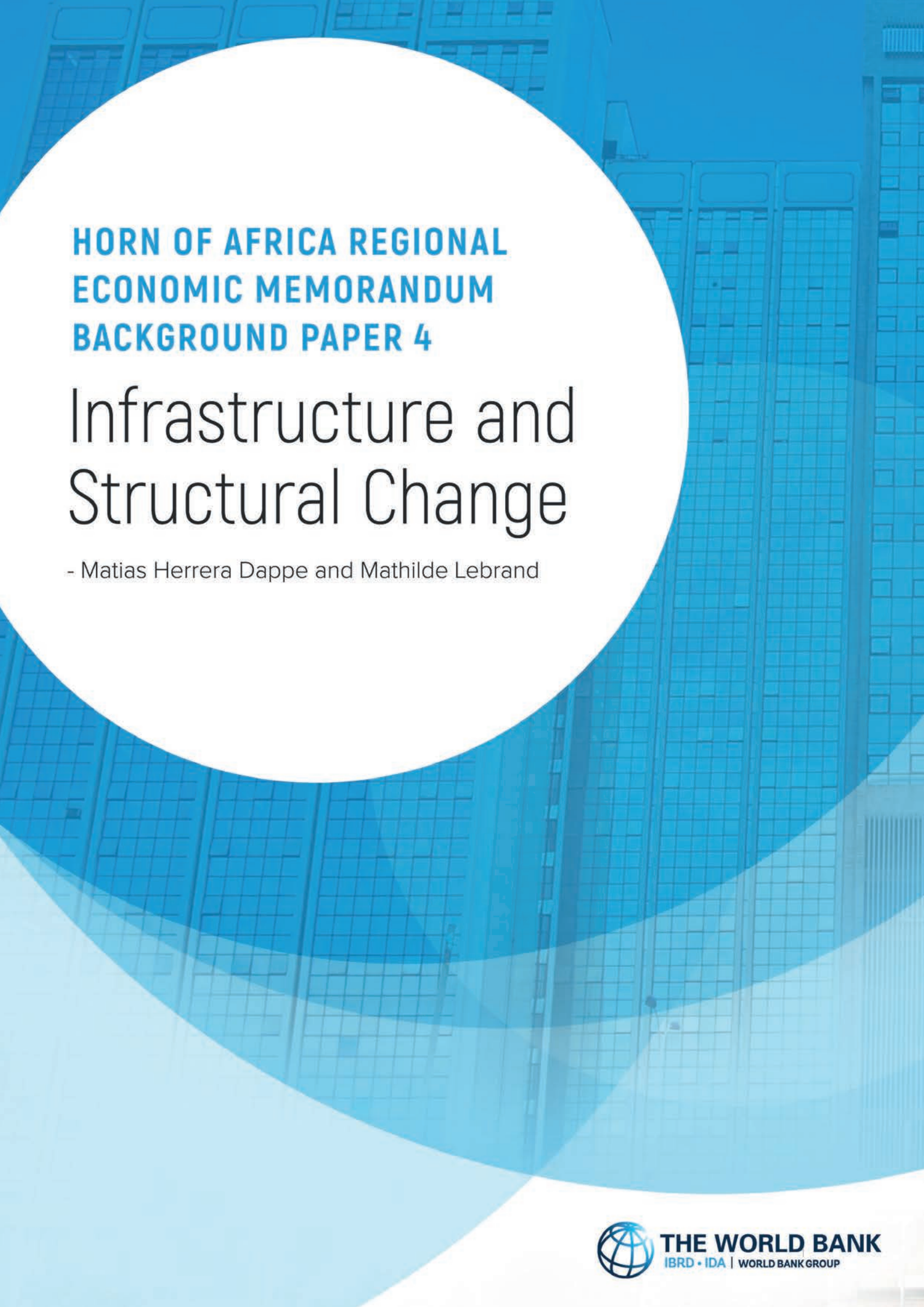

HORN OF AFRICA REGIONAL ECONOMIC MEMORANDUM BACKGROUND PAPER 4

# Infrastructure and Structural Change

- Matias Herrera Dappe and Mathilde Lebrand

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# Infrastructure and Structural Change

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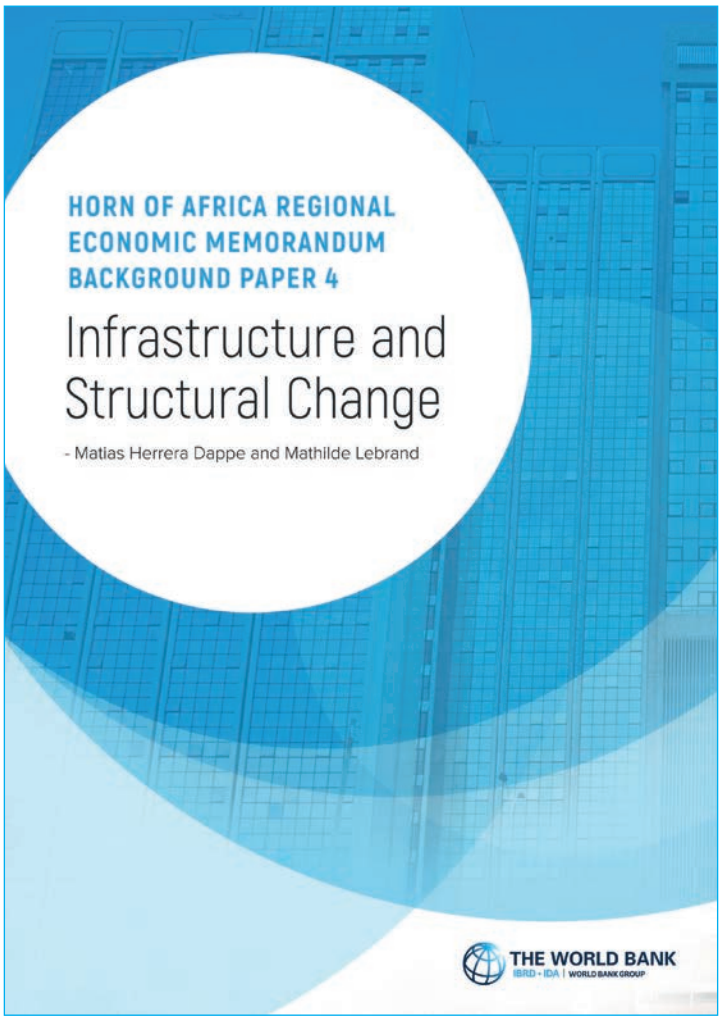


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# ABSTRACT

Access to infrastructure support economic development through both capital accumulation and structural transformation. This paper investigates the links between investments in electricity, Internet, and road infrastructure, in isolation and bundled, and economic development in the Horn of Africa, a region that includes countries with different levels of infrastructure and economic development. Using data on the expansion of the road, electricity, and Internet networks, it provides reduced-form estimates of the impacts of infrastructure investments on the sectoral composition of employment. It uses a spatial general equilibrium model, based on Moneke (2020), to quantify the impacts of future transport investments and trade facilitation measures on economic development in the Horn of Africa countries.

**Keywords:** Infrastructure, general equilibrium, transport corridors, structural change

**JEL Classification:** F15, J24, L16, O13, O14, O18, Q41, R1

# CONTENTS

# SECTION 1
# Introduction

Infrastructure investments can support economic development through both capital accumulation and structural transformation.[1] Structural change—the movement of workers from lower- to higher-productivity employment—is essential to growth in low-income countries. Poor transport infrastructure may create large frictions that limit specialization and exchange within countries. Improved transport leads to faster journeys, making economic agents closer together, and may also trigger relocation of economic activity, which lead to productivity increases. Electricity and Internet allow for modern production technologies and complement transport infrastructure by boosting firm productivity.

The literature has studied specific infrastructure expansions as potential drivers of development, but little work has been done on the associated structural change or how the combinations of such investments matter. This paper investigates how investments in electricity, Internet, and transport infrastructure and their interactions affect economic development through productivity gains and structural change in the Horn of Africa.

This paper first uses reduced-form analysis to understand the relationship between past investments in electricity, Internet, and road infrastructure and sectoral structure of employment in Ethiopia and Kenya. Reduced-form results capture the localized effects in the areas that have been affected, but do not capture the general-equilibrium effects and spillovers due to the network nature of infrastructure such as roads. The paper then uses a spatial general-equilibrium model, based on Moneke (2020), to assess the aggregate and spatial impacts of planned infrastructure investments in the region. The general-equilibrium model captures the spillover effects that a localized investment has on the rest of the country and all the countries in the Horn of Africa and generates welfare estimates for the entire region and all its subregions. A companion paper undertakes similar work for countries around Lake Chad.

The paper finds different patterns of infrastructure push on sectoral employment compared to isolated investments from the reduced-form specifications. Investments in electrification have a large impact on sectoral change, moving workers from agriculture to services mostly. Roads alone cause a significant but small impact on structural change. In contrast, the interaction of roads and electrification causes a strong increase in manufacturing employment. Internet access is associated with moving workers from agriculture to services.

Simulations based on the structural model shows that better market access from new investments in regional corridors could bring large welfare gains, especially when complemented with lower border delays. Lower transport costs reduce spatial frictions, increase specialization within and across countries, and lead to sectoral change away from the agricultural sector. Better regional integration is predicted to reduce employment in agriculture the most in Kenya and the least in Somalia. However, Somalia benefits the most from lower border and transport frictions. Within country,

[1] There are two approaches for explaining economic growth (McMillan, Rodrik, and Sepulveda 2017). The first assumes that the accumulation of skills, capital, and broad institutional capabilities are needed to generate sustained productivity growth. The second assumes a dual economy in which long-run growth is driven by the flow of resources to modern economic activities, which operate at higher levels of productivity.

increased specialization will lead some regions to become relatively more agricultural, others less. Additional investments in electrification and internet connectivity would be necessary to bring larger sectoral changes.

Several papers have examined the impact of infrastructure investment on sectoral employment at the micro-level. Gertler et al. (2016) find that lower transport costs empower women by opening up labor market opportunities and increasing their employment in the nonagricultural sector. Asher and Novosad (2020) find that a new rural road in India causes a 9-percentage points decline in the share of agricultural workers and an equivalent rise in wage labor. This paper adds to this literature.

Most of the literature studying the impact of infrastructure at the micro- and macro-level considers the gains from energy, transport, and digital investments in isolation or bundled in a unique infrastructure index. The aggregate impact of infrastructure has been measured through the elasticity of output with respect to a synthetic infrastructure index, which includes transport along with electricity and telecommunications (Calderon, Moral-Benito, and Serven 2015). This approach does not allow to isolate the complementarities of different infrastructure. Moneke (2020) shows that transport and electricity investments are complementary and that they increased economic development in Ethiopia. He finds starkly different patterns of big-push infrastructure on sectoral employment compared with only road investments. Roads alone cause service sector employment to increase at the expense of agriculture and, especially, manufacturing employment. In contrast, the interaction of roads and electrification causes a strong reversal in manufacturing employment. We thereby complement this latest paper by looking at internet, electricity and transport, and their complementarities, for both Ethiopia and Kenya.

There is a growing body of literature using quantitative spatial general equilibrium models to assess the impacts of infrastructure. Allen and Arkolakis (2014) develop a general equilibrium framework to determine the spatial distribution of economic activity and uses to assess the impact of the US interstate highway system. Michaels, Rauch, and Redding (2011) look at changes in sectoral employment as an outcome that captures the underlying infrastructure-induced effects. Redding and Turner (2016) and Redding (2020) survey the literature on the impacts of transport infrastructure and the growing use of models to quantify these impacts. Bustos, Caprettini, and Ponticelli (2016) and Fried and Lagakos (2020) study the general equilibrium implications of electrification via its effect on productivity. Several papers provide policy counterfactuals for future road and border infrastructure improvements for the Belt and Road Initiative (Lall and Lebrand, 2020; Bird, Lebrand, and Venables 2020); in Bangladesh (Herrera Dappe and Lebrand, 2019); and between Bangladesh and India (Herrera Dappe, Lebrand, and Van Patten 2021).

This paper contributes to the literature on several areas. It assesses the interactions between different types of infrastructure and how it affects the sectoral structure of employment at the district level. The paper also assess the spatial general equilibrium impacts of several planned transport investments and trade facilitation measures in neighboring countries that are at different stages of development.

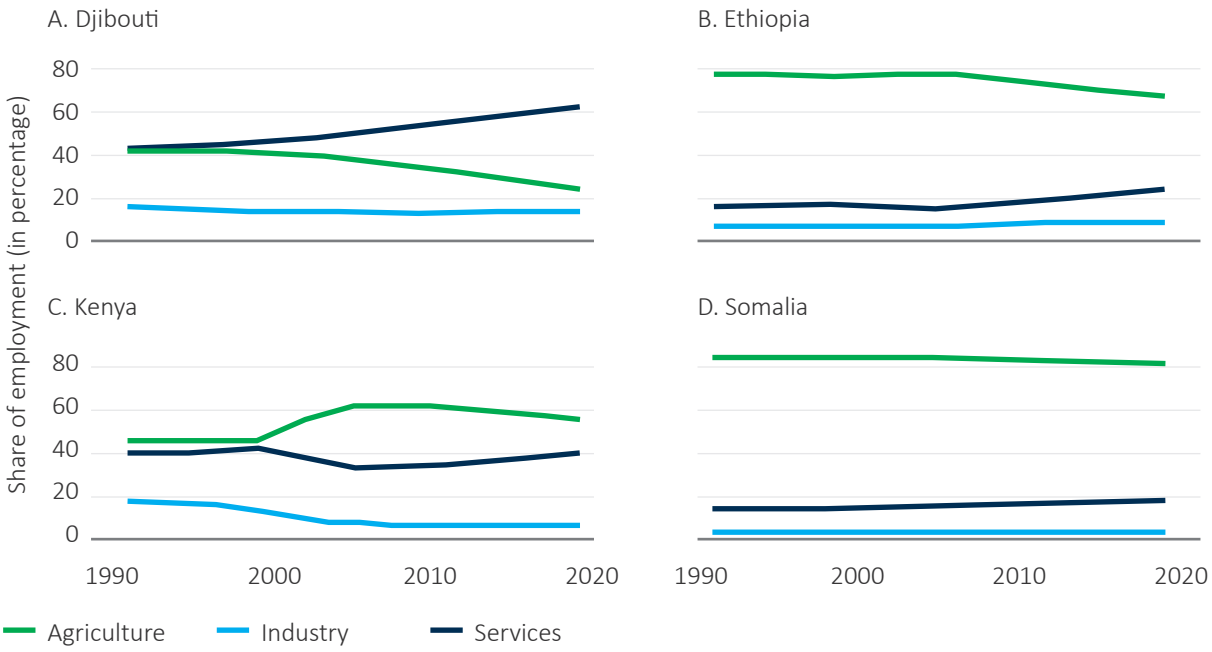
The paper is structured as follows. Section 2 provides an overview of the background in the Horn of Africa. Section 3 includes details of the data used in our analysis. Section 4 presents the empirical strategy and results. Section 5 develops a spatial general-equilibrium model to produce counterfactuals for more domestic and regional integration. Section 6 concludes.

SECTION 2

# Background

Economic growth in the Horn had been relatively strong before the COVID-19 pandemic struck, but the subregion still lags behind other African countries and the pace of structural change has been slower than expected. At approximately $1,000, the per capita income in the Horn of Africa remains well below the Sub-Saharan African average of about $1,500. Structural transformation out of agriculture is at different stages across countries. Employment in nonagricultural sectors accounts for about 45 percent of total employment in Kenya, 35 percent in Ethiopia, and less than 20 percent in Somalia (figure 1). The share of employment in agriculture in Djibouti, Ethiopia, and Kenya has been declining since the mid-2000s. In contrast, it has stagnated at high levels in Somalia. The main challenge for the subregion is generating enough adequate-quality jobs through economic transformation.

Figure 1: Employment per sector in Horn of Africa countries, 1990–2020




Source International Labour Organization, ILOSTAT database.

Economic activity has been converging across the Horn of Africa, but not in the borderlands, which are lagging. Evidence from nightlights points to faster growth in economic activity in less built-up and less well-lit areas (1992–2018), consistent with shared economic development and "catch-up" dynamics. However, a critical exception to this pattern is that border areas show slower growth relative to more developed, core areas. Little development is taking place in these areas, extending their historical marginalization and character as lagging, peripheral regions. Whether regional integration through improved connectivity and lower frictions at the borders will lead to stronger development in the lagging areas remains to be seen.

The extent and quality of infrastructure networks varies across the Horn; the subregion is a collection of national spaces rather than an integrated economic space. Ethiopia undertook significant investments in roads and electricity over the last decade, which lead to expansion in the road and electricity network. The all-weather road network expanded roughly fourfold between the late 1990s and the late 2010s, and the electricity network doubled, from 95 to 191 major electric substations (Moneke 2020). But the country still lags Kenya in access to electricity and all-weather roads in rural areas. Only 55 percent of the population had access to electricity in Ethiopia in 2018, a smaller share than in Djibouti (60 percent) or Kenya (75 percent). Access to all-weather roads and electricity is lagging in remote areas in Kenya, including the northern border areas. Somalia has limited infrastructure coverage. Only 32 percent of its rural population lived within 2 kilometers of an all-weather road in 2016, and only 35 percent of the total population had access to electricity in 2018. The Internet backbone fiber network and mobile coverage increased significantly in recent decades. Access in the region is still low, however, at 2 percent of the population in Somalia, 19 percent in Ethiopia, 22 percent in Kenya, and 56 percent in Djibouti in 2019.

# SECTION 3
# Data

This paper uses household survey data that have been georeferenced, new spatial infrastructure data, and district characteristics in order to study links between access to infrastructure and the structure of local economies as well as the complementarities between types of infrastructure.

## Infrastructure

We collected new information on road network expansions, access to the electricity network, and access to Internet fiber backbone from various sources (table 1).

Table 1: Sources of infrastructure data

| Type of infrastructure | Country | Years | Source |
|---|---|---|---|
| Roads | Ethiopia<br>Kenya | 1996, 2006, 2016<br>2003, 2009, 2016–18 | Ethiopian Roads Authority (ERA)<br>Kenya Road Board |
| Electricity | All | Varies across countries | Nighttime lights (VIIRS for 2016, DMSP for 1992-2013) / population raster (World Pop) |
| Electricity grid | All<br>All | Around 2006<br>Most recent | Foster and Briceno-Garmendia (2010)<br>gridfinder.org and Arderne et al. (2020) |
| Internet (fiber backbone) | All | 2009–2019 | Africa Bandwidth Maps 2009–19 |

Source: Authors.

We gathered geospatial maps of road expansion using government sources as well as previously harmonized collections of road networks (Foster and Briceno-Garmendia 2010; Jedwab and Storeygard 2020). The quality of the network and associated features and the frequency of updates vary across countries. For Ethiopia and Kenya, we used a rich panel of data on road network expansions complemented by details on road conditions (a panel of GIS data and maps for 1996, 2006, and 2016 for Ethiopia and 2003, 2009, and 2018 for Kenya that rely at least partially on actual road surveys). Panels of roads from the same source are rare. Figures A.2 and A.3 show the extensions of the paved road network for Kenya and Ethiopia. Related papers studying the expansion of the Ethiopian road network are Adamopoulos (2019), Gebresilasse (2019), and Kebede (2019), all of which focus on the feeder roads from the 2016 Ethiopian Roads Authority survey. The study by Moneke (2020), which focuses on all-weather (gravel, asphalt, or bitumen surface) roads, is closer to this study.

We used two methods to map access to the electricity network: nighttime lights and maps of power transmission grids. Nighttime light data are available for most years and locations but convey imperfect information on electrification. Historical maps of electricity grids are more difficult to find and use in a consistent way. We used satellite images of annualized nighttime lights (VIIRS for 2016, DMSP for 1992-2013) and population rasters from World Pop to calculate the percentage of the population that was electrified (lived in settlements that produce some light at night). We compared the results for two metrics: a dummy that is equal to one if at least 10 percent of the population has access to electricity and the share of the electrified population per district. Such methods have been

used before to estimate electricity access in remote areas and guide grid extension programs.[2] This method assumes that locations that emit lights at night are in settlements that have electricity access and that their electricity is most likely supplied from an electrical grid. It assumes that small off-grid systems do not emit enough light to be captured by satellites but that larger isolated power networks do. We cross-checked the numbers obtained with country estimates of electrified population from the World Bank.[3] Figure A.1 in the appendix shows the share of the population in Ethiopia and Kenya with access to electricity.

We also collected information on transmission grids based on past efforts to harmonize data for infrastructure from primary sources and recent mapping strategies to infer the electricity grids based on satellite data. For past data, we used electricity grids from the Africa Infrastructure Country Diagnostic (AICD), which collected primary data covering network service infrastructure from 2001 to 2006 in 24 African countries (Foster and Briceno-Garmendia, 2010). To complement these data, we relied on a recent effort by the World Bank; Facebook; and other institutions (the KTH Royal Institute of Technology, the Energy Sector Management Assistance Program [ESMAP], World Resources Institute, and the University of Massachusetts Amherst) to use remote sensing, machine learning, and big data to map connected populations and the systems that support them. This group created an algorithm for estimating the location of medium-voltage infrastructure based on nighttime lights and the location of roads assuming that medium-voltage lines are more likely to follow (or be followed by) main roads.[4] Figure A.4 in the appendix shows the grid for the Horn of Africa using the AICD grid and using the most recent grid.

Internet infrastructure is proxied by access to the fiber broadband backbone network. We obtained data for all Africa for 2009–20 from Africa Bandwidth Maps, which provides the exact location of fiber nodes along the backbone network. We constructed a proxy for access to the fiber backbone that is equal to one if there is a node of the backbone in the location of interest. Each node has a year attribute, which allows us to build a panel for access to the backbone. We assume that access before 2008 was null everywhere, an assumption that is supported by World Bank data on access to Internet, which reports that less than 4 percent of individuals in Sub-Saharan countries (including high-income countries) had access to Internet in 2008. We confirmed our figures by cross-checking them against World Bank indicators reporting the percentage of the population using Internet.[5] Figure A.5 in the appendix shows the access to Internet in Ethiopia and Kenya.

## Employment

We are interested in structural transformation, which we interpret as changes in sectoral employment, in line with the literature (Herrendorf et al. 2014). We derive sectoral employment shares from Demographic and Health Surveys (DHSs), which produce harmonized survey data with GPS coordinates for most surveys and are available for several rounds per country. The DHS is a repeated cross-section of enumeration areas (EA), with approximately 20–30 households enumerated per EA. Four rounds of survey data are covered in Ethiopia (2000, 2005, 2011, 2016) and four in Kenya (1991, 2003, 2009, 2018). For Ethiopia, the DHS rounds included 12,751 individuals in 2000, 14,052 in 2005, 21,080 in 2011, and 19,157 in 2016, from approximately 650

2 An example of mapping rural electrification based on night-time lights can be found at http://india.nightlights.io/.

3 The World Bank reports access to electricity (percent of population) for most countries for a long period at https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS.

4 Details can be found in Arderne et al. (2019) and Arderne et al. (2020).

5 The World Bank reports access to Internet (percent of population) for most countries for a long time period. See https://data.worldbank.org/indicator/WeT.NET.USER.ZS.

EAs, which differ per round. Djibouti and Somalia did not conduct DHSs.

We use DHS data for which we have access to the occupation of the individuals as well as a proxy for their location. In order to construct the shares of employment per sector, we use respondents' answers to questions about their current occupation. We first compute the shares of nonworking individuals and then group all working individuals into three sectors: agriculture, manufacturing, and services. We aggregate individual responses within each EA and then generate an unbalanced panel of districts that had at least one EA during a survey round. The DHS–provided GPS coordinates for EA locations are not perfectly reliable because of the common random displacement applied to GPS coordinates for anonymity.[6] We aggregate EAs per geographic location.

## District Characteristics

We use additional data to control for district heterogeneity. We use population data from the Global Human Settlement Layer (GHSL),[7] land categories from the European Space Agency land cover (see Defourny 2017), distance from the coast from the Global Self-consistent, Hierarchical, High-resolution Geography Database (GSHHG),[8] distance to the border,[9] access to a city larger than 50,000 inhabitants from the Malaria Atlas Project,[10] temperature from Land Processes Distributed Active Archive Center,[11] and elevation from CGIAR-CSI.[12]

6 DHS coordinates of rural (urban) EAs are randomly displaced within a 0–10 kilometer (0–5 kilometer) radius.

7 Population count from the Global Human Settlement Layeris based on population data from Gridded Population of the World v4.10 polygons, distributed across cells using the GHSL global layer. Source data are provided in 9 arc-second (250 meters) grid cells.

8 Distance to the coast (on land only) is measured in meters. It is derived using World Vector Shorelines (Wessel and Smith 1996).

9 Distance to country borders is measured in meters. It is derived using the database of Global Administrative Areas (GADM) 2.8 ADM0 (Country) boundaries.

10 Data incorporate data from Open Street Map (OSM) and the Google roads database. See Weiss et al. (2018).

11 Yearly daytime land surface temperature are from Wan, Hook, and Hulley (2015).

12 Global elevation (in meters) are from Shuttle Radar Topography Mission (SRTM) dataset (v4.1) at 500-meter resolution. See Jarvis et al. (2008).

SECTION 4

# Empirical Strategy and Results

## 4.1 Ordinary Least Squares

Our first empirical strategy uses panel ordinary least squares (OLS) regressions that include year and country fixed effects and a battery of initial district-level controls. The OLS specification is

$$\begin{aligned} Sector_{i,c,t} = {} & \alpha + \beta^{R} Paved\ road_{i,c,t} + \beta^{E} Electricity_{i,c,t} + \beta^{I} Internet_{i,c,t} \\ & + \gamma^{RE}\ Paved\ Road_{i,c,t} * Electricity_{i,c,t} + \gamma^{RI}\ Paved\ Road_{i,c,t} * Internet_{i,c,t} \\ & + Controls_{i,c,t} + FE + \epsilon_{i,c,t} \end{aligned}$$

where $Sector_{i,c,t}$ is the share of employment in agriculture, manufacturing or services for district $i$ in country $c$, at year $t$. $Paved\ Road_{i,c,t}$ is a dummy variable that takes a value of one if location $i$ in country c contains a paved road at year $t$. $Electricity_{i,c,t}$ is a dummy variable that takes a value of one if location $i$ in country $c$ has more than 10 percent of its population with lights at night at year $t$. $Internet_{i,c,t}$ is a dummy variable that takes a value of one if location $i$ in country c has more than 10 percent of its population with lights at night at year $t$. $Paved\ Road_{i,c,t} * Electricity_{i,c,t}$ captures the interaction of the road and electricity infrastructure, and $Paved\ Road_{i,c,t} * Internet_{i,c,t}$ the interaction of the road and internet infrastructures. We add interaction effects between the dummies to better understand the complementarities between infrastructures. We do not include an interaction effect for electricity and Internet, as access to Internet is assumed to rely on electricity access. $Controls_{i,c,t}$ represents the additional location-specific controls, which include initial district population, access to a main city, land size, distance to the coast, distance to the border, access to a city of more than 50,000 inhabitants, temperature, and elevatio. $FE$ is the year and country fixed-effects. The coefficients $\beta$ capture the correlation between access to a type of infrastructure on the different sectoral employment shares, while the coefficients $\gamma$ capture the infrastructure interaction terms.

We identify several identification challenges. Infrastructure investments are likely endogenously allocated with respect to the outcomes of interest. Given the high cost of infrastructure investments, conscious allocation decisions are to be expected (by, for example, targeting high growth potential locations or politically demanded locations). Measurement error in the right-hand side variables may lead to attenuation bias (from, for example, inaccurate information on the timing of infrastructure expansion or imprecise historic road and grid maps). Measurement errors, which are expected to be large in this case, lead to an OLS estimate that is biased toward zero.

We report results for the unbalanced panel of districts that include at least one EA. We first estimate local average associations of the three infrastructure investments—roads, electricity, and Internet—and the interaction between these investments on sectoral employment at the district-year level. Then we analyze within-country heterogeneity in structural transformation across districts. All regressions exclude the Somali region

of Ethiopia, because coverage of this region in the DHS data is poor.

## *Average effects*

We start with a regression that includes all countries in the Horn of Africa. We then compare the results by country. Throughout, standard errors are clustered at the district level, the level of treatment.

*Horn of Africa*

Access to electricity is associated with a transformation away from agriculture in the Horn of Africa. Table 2 reports the results of pooling data from Ethiopia and Kenya. Having access to electricity at the district level is associated with a 6 percentage-point reduction in the employment share of agriculture and a 4 percentage-point increase in the employment share of services. Big-push investments that combine paved roads and Internet are also associated with structural changes in employment. The combined investments are associated with a 12 percentage-point additional increase in the share of employment in services. Table A.1, in the appendix, presents the results using the dummy variable, which capture electricity access based on grid expansion.

Table 2: OLS results for Horn of Africa

| | Agriculture | Manufacturing | Services |
|---|---|---|---|
| Paved road | -0.0152 | 0.0113 | 0.00451 |
| | (-0.70) | (0.92) | (0.25) |
| Internet | 0.0344 | 0.0126 | -0.0641 |
| | (0.52) | (0.26) | (-1.34) |
| Electricity | -0.0573** | 0.0122 | 0.0407** |
| | (-3.04) | (1.45) | (2.78) |
| Road + Internet | -0.0979 | 0.000701 | 0.121* |
| | (-1.41) | (0.01) | (2.41) |
| Road + Electricity | -0.0290 | 0.0157 | 0.0159 |
| | (-1.16) | (1.14) | (0.80) |
| Year + Country fixed effect | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |
| *R*-squared | 0.426 | 0.308 | 0.369 |
| Number of observations | 1,887 | 1,887 | 1,887 |

Note: *t* statistics in parentheses.
$+_p < 0.10$, $*_p < 0.05$, $**_p < 0.01$

*By Country*

In Ethiopia, access to electricity and big-push investments are associated with a reduction in agriculture employment and an increase in employment in manufacturing and services (table 3). At the district level, having access to electricity is associated with a 6.2 percentage-point reduction in the agriculture employment share, an almost 2 percentage-point increase in the manufacturing employment share, and a 4.5 percentage-point increase in the employment share of services. By itself, having access to a paved road is not associated with any change in employment.

Table 3: OLS results for Ethiopia

| | Agriculture | Manufacturing | Services |
|---|---|---|---|
| Paved road | 0.0154 | -0.00257 | -0.0128 |
| | (0.47) | (-0.17) | (-0.52) |
| Internet | 0.0804 | -0.0287+ | -0.0516 |
| | (1.28) | (-1.89) | (-0.88) |
| Electricity | -0.0624** | 0.0173* | 0.0452** |
| | (-3.14) | (2.05) | (2.98) |
| Road + Internet | -0.206** | 0.0592** | 0.147* |
| | (2.73) | (-2.84) | (2.27) |
| Road + Electricity | -0.0664+ | 0.0325+ | 0.0338 |
| | (-1.65) | (1.78) | (1.14) |
| Year FE | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |
| R-squared | 0.291 | 0.099 | 0.311 |
| Number of observations | 1162 | 1162 | 1162 |

Note: *t* statistics in parentheses.
$+p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Big-push investments that combine investments in roads and electricity or Internet are associated with changes in employment away from agriculture toward the manufacturing and services sectors. These findings are similar to those of Moneke (2020). Combined investment in roads and electricity is associated with a reduction in the employment share of agriculture of almost 13 percentage points and an increase in the employment share of manufacturing of almost 5 percentage points. Combined investment in roads and Internet is associated with a reduction in the employment share of agriculture of almost 21 percentage points, an increase in the employment share in manufacturing of 3 percentage points, and an increase in the employment share of services of almost 15 percentage points. The findings on manufacturing indicate that the reductions in transport costs might not be enough to lead to expansion of the manufacturing sector but that once combined with investments in Internet and electricity, which increase productivity, the manufacturing sector benefits from lower transport costs.

Table 4 reports the results of the regression for Kenya only. Access to Internet alone is associated with an increase in the share of manufacturing employment; but combined access to Internet and paved roads is associated with a reduction in the share of manufacturing employment. Combined investment in paved roads and Internet has a positive impact on the share of services employment, however.

Table 4: OLS results for Kenya

| | Agriculture | Manufacturing | Services |
|---|---|---|---|
| Paved road | -0.0255 | 0.0213 | 0.00418 |
| | (-0.70) | (0.88) | (0.12) |
| Internet | -0.0591 | 0.185$^{+}$ | -0.126 |
| | (-0.32) | (1.74) | (-1.35) |
| Electricity | -0.0992 | 0.0353 | 0.0638 |
| | (-1.49) | (1.06) | (1.02) |
| Road + Internet | 0.0358 | -0.198$^{+}$ | 0.162$^{+}$ |
| | (0.19) | (-1.84) | (1.69) |
| Road + Electricity | 0.0218 | -0.00950 | -0.0123 |
| | (0.32) | (-0.26) | (-0.19) |
| Year FE | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |
| R-squared | 0.298 | 0.200 | 0.298 |
| Number of observations | 725 | 725 | 725 |

Note: *t* statistics in parentheses.
$^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$

## *Heterogenous effects*

This section analyzes the within-country heterogeneity in structural transformation across districts, focusing on the share of agricultural employment and the population-weighted distance to the largest town, as in Moneke (2020).

*By share of agricultural employment*

Table 5 confirms the spatial heterogeneity of outcomes across districts in Ethiopia. Results are reported for quantile 0.25 (49 percent of employment in agriculture), quantile 0.5 (75 percent of employment in agriculture), and quantile 0.75 (90 percent of employment in agriculture). Access to electricity only is associated with a reduction in the shares of agriculture employment in all districts, with the association strongest in districts with low shares of agriculture employment. Access to roads and electricity is also associated with the largest reduction in the share of agricultural employment in less agricultural districts. These results are in line with Moneke (2020).

Table 5: Heterogenous effects on employment in agriculture in Ethiopia, by initial share of agricultural employment

| Share of employment in agriculture | Quantile 0.25 (49%) | Quantile 0.5 (75%) | Quantile 0.75 (90%) |
|---|---|---|---|
| Paved road | 0.0385 | 0.0485 | 0.0119 |
| | (1.11) | (0.95) | (0.62) |
| Internet | 0.129 | 0.0978 | –0.0448 |
| | (1.02) | (0.87) | (–1.07) |
| Electricity | –0.112** | –0.0395$^{+}$ | –0.0268* |
| | (-3.40) | (-1.69) | (–2.41) |
| Road + Internet | –0.203 | -0.303* | –0.0954 |
| | (–1.31) | (–2.02) | (–1.28) |
| Road + Electricitity | -0.153** | -0.106 $^{+}$ | –0.0236 |
| | (–3.25) | (–1.90) | (–1.17) |
| Year fixed effects | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |
| Number of observations | 1162 | 1162 | 1162 |

Note: *t* statistics in parentheses.
$^{+}p < 0.10$, * $p < 0.05$, ** $p < 0.01$

*By distance to a main city*

Do changes in the shares of manufacturing and services employment associated with access to infrastructure vary with distance to large towns? Table 6 reports the estimation results for the share of manufacturing employment across quartiles of distance to a town of at least 50,000 inhabitants for Ethiopia. Expansions in Internet access are associated with reductions in the share of manufacturing employment in districts close to towns (second quartile of distance) and increases in manufacturing employment in districts far from towns (fourth quartile of distance). These results may indicate that in isolated districts, access to Internet provides firms with information that helps them increase productivity and access to new customers but that firms in such districts are protected from outside competition because of high transport costs. In contrast, in districts close to large towns, Internet access may increase competition from products from other parts of the country (Moneke 2020; Behrens et al. 2006).

Table 6: Heterogenous effects on employment in manufacturing in Ethiopia, by distance to a main city

| Share of employment in manufacturing | Quartile 2 | Quartile 3 | Quartile 4 |
|---|---|---|---|
| Paved road | −0.0322 | 0.0460 | −0.0280 |
| | (−1.65) | (1.25) | (−1.31) |
| Internet | -0.0820** | −0.00571 | 0.0646+ |
| | (−3.70) | (−0.13) | (1.89) |
| Electricity | 0.0179 | 0.0214 | 0.00411 |
| | (0.96) | (1.17) | (0.30) |
| Road + Internet | 0.110* | 0.0325 | 0 |
| | (2.32) | (0.52) | (.) |
| Road + Electricity | 0.0419+ | −0.0362 | 0.0854** |
| | (1.89) | (−0.84) | (2.95) |
| Year fixed effects | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |
| Number of observations | 0.261 | 0.158 | |

Note: *t* statistics in parentheses.
$^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$

In Ethiopia, investments that combine types of infrastructure are associated with increases in the share of manufacturing employment in districts that are closest to a main town (quartile 2) and farthest away (quartile 4). Isolated investments in roads or Internet are either not associated or negatively associated with changes in the share of employment in manufacturing. In contrast, bundled investments in roads and Internet are associated with increases in the share of manufacturing employment, particularly in districts close to large towns. These results suggest that even though improvements in road access can increase competition from manufactures from other parts of the country, the reduction in transport costs benefits the manufacturing sector. The positive coefficient of combined road and electricity investments supports such argument.

Table 7 reports similar results for employment in the services sector. Isolated investments in roads and Internet are associated with a negative impact on services employment in locations close to a main town (quartile 2), but bundling road and Internet investments is associated with large increases in the share of services employment. In districts that are farther away, isolated investments in electricity (districts in quartile 3) or roads (districts in quartile 4) are associated with larger shares of employment in services; bundling investments is less of a priority in isolated regions.

Table 7: Heterogenous effects on service employment in Ethiopia, by distance to a main city

| Share of employment in services | Quartile 2 | Quartile 3 | Quartile 4 |
|---|---|---|---|
| Paved road | −0.0381 | −0.00549 | 0.0672* |
| | (−1.73) | (−0.29) | (2.15) |
| Internet | −0.132** | −0.00343 | 0.0448 |
| | (−4.21) | (−0.14) | (1.19) |
| Electricity (>10p) | 0.0269 | 0.0601** | 0.0137 |
| | (0.96) | (2.73) | (0.43) |
| Road + Internet | 0.167** | 0.0252 | 0 |
| | (3.52) | (0.51) | (.) |
| Road + Electricity | 0.0236 | −0.0404 | 0.0442 |
| | (0.67) | (−1.17) | (1.01) |
| Year fixed effects | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |
| Number of observations | 0.261 | 0.158 | 0.269 |

Note: *t* statistics in parentheses.
$^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$

## 4.2 Instrument Variables

In this section, we use an instrumental variables identification strategy to deal with the potential endogeneity in the placement of the infrastructure. We instrument both roads and electricity, and the interaction terms.

We instrument electrification and access to a paved road. Regarding electrification, the instrumental variable relies on four assumptions. First, electricity generation must be connected to demand, which comes mostly from the main cities. Second, the sources of energy generation that are identified are the main sources of electricity generation. Third, the locations of the supply sources are exogenous to economic geographic development. Finally, the locations between the generation sources and the main demand centers are more likely to be electrified.

We identified two sources of energy generation that can be used for the IV strategy: dams for hydroelectricity and wind farms. The main sources of energy supply are hydropower in Ethiopia and hydropower and wind in Kenya (table 8). Similar to Moneke (2020), we developed an IV that yields a hypothetical electrification status based on a location's proximity to a straight-line corridor from electricity generators to the main cities. We identified the locations of the electricity generators using two databases, one on the opening year of dams and another on the locations of power plants (Platts database). For Ethiopia, we used a database including all dams in Africa, their location, and their year of opening. For Kenya, we used the global power plant database, which includes the capacity and year of commissioning of all power plants by type of energy (hydro, wind, gas, and geothermal). From the year of the dam opening or power plant commissioning onward, all districts lying along the straight lines connecting the dams or power plants to the main demand centers are considered as having access to electricity. We then identified the main sources of demand in each country (Addis Ababa in Ethiopia and Nairobi and Mombasa in Kenya).

Table 8: Sources of energy for electricity production in Ethiopia and Kenya, 1990 and 2015 (percent of total)

| | 1990 | | 2015 | |
|---|---|---|---|---|
| Source of energy | Ethiopia | Kenya | Ethiopia | Kenya |
| Hydro | 89 | 81 | 93 | 39 |
| Renewable, excluding hydro | 0 | 14 | 7 | 48 |
| Oil, gas, and coal, and others | 11 | 5 | 0 | 13 |

Our IV satisfies the main assumptions of an IV strategy. The choice of location of hydro and wind generators can be assumed to be driven by geographic and climatic characteristics of the locations and not by economic activity in the area. The timing of opening can be considered exogenous, as years of delay are common for such projects. The random assignment assumption of the IV would imply that a district's inclusion along a straight-line corridor is spatially and temporally as good as random assignment.

To instrument for the timing of a district's paved road connection, we find the optimal network to connect all cities with more than 50,000 inhabitants in a least-cost fashion by using common minimum spanning tree algorithms, such as Kruskal's and Boruvka's algorithms. The list of cities with more than 50,000 inhabitants varies over time because of changes in population, which creates a panel of roads for each country.

We run a two-stage least squares (2SLS) regression on the following specifications, with province and year fixed effects and district-level initial values as controls:[13]

$$
\begin{aligned}
Road_{i,t} \# Electricity_{i,t} = {} & \alpha + \beta^{R} RoadIV_{i,t} = 1 \;\&\; ElectricityIV_{i,t} = 0) \\
& + \beta^{E} (RoadIV_{i,t} = 0 \;\&\; ElectricityIV_{i,t} = 1) \\
& + \gamma^{RE} (RoadIV_{i,t} = 1 \;\&\; ElectricityIV_{i,t} = 1) + \beta^{I} Internet_{i,t} + Controls_{i} \\
& + FE + \epsilon_{i,t}
\end{aligned}
$$

where $Road_{i,t} \# Electricity_{i,t}$ is one of the interactions terms between the dummies $Road_{i,t}$ and $Electricity_{i,t}$.

The second stage equation is given by:

$$
\begin{aligned}
& Sector_{i,t} = \\
& \alpha + \beta^{R,SLS} (RoadIV_{i,t} = 1 \;\&\; \widehat{ElectricityIV}_{i,t} = 0) \\
& + \beta^{E,SLS} (RoadIV_{i,t} = 0 \;\&\; \widehat{ElectricityIV}_{i,t} = 1) \\
& + \gamma^{RE,SLS} (RoadIV_{i,t} = 1 \;\&\; \widehat{ElectricityIV}_{i,t} = 1) + \beta^{I,SLS} Internet_{i,t} \\
& + Controls_{i} + FE + \epsilon_{i,t}
\end{aligned}
$$

where $Sector_{i,t}$ is the share of employment in agriculture, manufacturing, or services in district $i$ in year $t$.

[13] District-level control variables are interacted with the country dummy such that the effects of distances can be compared only within countries.

Table 9 reports the results for the 2SLS method for Ethiopia and Kenya. First-stage results and weak instrument tests are available on demand. Access to electricity led to only a 7.7 percentage-point decrease in the share of agriculture employment and a 6.2 percentage-point increase in the share of services employment; access to paved roads led to only a 3.2 percentage-point increase in manufacturing employment. Districts with access to paved roads and electricity saw a 5.2 percentage-point shift of workers from agriculture to manufacturing. Access to Internet was associated with a 2 percentage-point increase in service employment.

**Table 9: Two-stage least squares regression results for Ethiopia and Kenya**

| Share of employment | Agriculture | Manufacturing | Services |
|---|---|---|---|
| Paved road=0 x Electricity=1 | -0.295* | 0.102 | 0.193* |
| | (-2.42) | (1.60) | (2.11) |
| Paved road=1 x Electricity=0 | -0.0506+ | 0.0491** | 0.00150 |
| | (-1.21) | (2.74) | (-0.25) |
| Paved road=1 x Electricity=1 | -0.150* | 0.0955** | 0.0548 |
| | (-2.37) | (3.16) | (1.05) |
| Internet | -0.0335+ | -0.00192 | 0.0354* |
| | (-1.80) | (-0.18) | (2.26) |
| Year + province FE | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |
| *R*-squared | 0.563 | 0.425 | 0.492 |
| Number of observations | 1887 | 1887 | 1887 |

Note: *t* statistics in parentheses.
$+_p < 0.10$, $*_p < 0.05$, $**_p < 0.01$

Table 10 reports the results of the IV specification for Ethiopia only. Access to paved roads and electricity led to a 7.6 percentage-point increase in manufacturing employment and a 7 percentage-point decrease in Ethiopian districts. These findings are similar to the findings in Moneke (2020).[14]

[14] The results go in the same direction, but the coefficients vary, because the specification differs and the instruments are not the same.

Table 10: Two-stage least squares regression results for Ethiopia

| Share of employment | Agriculture | Manufacturing | Services |
|---|---|---|---|
| Paved road=0 x Electricity=1 | -0.404** | 0.192** | 0.211* |
| | (-2.94) | (2.96) | (2.16) |
| Paved road=1 x Electricity=0 | -0.0659* | 0.0577** | 0.00824 |
| | (-2.26) | (4.09) | (0.38) |
| Paved road=1 x Electricity=1 | -0.191* | 0.153** | 0.0378 |
| | (-2.25) | (4.27) | (0.55) |
| Internet | -0.0615+ | 0.00496 | 0.0565+ |
| | (-1.65) | (0.30) | (1.88) |
| Year + province FE | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |
| *R*-squared | 0.425 | 0.174 | 0.427 |
| Number of observations | 1162 | 1162 | 1162 |

Note: *t* statistics in parentheses.
+$p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Access to electricity reduces the share of employment in agricultural activities, moving workers to the services sector when there is no paved road and to the manufacturing sector when there is one. On its own, access to paved roads increases the share of manufacturing employment, as it did for Ethiopia and Kenya combined.

SECTION 5

# Welfare Impacts of Infrastructure

This section presents the general equilibrium model we use to assess the welfare impacts of infrastructure investments, including the calibration of the model, and shows the results under several counterfactual scenarios.

## 5.1 The Model

The spatial general equilibrium model is based on Moneke (2020). It is characterized by the following features. Locations differ in their productivity, geography, and trade links. Road investments are assumed to have general equilibrium effects via changes in trade costs and the resulting reallocation of labor across space, as in Allen and Arkolakis (2014) and Redding (2016). Electrification investments are assumed to have general equilibrium effects via productivity, similar to models of differential productivity shocks across space such as Bustos, Caprettini, and Ponticelli (2016). The economy is assumed to consist of multiple sectors of production, such that changes in sectoral employment across locations (i.e., spatial structural transformation) capture an outcome of interest, as in Michaels, Rauch, and Redding (2011) and Eckert and Peters (2018).

Compared to Moneke (2020), we consider a geography that includes several countries that can trade with each other, with additional trade barriers applying for cross-border trade. Workers can move across locations within but not across countries.

The whole geography consists of many locations $n \in N$ of varying land size $H_n$ and endogenous population $L_n$. Consumers value consumption of agriculture goods, $C^T$ , manufacturing goods, $C^M$ , services, $C^S$, and land, $h$. The utility of a representative household in location n is assumed to follow an upper-tier Cobb-Douglas functional form over goods and land consumption, scaled by a location-specific amenity shock $V_n$:

$$U_n = V_n C_n^a h_n^{1-a}$$

with $0<\alpha<1$. The goods consumption index is defined over consumption of each tradable sector's composite good and services:

$$C_n = [\psi^T (C_n^T)^\rho + \psi^M (C_n^M)^\rho + \psi^S (C_n^S)^\rho]$$

assuming consumption of sectoral composite goods to be complementary

$$(0 < \kappa = \frac{1}{1-\rho} < 1)$$

Consumers exhibit love of variety for both tradeable sectors' goods, $C^T$ and $C^M$, which we model in the standard CES fashion, where $n$ denotes the consumer's location and $i$ the producer's location, whereas $j$ is a measure of varieties. Consumption of each tradeable sector's good is defined over a fixed continuum of varieties $j \in [0, 1]$:

$$C_n^T = \left[ \sum_{i \in N} \int_0^1 \left( C_{ni}^T(j) \right)^v dj \right]^{1/v}$$

where $v$ is the elasticity of substitution across varieties, such that varieties within each sector are substitutes for each other $\sigma = \frac{1}{1-v} > 1$. An equivalent formulation is used for $C^M$. The following equation provides the classic Dixit-Stiglitz price index over traditional sector goods:

$$P_n^T = \left[ \sum_{i \in N} \int_0^1 \left( p_{ni}^T(j) \right)^{1-\sigma} dj \right]^{\frac{1}{1-\sigma}}$$

On the production side, there are two tradable sectors from which firms produce varieties that can be traded across many other locations. Production uses labor and land as inputs under constant returns to scale subject to stochastic location:

$$Y_n^i = Z^i \left( \frac{L_n^i}{\mu^i} \right)^{\mu^i} \left( \frac{h_n^i}{1-\mu^i} \right)^{1-\mu^i} \qquad i = T, M$$

where $0 < \mu^i < 1$ and, $z^i$ denotes the sector-location-specific realization of productivity $z$ for a variety in sector $i$ and location $n$. Following Eaton and Kortum (2002), locations draw sector- specific idiosyncratic productivities for each variety j from a Fréchet distribution:

$$F_n^i\left(z^i\right) = e^{\left(-A_n^i z^{i}\right)^{-\theta}} \qquad i = T, M$$

where $A_n^i$ is the average sectoral productivity in location $n$. The shape parameter, $\theta$, determines the variability of productivity draws across varieties in a given location $n$.

Trade in both sectors' final goods is costly, and trade costs are assumed to follow an iceberg structure. Trade costs between locations $n$ and $m$ are denoted as $d_{nm}$, such that quantity $d_{nm}$ has to be produced in $m$ for one unit to arrive in $n$. We assume that trade costs are the same across sectors and are symmetric.

Given perfect competition in both production sectors, the price of a given i-sector variety equals marginal cost inclusive of trade costs:

$$p^{i}_{nm} = \frac{\omega^{\mu^{i}}_{m} r_{m}^{1-\mu^{i}} d_{nm}}{z^{i}_{m}}$$

where $\omega^{\mu^{i}}_{m}$ is the wage of a worker and $r_{m}$ the price of land.
Each location $n$ will buy a given variety from its minimum-cost supplier location $m$:

$$p^{i}_{nm} = min \{p^{i}_{m,} m \in N\}$$

The share of expenditure that the destination location $n$ spends on agricultural sector (and equivalently manufacturing sector) goods produced in origin $m$ is given by

$$\pi^{i}_{nm} = \frac{A^{i}_{m}\left(\omega^{\mu^{i}}_{m} r_{m}^{1-\mu^{i}} d_{nm}\right)^{-\theta}}{\sum_{k\in N} A^{i}_{k}\left(\omega^{\mu^{i}}_{m} r_{m}^{1-\mu^{i}} d_{nk}\right)^{-\theta}}$$

Production of non-tradable services also uses labor and land as inputs, but output is a single homogeneous service. We assume agriculture to be the most and services the least land-intensive sector $\mu^{T} < \mu^{M} < \mu^{S}$.

Within each location, the expenditure share on each tradable sector's varieties and services depends on the relative (local) price of each sector's (composite) good:

$$\xi^{K}_{n} = \frac{(\psi^{K})^{\kappa}(P^{K}_{n})^{1-\kappa}}{(\psi^{M})^{\kappa}(P^{M}_{n})^{1-\kappa} + (\psi^{T})^{\kappa}(P^{T}_{n})^{1-\kappa} + (\psi^{S})^{\kappa}(P^{S}_{n})^{1-\kappa,}} \qquad K \in \{T, M, S\}$$

Given the properties of the Fréchet distribution of productivities, tradable sectoral price indices can be further simplified:

$$P^{i}_{n} = \gamma\left[\sum_{k\in N} A^{i}_{k}\left(\omega^{\mu^{i}}_{k} r^{1-\mu^{i}}_{k} d_{nk}\right)^{-\theta}\right]^{-1/\theta} = \gamma\,(\Phi^{T}_{n})^{-1/\theta}$$

To arrive at a spatial equilibrium, we provide conditions for land market clearing, labor market clearing, and a labor mobility condition. For an equilibrium in the land market, total income from land must equal total expenditure on land, where the latter summarizes land expenditure by consumers, $M$-sector firms, $T$-sector firms and $S$-sector firms. Similarly, labor market clearing requires that total labor income earned in one location must equal total labor payments across sectors on goods purchased from that location everywhere. We assume that workers can freely move across locations within but not across countries. Free mobility of

workers across locations within a country therefore implies that the wage earned by workers in each location after correcting for land and goods prices, as well as a location's amenity value, must be equalized across locations within a country. The welfare in each location of a same country $c$ is given by:

$$V_{n,c} = \overline{V}_c = \frac{\alpha^{\alpha}\ (1 - \alpha)^{1 - \alpha} V_{n,c}\omega_{n,c}}{[P_{n,c}]^{\alpha/(1 - k)}\, r_{n,c}^{1 - \alpha}}, \forall n \in \text{country}$$

where $P_{n,c}=(\phi^{M})^{\kappa}(P_{n,c}^{M})^{1-\kappa} + (\phi^{T})^{\kappa}(P_{n,c}^{T})^{1-\kappa} + (\phi^{S})^{\kappa}(P_{n,c}^{S})^{1-\kappa}$. We follow the specification in Moneke (2020) and Michaels, Rauch, and Redding (2011) to include the district-specific parameter $V_{n,c}$ in the wage, so that the welfare can be interpreted as the real income in each location.

## 5.2 Calibration of the Model

We calibrate the model by using some parameters from the literature and recovering the key productivity parameters and wages to obtain an equilibrium for the current situation. Table A.2 in the appendix reports the parameters from the literature used to calibrate the model, which are similar to the ones in Moneke (2020). We use the sectoral labor shares from Ethiopia in both Ethiopia and Kenya. To recover the productivity parameters, we use the labor market–clearing conditions, the land market conditions, and the labor mobility conditions. For each location, the model admits three equations for the three endogenous variables in each location—land market clearing, labor market clearing, and labor mobility condition—that allow us to solve for a general equilibrium of the model in terms of its core endogenous variables: wages, land rental rates, and population. Moneke (2020) shows the uniqueness of the equilibrium based on similar work by Michaels, Rauch, and Redding (2011). We obtain a series of $\{A_n^T, A_n^M, A_n^S\}_{n \in N}$ for which the distribution of population, employment, and land is an equilibrium given the current trade costs.

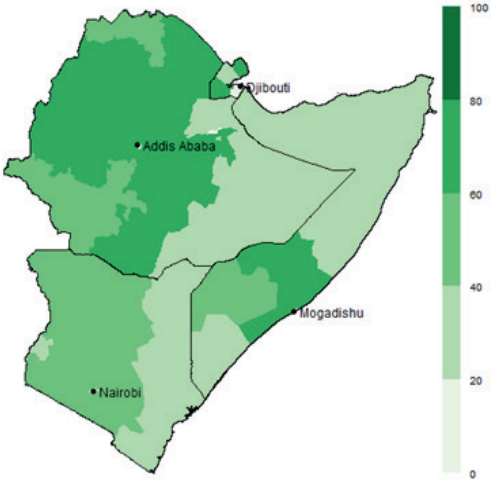
We calibrate the model to assess the welfare and spatial impacts of new transport investments. First, we calibrate the model to obtain the underlying parameters of the model for the baseline situation, without the new investments. Second, we update the trade costs based on the new assumptions. Third, we use the model to obtain the new employment shares given the new transport costs, the wage per location, and therefore the real wage given the new equilibrium goods and housing prices.

We use the available road networks for each country, making assumptions about speed along the networks based on the type and condition of roads that are registered. For Kenya, we used reported speed from our sources for the latest year. For other countries, we relied on additional features, such as the type of surface and the condition of the roads. Investments are assumed to increase the speed at which vehicles can travel along segments that are improved or build new links between locations. We assume trade costs to be iceberg costs, such that the costs between the origin location (o) and the destination (d) are given by $d_{od} = max\,(1, time^{\tau})$ Border costs are also added to trace costs, as detailed below.

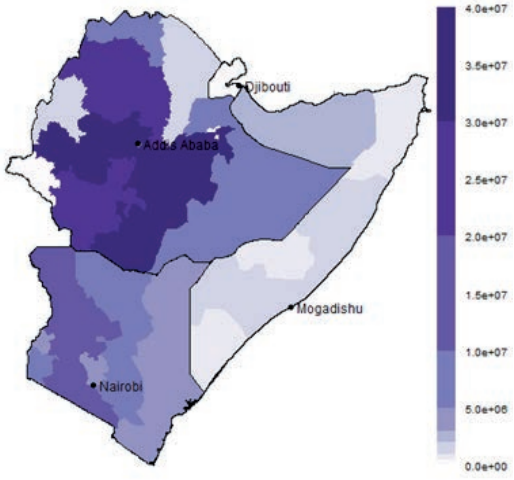
We calibrate the model using spatial data for land, population, and sectoral shares from the sources used earlier. Because of the complexity of a three-sector model to converge in order to recover the initial sectoral productivities, we reduce the spatial disaggregation to fewer locations. Such aggregation also smoothed measurement issues of sectoral employment based on the DHS data. We divide the Horn of Africa into 32 regions, including 11 first-order administrative divisions in Ethiopia, 5 in Djibouti, 8 groupings of first-order administrative divisions in Somalia, and 8 groupings in Kenya. Figure 2 shows the share of agricultural employment and the population for each subnational region.

Figure 2: Descriptive statistics for the 32 regions in the Horn of Africa

A. Share of employment in agricultural sector (in percentage of total employed population)




B. Population




Source: Authors' calculations using DHS data from latest year available per country and population from GHS 2015.

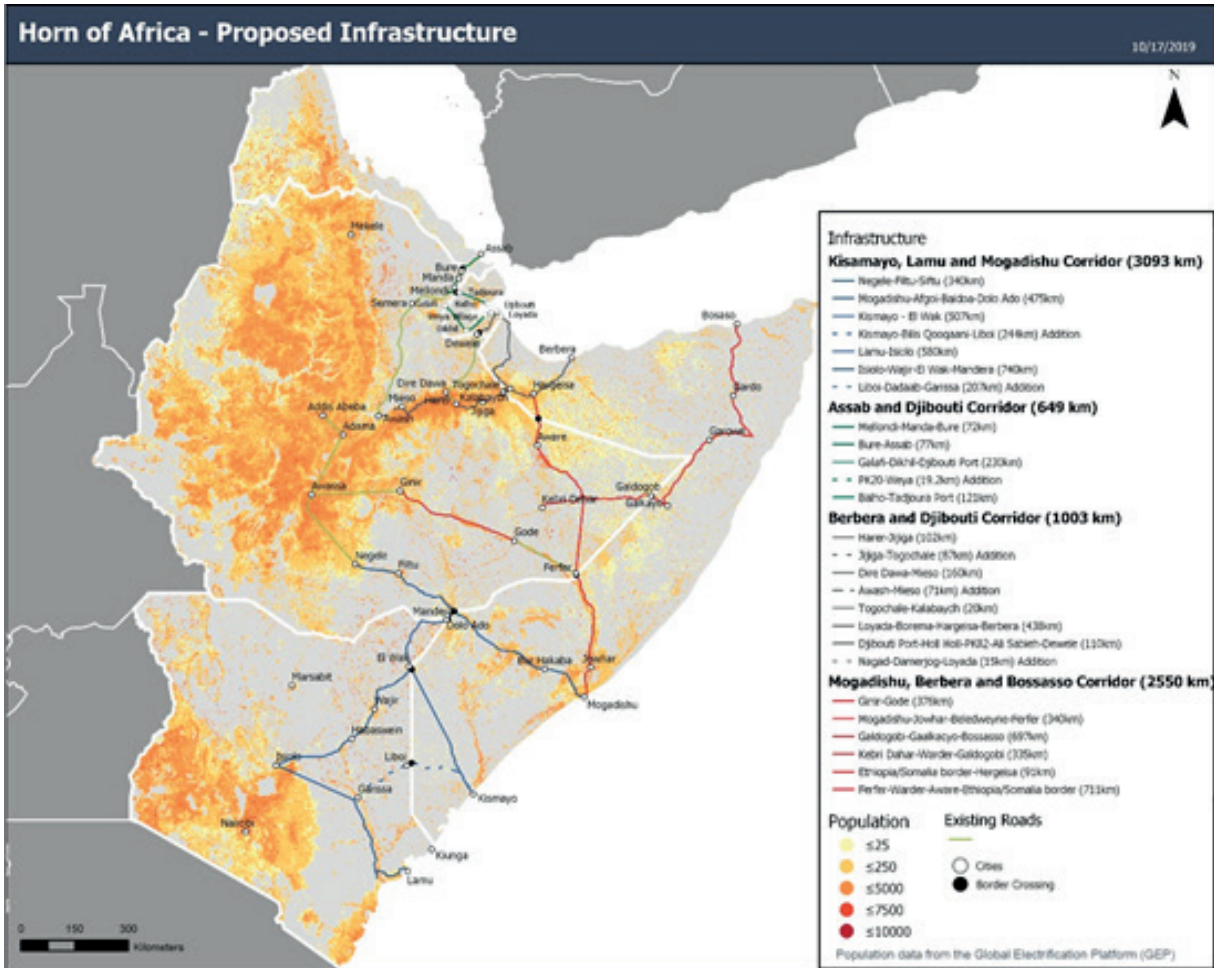
## 5.3 New transport infrastructure in the Horn of Africa

We investigate the impact of several regional transport corridors listed in table 11 and mapped in figure 3.

Table 11: **Summary of counterfactual scenarios**

| Scenario | Country | Road Infrastructure | Policies |
|---|---|---|---|
| | | Baseline | |
| 1 | Djibouti, Ethiopia, Kenya, Somalia | Speed and road conditions from latest surveys | High Trade border costs |
| | | With transport infrastructure investments | |
| 2.1 | Kenya, Somalia, Ethiopia | Corridor 1: Kismayo, Lamu and Mogadishu Corridor with 3093km of rehabilitation or new roads | High Trade border costs |
| 2.2 | Djibouti, Ethiopia | Corridor 2: Assab and Djibouti Corridor with 649km of rehabilitation or new roads | High Trade border costs |
| 2.3 | Somalia, Djibouti | Corridor 3: Berbera and Djibouti Corridor with 1003km of rehabilitation or new roads | High Trade border costs |
| 2.4 | Djibouti, Ethiopia, Somalia | Corridor 4: Mogadishu, Berbera and Bossasso Corridor with 2550km of rehabilitation or new roads | High Trade border costs |
| | | With border infrastructure investments | |
| 3 | Djibouti, Ethiopia, Kenya, Somalia | Corridors 1–4 | 50% reduction in border times at border posts along corridors 1–4 |

Figure 3: Proposed road corridors in the Horn of Africa




Source: World Bank.

### *Corridor 1: Kismayo, Lamu, and Mogadishu Corridor*

Corridor 1 links population centers in Ethiopia, Kenya, and Somalia with the Somali ports of Mogadishu and Kismayo and the Kenyan port of Lamu. The corridor serves several purposes. It provides an important bilateral artery between the Kenyan and Ethiopian economies, pillars of the regional market that are currently largely disconnected. It also connects three ports that are underutilized for national and regional trade (Lamu, Kismayo, and Mogadishu) with economic centers and hinterland demand. It also establishes connectivity within some of the most remote corners of the three countries.

### *Corridor 2: Assab and Djibouti Corridor*

Corridor 2 complements the trade corridor connecting population centers in Ethiopia with global markets through links with the port of Djibouti. It provides an alternate route between Ethiopia and the coast in Djibouti and complements existing linkages, reestablishing the historically important route to the port of Assab in Eritrea.

### *Corridor 3: Berbera and Djibouti Corridor*

Corridor 3 is a vital import route as well the primary path for export of goods out of Ethiopia. Its Djibouti–Ethiopia segments are already

fundamental links between the population centers of landlocked Ethiopia and global markets.

*Corridor 4: Mogadishu, Berbera, and Bossasso Corridor*

Corridor 4 provides access to the Port of Mogadishu in the southeast, through population centers on the Somali agricultural heartland along the Shabeelle River, the trading center of Beledweyne, following the river through Ferfer and toward the more populated western regions, including Addis Ababa. In the north, it connects to the Port of Bossasso, through Garowe and into Ethiopia, connecting the scattered population of Ethiopia's Somali region and linking up to Hargessa and Corridor 3 in the northwest. The corridor is intended to improve the connectivity of residents of the arid regions at the tip of the Horn of Africa.

### 5.3.1 Calibration of counterfactuals

We create counterfactuals using the transport networks from each country described in section 2. Figure A.6 in the appendix shows the new corridors and investments in border posts. We assume a speed of 70 kilometers an hour for the new corridors and reduce the time at the border in some of the scenarios.

### 5.3.2 Welfare impacts

Welfare is defined as the real income available for workers in a specific location, with nominal wages deflated by the prices for goods and housing across locations as well as an amenity from living in different places. We compute the welfare impact in each counterfactual and compare it to the baseline welfare:

$$\Delta Welfare_{n,c} = \Delta[Population_{n,c} \times V_{n,c}] \quad (4.13)$$

Table 12 shows the changes in the shares of employment in nonagricultural sectors. The proposed investments in transport corridors would lead to a 3 percentage-point increase in the share of employment in nonagricultural sectors in the four countries in the Horn of Africa. Kenya would experience the largest increase, followed by Ethiopia, Djibouti, and Somalia. Trade facilitation measures that reduce border times by half would add only a half percentage-point to the change in the share of employment in nonagricultural sectors in the Horn of Africa, but it would lead to significant increases in the share of employment in nonagricultural sectors in Kenya and Djibouti.

Table 12: **Counterfactual increases in share of nonagricultural employment in Horn of Africa, by country (percentage points)**

| Country | Transport only | With trade facilitation |
|---|---|---|
| Djibouti | 1.3 | 4.3 |
| Ethiopia | 2.6 | 1.0 |
| Kenya | 4.2 | 10.7 |
| Somalia | 0.4 | 0.8 |
| Total | 3.0 | 3.5 |

Table 13 shows the change in real income when considering only new road corridors and trade facilitation measures that reduce border frictions. The overall increase in welfare is just 1 percent when only investments in transport corridors are made; it is four times larger when times are also reduced at border posts along the corridors. Somalia enjoys the largest gains, followed by Djibouti, Kenya, and Ethiopia.

Table 13: Counterfactual increases in real income in Horn of Africa, by country (percentage points)

| Country | Investments in transport corridors | Investments in transport corridors and trade facilitation |
|---|---|---|
| Djibouti | 0 | 5.3 |
| Ethiopia | 1.3 | 3.9 |
| Kenya | 0.7 | 4.9 |
| Somalia | 1.4 | 6.3 |
| Total | 1.0 | 4.3 |

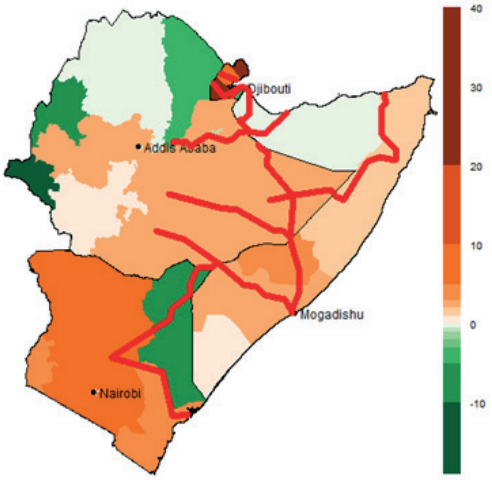
### 5.3.3 Spatial impacts

The total share of employment in nonagricultural sectors increases in all countries, but not in every subnational region. Lower transport and trade costs increase market access, providing more opportunities for producers in districts that benefit from transport investments. Better connectivity leads to higher specialization and increases competition from imports from other regions in the country for the traded good sectors (manufacturing and agricultural activities). Workers move across locations and sectors in response to changes in wages and prices.

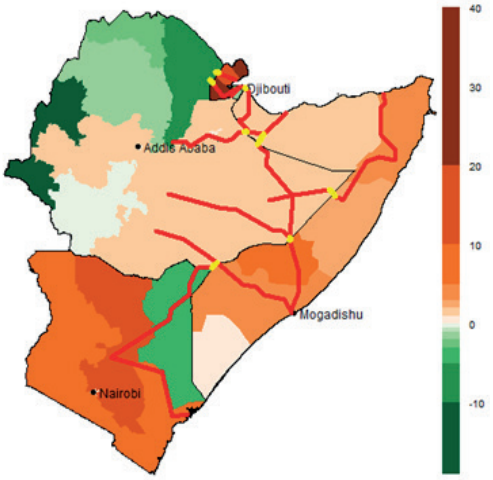
For some regions, better regional connectivity translates into higher specialization in agricultural production. In figure 4, the green areas are regions here the share of nonagricultural employment will decrease because of the transport corridor investments and better trade facilitation; the orange and red areas are regions where it will increase. The regions that experience an increase in the share of agricultural employment are either isolated regions or border regions, mostly in the northwest of Ethiopia and the northeast of Kenya. The spatial patterns remain the same when the time to cross the borders is reduced by half, but the largest changes become larger.

Figure 4: Changes in share of nonagricultural employment in counterfactual scenarios relative to baseline (in percentage)

A. Transport corridor investments




B. Transport corridor investments and trade facilitation

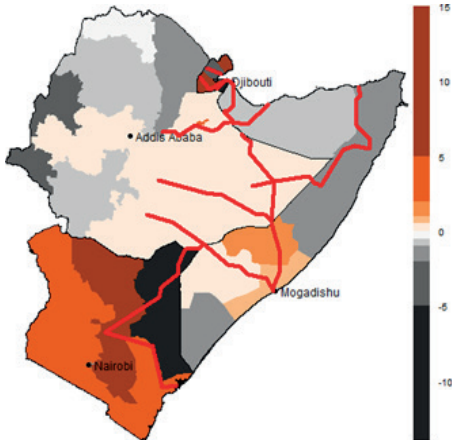



Source: Authors' calculations.

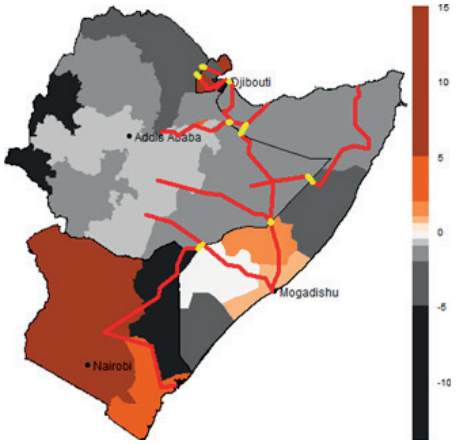
Specialization in manufacturing—the traded nonagricultural good—changes most in regions that benefit from corridor improvement. However, not all regions that benefit from better connectivity experience an increase in specialization in manufacturing. The shares of manufacturing employment will increase the most in Djibouti and Kenya; they increase only slightly in the central and eastern parts of Ethiopia and in the regions around Mogadishu in Somalia (figure 5). When transport investments are complemented with trade facilitation measures that reduce border times by half, the share of employment in manufacturing decreases across Ethiopia. In Somalia, and particularly in Kenya, the changes in employment shares become even larger, with most regions in Kenya further specializing in manufacturing. Complementary investments in electricity and Internet could increase productivity and support the manufacturing sector in some of those locations where improved connectivity will have a negative effect.

**Figure 5: Change in share of manufacturing employment in counterfactual scenarios relative to baseline (in percentage)**

A. Transport corridor investments




B. Transport corridor investments and trade facilitation

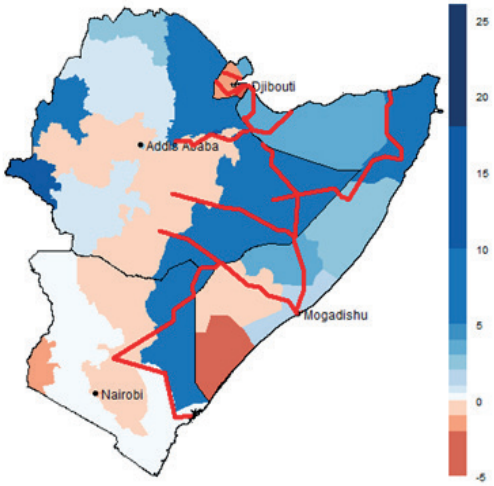



Source: Authors' calculations.

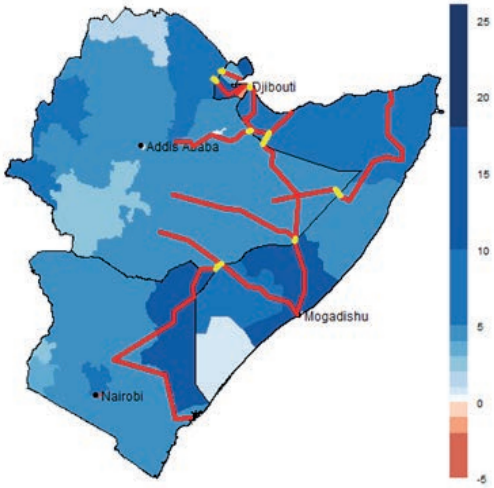
Overall, welfare, measured as real income, increases at the aggregate level for all countries but not for all subnational regions when only transport corridor improvements are undertaken (figure 6). Real income tends to increase in the regions the new corridors will traverse. If border times also decrease, almost all regions in the Horn of Africa enjoy higher welfare, with some regions in Kenya and Somalia benefiting the most in percentage terms.

Figure 6: Welfare impacts in counterfactual scenarios relative to baseline (in percentage points)

A. Transport corridor investments




B. Transport corridor investments and trade facilitation




Source: Authors' calculations.

SECTION 6

# Conclusion

This paper investigates how infrastructure—transport, electricity and Internet—affects economic development through the channels of sectoral employment and structural change. It first estimates the impacts of past transport, electricity, and Internet investments in Ethiopia and Kenya on sectoral employment. The empirical analysis shows that access to electricity triggered a shift in employment from agriculture to services, that access to paved roads led to an increase in the share of manufacturing employment, and that access to Internet led to an increase in the share of service employment and, in Ethiopia only, a shift away from agriculture.

One of the main contributions of the paper is the finding that, on average, combining investments in electricity and paved roads led to a shift from agriculture to manufacturing, with no significant change in the share of employment in services. Combining investments induces a movement out of agricultural employment in locations near main towns but not in isolated locations.

The paper's spatial general equilibrium model estimates the potential impacts of proposed regional transport corridor projects in the Horn of Africa. The analysis also looks at the impact of complementary trade facilitation measures. It shows the importance of such complementary interventions in facilitating regional trade and enhancing the benefits of transport corridors.

The spatial general equilibrium model does not consider investments in electricity or Internet. The plan for future research is to include those sectors in the model and to link them with the empirical analysis.

# References


Adamopoulos, Tasso, "Spatial Integration, Agricultural Productivity, and Development: A Quantitative Analysis of Ethiopia's Road Expansion Program," 2019 Meeting Papers 86, Society for Economic Dynamics 2019.

Adukia, Anjali, Sam Asher, and Paul Novosad, "Educational Investment Responses to Economic Opportunity: Evidence from Indian Road Construction," *American Economic Journal: Applied Economics,* January 2020, 12 (1), 348–376.

Allen, Treb and Costas Arkolakis, "Trade and the Topography of the Spatial Economy," *The Quarterly Journal of Economics,* 2014, 129 (3), 1085–1140.

Arderne, C., C. Zorn, C. Nicolas, and E. Koks, "Predictive mapping of the global power system using open data.," *Sci Data* 7, 19, 2020.

Asher, Sam and Paul Novosad, "Rural roads and local economic development," Policy Research Working Paper Series 8466, The World Bank June 2018.

Behrens, Kristian, Carl Gaigne, Gianmarco I.P. Ottaviano, and Jacques-Francois Thisse, "Is remoteness a locational disadvantage?," *Journal of Economic Geography,* June 2006, 6 (3), 347–368.

Bird, Julia, Mathilde Lebrand, and Anthony J. Venables, "The Belt and Road Initiative: Reshaping economic geography in Central Asia?," *Journal of Development Economics,* 2020, 144 (C).

Bustos, Paula, Bruno Caprettini, and Jacopo Ponticelli, "Agricultural Productivity and Structural Transformation: Evidence from Brazil," *American Economic Review,* June 2016, 106 (6), 1320–1365.

Calderon, Cesar, Enrique Moral-Benito, and Luis Serven, "Is infrastructure capital productive? A dynamic heterogeneous approach," *Journal of Applied Econometrics,* March 2015, 30 (2), 177–198.

Croke, Kevin and Alice Duhaut, "The Impact of Roads on Land-Use Change in Ethiopia: Evidence from Satellite Imagery," 2020.

Donaldson, Dave, "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure," *American Economic Review,* April 2018, 108 (4-5), 899–934.

Eckert, Fabian and Michael Peters, "Spatial Structural Change," 2018 Meeting Papers 98, Society for Economic Dynamics 2018.

Foster, Vivien and Cecilia Briceno-Garmendia, *Africa's Infrastructure: A Time for Transformation [Infrastructures africaines]* number 2692. In 'World Bank Publications.', The World Bank, June 2010.

Fried, Stephie and David Lagakos, "Electricity and Firm Productivity: A General- Equilibrium Approach," Working Paper 27081, National Bureau of Economic Research May 2020.

Gebresilasse, Mesay, "Rural roads, agricultural extension, and productivity," 2019.

Gertler, Paul J., Marco Gonzalez-Navarro, Tadeja Gravcner, and Alexander D. Rothen- berg, "Road Quality, Local Economic Activity, and Welfare: Evidence from Indonesia's Highways," 2016.

Herrendorf, Berthold, Rogerson, Richard and Valentinyi, Akos, (2014), Growth and Structural Transformation, ch. 06, p. 855-941 in , Handbook of Economic Growth, vol. 2, Elsevier.

Herrera Dappe, Matías and Mathilde Lebrand, "The Spatial Effects of Logistics Interventions on the Economic Geography of Bangladesh," 2019.

Herrera Dappe, Matías, Mathilde Lebrand, and Diana Van Patten, "Bridging India and Bangladesh: Cross-border Trade and the BBIN Motor Vehicles Agreement," 2021.

Jedwab, Remi and Adam Storeygard, "The Average and Heterogeneous Effects of Transportation Investments: Evidence from Sub-Saharan Africa 1960-2010," NBER Working Pa- pers 27670, National Bureau of Economic Research, Inc August 2020.

Kebede, Hundanol, "The gains from market integration: The welfare effects of rural roads in Ethiopia," 2019.

Lall, Somik V. and Mathilde Lebrand, "Who wins, who loses? Understanding the spatially differentiated effects of the belt and road initiative," *Journal of Development Economics,* 2020, 146 (C).

McMillan, Margaret, Dani Rodrik, and Claudia Sepulveda, "Structural Change, Fundamentals and Growth: A Framework and Case Studies," Working Paper 23378, National Bureau of Economic Research May 2017.

Michaels, Guy, Ferdinand Rauch, and Steve Redding, "Technical note: an Eaton and Kortum (2002) model of urbanization and structural transformation.," 2011.

Moneke, Niclas, "Can Big Push Infrastructure Unlock Development? Evidence from Ethiopia," Technical Report 2020.

Ngai, L. Rachel and Christopher A. Pissarides, "Structural Change in a Multisector Model of Growth," *American Economic Review,* March 2007, 97 (1), 429–443.

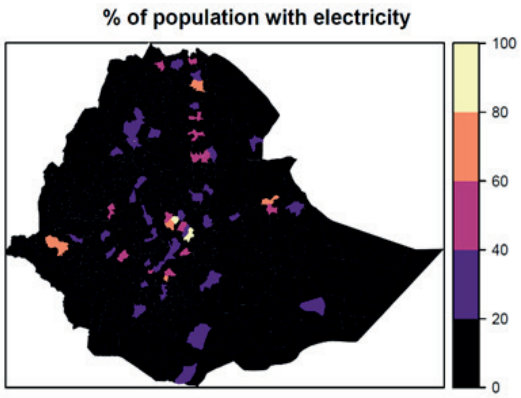
Redding, Stephen J., "Goods trade, factor mobility and welfare," *Journal of International Economics,* 2016, 101 (C), 148–167.

# A Appendix

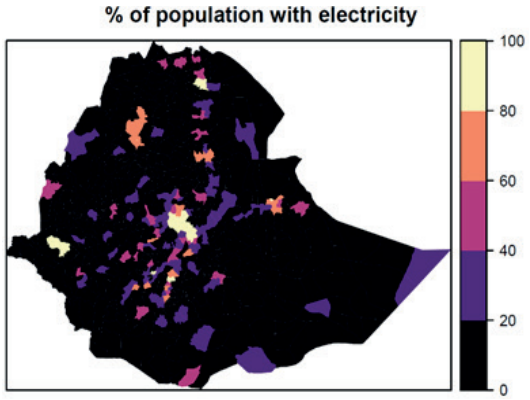
Figure A1: Share of subnational population with access to electricity in Ethiopia and Kenya based on nightlights in 2016 (in percentage)

Ethiopia

A. 1998

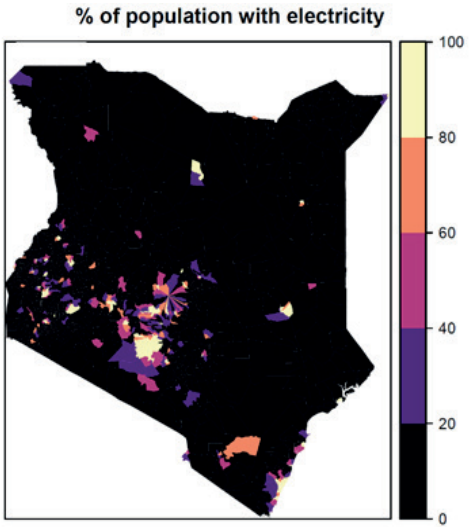



B. 2016

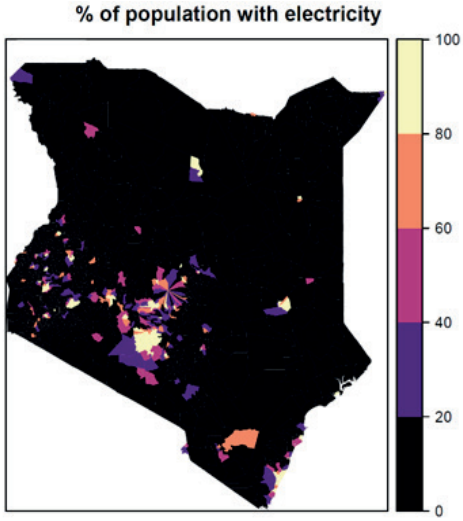



Kenya

A. 1998



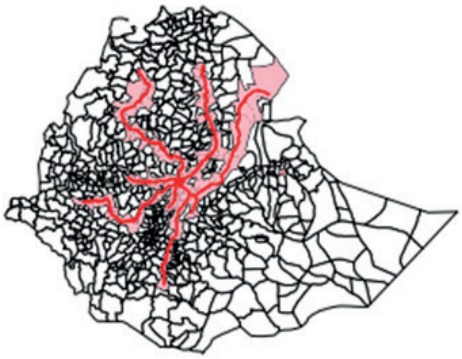

B. 2016



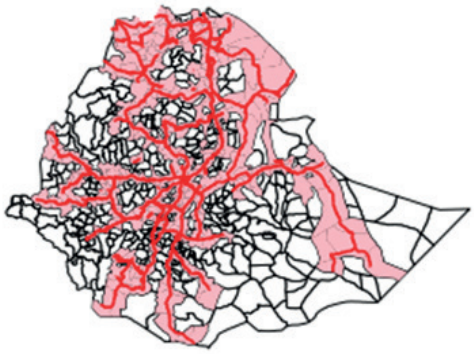

Source: Authors' calculations.

## Figure A2: Paved road network in Ethiopia, 1996 and 2016

A. 1996



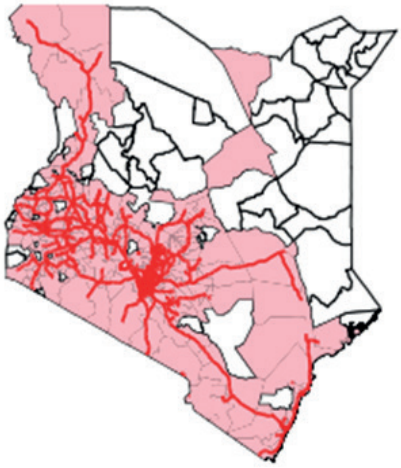
B. 2016



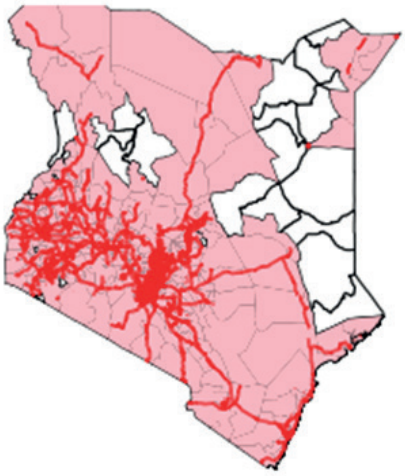
Source: Data from the Ethiopian Roads Authority used in Croke and Duhaut (2020).

## Figure A3: Paved road network in Kenya, 2003 and 2018

A. 2003



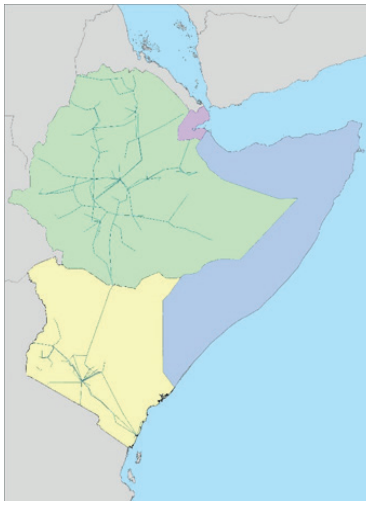
B. 2018



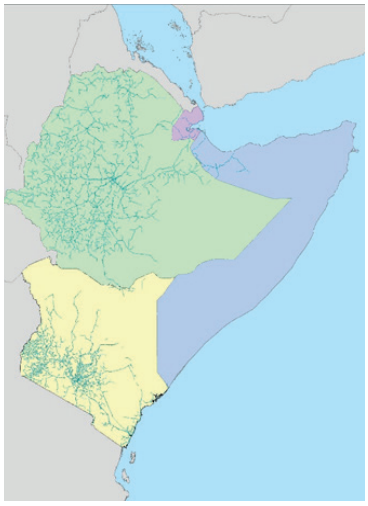
Source: Kenya Road Board.

## Figure A4: Electricity grid in Ethiopia and Kenya, 2007 and 2018

A. 2007



B. 2018



Source: Foster and Briceno-Garmendia (2010), gridfinder.org, and Arderne et al. (2020).

## Figure A5: Access to Internet backbone in Ethiopia and Kenya, 2009 and 2019

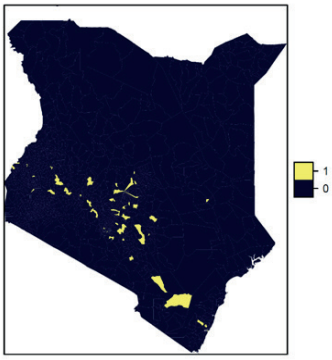
### Ethiopia

A. 2009

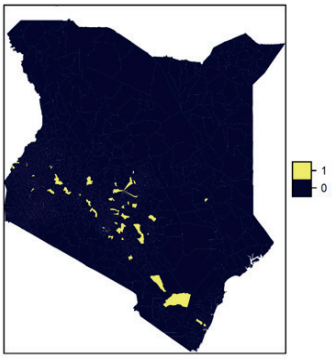

B. 2019


### Kenya

C. 2009

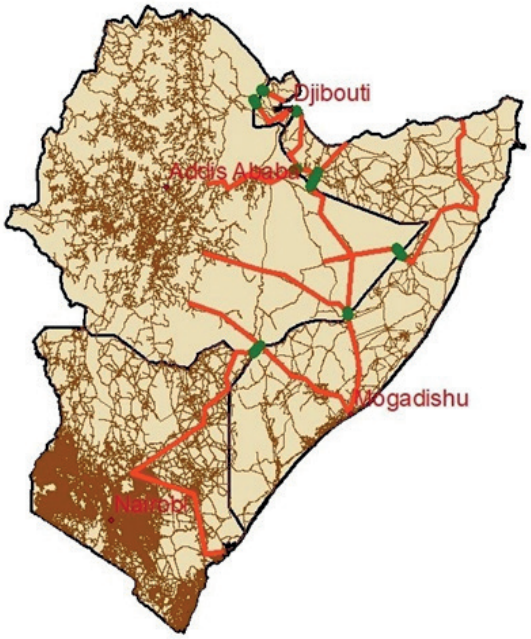



D. 2019




Source: Africa Bandwidth Maps.

Figure A6: Transport network, new corridors, and border points benefiting from lower border delays in the Horn of Africa as coded to quantify the counterfactuals




Source: Authors' based on country road networks as listed in Section 3.

Table A1: OLS results for the Horn of Africa using the electricity grid

| Share of employment per sector | Agriculture | Manufacturing | Services |
|---|---|---|---|
| Paved roads | -0.0587* | 0.0171 | 0.0191 |
| | (-2.36) | (1.34) | (0.99) |
| Internet | 0.00760 | 0.0189 | -0.0461 |
| | (0.11) | (0.37) | (-0.97) |
| Electricity grid | -0.0143 | 0.00675 | 0.0174 |
| | (-0.77) | (0.78) | (1.28) |
| Road + Internet | -0.0797 | -0.00368 | 0.108* |
| | (-1.12) | (-0.07) | (2.17) |
| Road + Electricity grid | 0.00914 | 0.0106 | 0.00795 |
| | (0.35) | (0.80) | (0.40) |
| Year + Country FE | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |
| *R*-squared | 0.418 | 0.307 | 0.363 |
| Number of observations | 1887 | 1887 | 1887 |

Note: *t* statistics in parentheses.
$^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$

Table A2: Parameters for structural estimation

| Parameter | Value | Source | Description |
|---|---|---|---|
| $\sigma$ | 4 | Bernard et al. (2003) | Elasticity of substitution between varieties |
| | | Data for Ethiopia (HCES) | Expenditure share on land/housing |
| | 0.5 | Ngai and Pissarides (2007) | Elasticity of substitution across sectors |
| $\mu^M$ | 0.82 | Moneke (2020) for Ethiopia | Labor share in M-production |
| $\mu^T$ | 0.78 | Moneke (2020) for Ethiopia | Labor share in T-production |
| $\mu^S$ | 0.84 | Moneke (2020) for Ethiopia | Labor share in S-production |
| $\tau$ | 0.3 | Moneke (2020) for Ethiopia | Elasticity of trade cost with respect to distance |
| $\theta$ | 4 | Donaldson (2018) | Shape parameter of productivity distribution across varieties & locations |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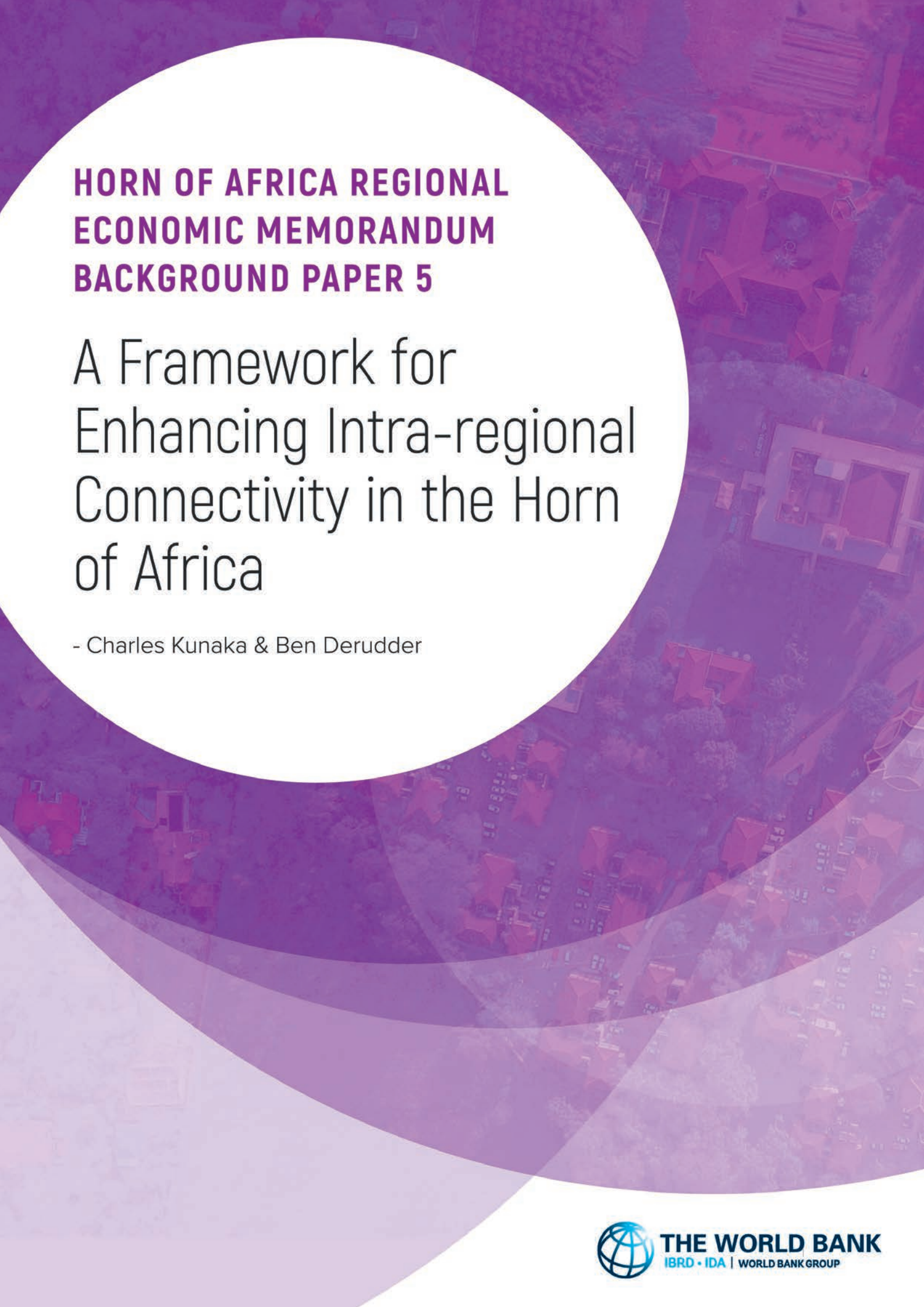

HORN OF AFRICA REGIONAL ECONOMIC MEMORANDUM BACKGROUND PAPER 5

# A Framework for Enhancing Intra-regional Connectivity in the Horn of Africa

- Charles Kunaka & Ben Derudder

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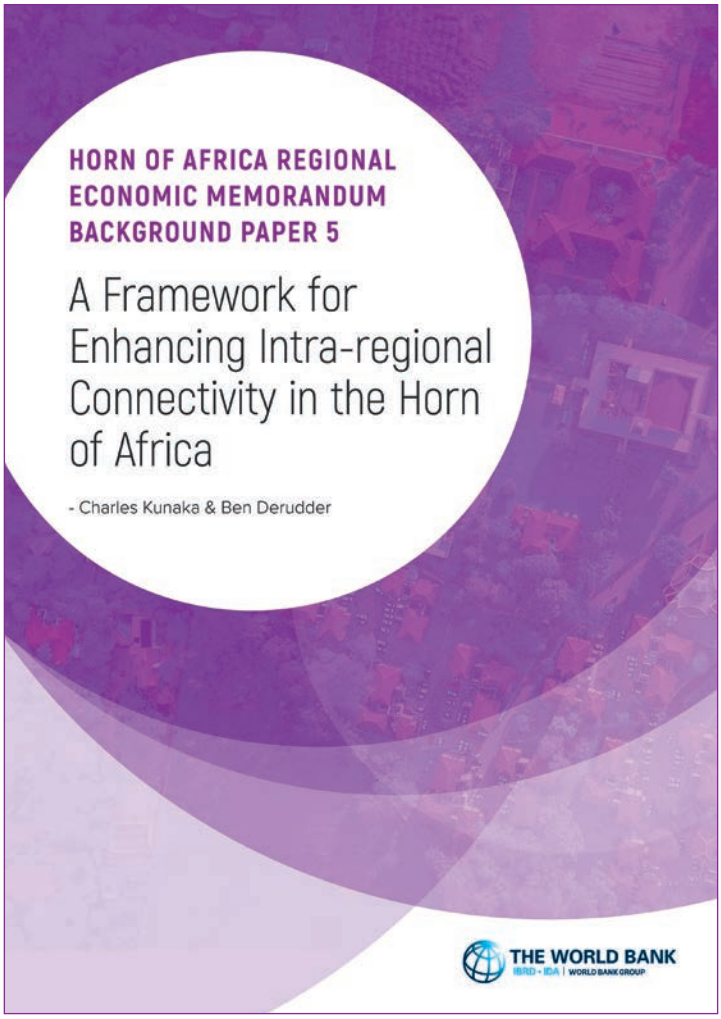
HORN OF AFRICA REGIONAL ECONOMIC MEMORANDUM BACKGROUND PAPER 5

# Enhancing Intra-regional Connectivity in the Horn of Africa

- Charles Kunaka & Ben Derudder



# CONTENTS

SECTION 1

# Background

**The Horn of Africa (HoA) Initiative places the development of regional corridors at the centre of the regional integration agenda.** Poor intra-regional connectivity has emerged as one of the main signals of weak regional integration as well as an impediment to increased trade within the region. Regional dialogue in the HoA places a premium on measures to enhance interconnectivity and remove hurdles to the flow of trade and transport. Enhancing connectivity should enhance access to broad factor and product markets and make connected economic centers in different countries more attractive by providing productivity benefits. From a corridor development perspective, the place of an economic centre, its location and role, its linkages with other centers in a network will determine how it benefits from the HoA initiative.

**A classical definition of a corridor is that it is "is a coordinated bundle of transport and logistics infrastructure and services that facilitates trade and transport flows between major centers of economic activity" (Kunaka, Carruthers, 2014).** For instance, depending on an economic center's position in a connected corridor network, it can intermediate flows of components and goods between other centers and benefit from its position. As such, this paper is intended to focus dialogue on how to best envision the network of corridors in the Horn. Some of the policy questions it aims to answer are: (a) which regional links would have the most impact on overall regional connectivity: (b) how critical are national transport networks to connectivity outcomes in the region; and (c) what would be the best strategy for improving the integration of lagging regions, many of them in the borderlands of the Horn of Africa. The paper is based on the hypothesis that improving connectivity between the major economic centers in the HoA offers significant prospects for enhancing regional trade and transport connectivity.

**The chapter is connected to the range of broader policy discussions on the nexus of access to goods, services, and knowledge provided by cities as a key driver of integration and socio-economic development:** cities that are well connected in trade and transport networks can serve both as markets for local products and as hubs for regional and international trade and knowledge exchange. There is ample empirical evidence about the goods, services, and knowledge provided by well-connected urban contexts being more abundant, more diverse, and lower in cost. Well-connected cities also provide more direct access to medical services and education and have the potential to promote social interaction between people with different ethnic, national and linguistic backgrounds. Overall, as a city's connectivity increases, the average distance/time/cost/difficulty to gain access to/from other urban and regional economies decreases, thus creating more opportunities for interaction and the associated economic benefits.

**In the Horn of Africa, distance is arguably the most decisive factor driving regional connectivity.** In the region's most sparsely urbanized regions, cities are separated by significant distances which impose considerable constraints on inter-city connectivity. However, rather than distance per se, previous research has shown that it is above all the relative presence or absence of inter-city transport infrastructures that explicates inter-city connectivity (Derudder et al., 2018). For example, the Kenyan city of El Wak and the Ethiopian city of Tepi are separated by an Euclidean distance of about 780 km. However, given the lack of

well-developed transport corridors this entails 1250 km of driving that takes 24 hours at best. Furthermore, there are no clear-cut options to significantly shorten this connection (for example by air), making it hard to conceive meaningful interactions between both urban economies. Although this is of course an extreme example, it provides a stark illustration of the connectivity conundrum in parts of the Horn of Africa.

**It is clear that HoA cities are very unequally connected. A first consideration is that different types of transport infrastructure are associated with different types of connectivity.** For example, air transport connections are important because they allow for fast and direct access. However, this type of connectivity is presently only open to a small portion of the population. Transport connections by well-developed road infrastructure are not as fast and often more indirect. However, this infrastructure has the potential of forming the core of corridors that act as coordinated bundles of interaction between numerous centers of economic activity and are accessible for a much larger part of the population. Second, regional, national, and international connectivity is clearly concentrated in the HoA's major cities, especially capital cities. These cities as well as the cities that have relatively strong connections with them have a comparative advantage over other cities. Meanwhile, relatively smaller and/or peripherally located cities are often poorly connected to these major nodes and transport corridors Thus, they risk being caught in a spiral of geographical and topological marginalisation. Nonetheless, targeted investments can radically change the development outlook of such cities. One of the objectives of this paper is to suggest which (types of) links have the most potential in this regard.

**Within the above context, this background paper systematically maps and assesses the connectivity of cities in the Horn of Africa (HoA) and uses the results to proposes a number of policy perspectives on how to strategically boost connectivity in different parts of the region.** Analytically, this is achieved through network analysis of the directness, the diversity, topology and the density of HoA cities' transport infrastructure connections. Crucially, network analysis allows proxy-ing HoA cities' potential to participate in value chains at various geographical scales and identifying key areas of possible intervention. Results can guide institutional and governance measures that can be taken to influence connectivity as a whole and for specific cities and transport corridors in particular. The output can thus help determine the interventions that are needed to tackle bottlenecks in corridors, addressing infrastructure, policy and regulatory constraints.

**The remainder of this paper is organized as follows.** Section 2 outlines the rationale for an analysis of inter-urban connectivity in general and its linkages with the broader topic of regional integration and the economic geographies of the HoA in particular. Section 3 discusses our analytical framework, while Section 4 discusses the results. The paper is concluded with a discussion of key policy perspectives in section 5.

SECTION 2

# Why intercity connectivity is key to regional integration

**The proposed network analysis of transport connections between cities obviously chimes well with broader scientific discussions on the impact of transport infrastructure provision on the economy in general and its role in promoting regional integration, by causing, reinforcing, or tackling spatial inequality in particular.** It is widely accepted that transport infrastructures are an important component of the economy, impacting both the development of cities as well as the welfare of their population (e.g. Limao & Venables. 2001; Calderon & Serven. 2004; Brooks and Hummels, 2009; Yin et al., 2015; Glaeser et al., 2016). Enhanced transport corridors have been shown to increase trade, productivity, competition, and business activity because of the improved market access that comes with lowered transport costs. Having reliable strong and robust

transport connections to external labor, resource and consumer markets makes a location more attractive by providing productivity or profitability benefits in addition to bringing lower unit costs for workforce and facilities operations. The extensively documented impact of transport on economic growth is discursively reinforced by policy narratives: many transport expansion or improvement projects are justified because of their alleged ability to bolster economic development in the broadest sense. Indeed, policy-makers and planners frequently cite economic growth as a key motivation and justification for major investments in cyber-infrastructure, highways, rail lines, airports, and intermodal facilities for developing intra-regional, inter-regional, and international markets.

**The presence of increasingly extensive infrastructure networks may suggest that, in an increasingly globalized and urbanized economy, knowledge and goods are almost instantly available to economic agents at limited cost.** However, such naïve 'death-of-distance' readings of the space-economy obviously ignore that in reality there are still substantial and geographically uneven costs associated with overcoming distance. An important concept in this regard is that of 'urban connectivity'. In its most basic guise, urban connectivity refers to the observable pattern of linkages between cities that can be examined using tools of graph theory. Although interest in 'city networks' dates back to at least the 1960s (e.g., Nystuen and Dacey 1961; Haggett and Chorley 1969), there has been a recent surge in interest in this field since the 2000s (Neal, 2012). Crucially, the concept of urban connectivity entails much more than the mere stock or quality of transport infrastructures associated with a city: it refers to the directness, the diversity, the topology and the density of a city's connections with other cities. For example, the presence of a sizable airport alone does not make a city into a well-connected node, as this also depends on the nature and variety of its direct connections and a number of other connectivity characteristics. For instance, a city's connectivity may change because of topological changes that are not directly related with that city: creating additional air transport connection in a proximate city with which it has good road connectivity may also change the city's network position. The added value of thinking in terms of spatial networks instead of spatial interaction, therefore, resides in (also) systematically considering the value of connections beyond 'direct neighbors' (Derudder, 2020).

**In general terms, a network perspective focuses on the extent to which benefits of one entity (i.e. a city) being connected to the network spill over to other entities (i.e. cities).** Katz and Shapiro (1985) coined the term network externalities to refer to the effects a product or service has on a user while others are using the same or compatible products or services. Positive network externalities exist if the advantages (or, more technically, the marginal utility) are an increasing function of the number of other users. Katz and Shapiro (1985) discussed the example of ICT infrastructure where the utility that a given user derives from the good depends on the number of other users in the same network. Cast in the context of inter-city transport networks, this would suggest that cities stand to benefit – albeit unevenly – from an enhanced supply of connectivity across the

network. However, it is useful to point out that there are also negative network externalities, which emerge if the benefits are a decreasing function of the number of other users. For example, a new and improved road can confer negative network externalities if it attracts new, disproportionally large traffic volumes thus creating congestion that ultimately lower connectivity. However, in most instances, and this is also the assumption in this background paper, additional or improved inter-city transport connections are regarded as creating positive network externalities.

Camagni (1993) and later Capello (1996, 2000) generalized this line of thinking for city-systems by proposing the related notion of 'urban network externalities' referring to the urban-economic benefits associated with inter-city interactions. They advance a 'club good' perspective on urban network externalities (van Meeteren et al., 2016), emphasizing that benefits accrue on the level of the city production function as connections deliver beneficial synergies and complementarities (Camagni et al. 2013; van Oort et al. 2010). In our research on the HoA, we will follow this line of research theorizing that urban network externalities are above all positive externalities that are derived from the directness, the diversity, the topology and the density of a city's connections with other cities.

City network analysis in the HoA needs to consider that many connections are often average at best compared to other geographical settings (e.g. the relatively lower quality of highways between major centers in different countries, as well as the relatively longer/more complex border crossings on roads), with many of these being of relatively recent date (e.g. the recent development of an Ethiopian national train system). The creation or deepening of transport corridors in the HoA implies the stepwise evolution from a set of poorly connected cities to a much more integrated, region-wide network connecting all cities in the HoA. When implemented, such a 'mature' system will allow for a more efficient exploitation of economies of scale and scope as well as productivity benefits in the cities along the corridors. The spatial concentration of flows in economic centers along these axes turns them into privileged sites within the wider region. One of the key objectives of the infrastructure investments in the Horn of Africa (HoA) is to facilitate the development of such an integrated regional transport system anchored in its cities.

*The concept of urban connectivity entails much more than the mere stock or quality of transport infrastructures associated with a city.*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SECTION 3

# Analytical framework

## 3.1 Identifying the key nodes for connectivity in the HoA

**One of the recurring challenges in urban research is the formal identification of cities.** Measures of cities often tend to rely on national definitions, which vary considerably and limit comparability and integrated analysis. Importantly, in addition to harmonization as such, definitions and indicators also ideally need to capture the role of cities as economic centers. Over the past years there have been a number of large-scale efforts to develop harmonized indicators of cities in their role as economic centers. One of the most consistent frameworks in this regard is provided in the context of the European Union-initiated 'Global Human Settlement' (GHS) project, which *inter alia* entails the development of a spatial raster dataset depicting the global distribution of population: the Global Human Settlement Layer (GHSL). The GHSL uses heterogeneous data including global archives of fine-scale satellite imagery, census data, and volunteered geographic information. The data is processed automatically using machine learning techniques and generates analytics and knowledge reporting objectively and systematically about the presence of population densities and built-up infrastructures.

**This spatial raster with population densities is used as the input to a Degree of Urbanization (DoU) algorithm, which assigns territories to different classes based on spatial contiguities of similar raster cells.** This leads to the identification of 'cities' according to a uniform set of attributes gathered from the GHSL raster data. The DoU is calculated by assigning 1 km² grid cells to one of the different classes based on contiguity, density, and population size. The 'cities' class is defined as contiguous sets of grid cells with a density of at least 1,500 inhabitants per km² that collectively have a population of at least 50,000. Any gaps within this collection of grid cells are then filled, after which the edges are smoothed with an iterative application of the majority rule (i.e. if five out of the eight surrounding cells are part of an urban center, this cell is added to the center). Figures 1a and 1b show the result for the examples of Ziway (Ethiopia) and Mogadishu (Somalia).

Figure 1: Title of Figure

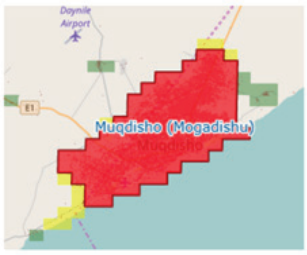
A. Ziway according to the DoU classification

B. Mogadishu 'according to the DoU classification

| Characteristics | Geography | Socio-Economic | Environment | Exposure and hazard | SDG |
|---|---|---|---|---|---|

**Name of the Urban Centre**: Muqdisho (Mogadishu) (SOM)
**Resident population in 2015**: 1 503 035 inhabitants
**Surface in 2015 (km²)**: 98
**Average Population Density in 2015 (inhabitants/km²)**: 15 337
**Geographical coordinates (centroid)**: Lat.: 2.0525, Lon.: 45.3316
**Country**: Somalia
**Number of countries crossed**: 1 country
**Countries crossed (ISO codes)**: SOM
**UN region**: Africa
**UN subregion**: Eastern Africa
**UN income class**: Low-income Countries (LIC)
**UN development class**: Least developed countries (LDCL)

**Map of Muqdisho (Mogadishu) [SOM]**



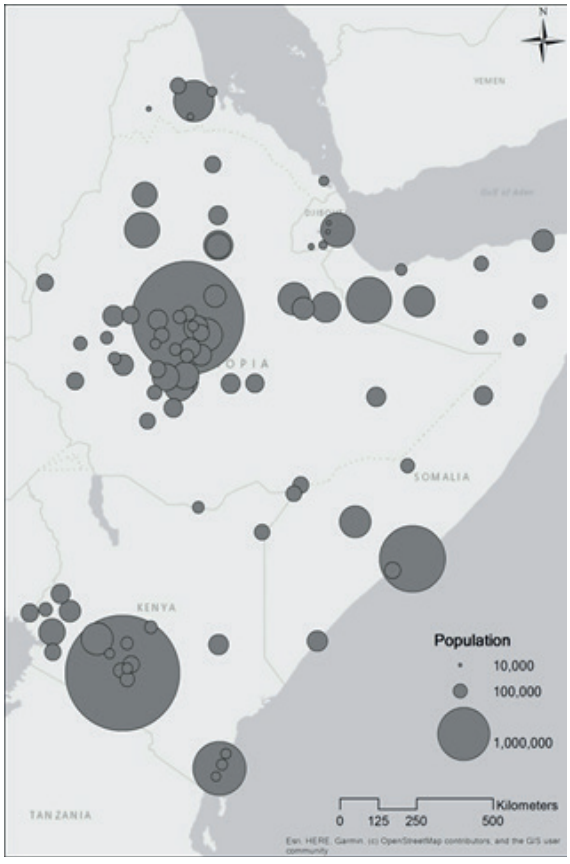

UN region, subregion, income class and development class are extracted from UN World Urbanization Prospects (WUP) 2018

Source: Insert source here.

**Using the DoU-based definition of cities has several benefits, the three most pertinent ones in the context of this research being that:** (1) it can be applied in a very cost-effective manner; (2) allows for a consistent perspective on the size of cities; and (3) is conceptually and operationally linked to the broader conception of economic centers. This is because the methodology captures spatial concentration of people directly, instead of relying on proxies such as built-up areas, night lights, or administrative units.[iii]

**A total of 84 centers in the Horn of Africa are formally identified as 'cities' in the DoU classification, 3 of which are cross-border cities (Busia at the Uganda/Kenya border, Mandera at the Kenya/Somalia border, and Moyale at the Kenya/Ethiopia border).** With the exceptions of Djibouti (Djibouti) and Asmara (Eritrea), the cities are located in Kenya, Ethiopia, and Somalia. To make the analysis regionally more inclusive, additional cities with a population below 50,000 were selected for Djibouti (4) and Eritrea (5) using population data from the City Population database (http://www.citypopulation.de). This produces a total of 93 cities, with at least 5 cities in each HoA country. Figure 2 shows the geographical layout of the urban system in the region, while Appendix 1 (cities rank-ordered by population) and Appendix 2 (cities rank-ordered by population per country) provide an overview of the framework of analysis.

Figure 2: **Framework for analysis: 'cities' in the HoA based on the Degree of Urbanization methodology**

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## 3.2 Data sources and specification of connections

**The connectivity analysis is based on a combination of three transport networks: road, air, and train.** Although air transport networks and train networks are increasingly important connectivity providers within the region at large, the often-crucial connectivity they provide is presently restricted to specific parts of the population and specific HoA cities and corridors. This makes the specification of, and a focus on the road network of crucial importance, both analytically and in terms of policy perspectives: today, most inter-city connections in the HoA are provided via road connections. Furthermore, the road network is also a major actual and potential 'feeder' of air transport connectivity, especially for cities that are located in the relative vicinity of major air transport hubs (e.g., Athi River near Nairobi, or Debre Zeit near Addis Ababa): depending on distance and road quality, these cities can also draw on the air transport connectivity nominally associated with the capital cities. In light of this, we specify a network that combines all three networks but with a more inclusive approach for road connectivity.

**Road connectivity is based on measures of driving time and driving distance for the fastest routes given by Google Maps between all 93*(93-1)/2 = 4278 pairs of cities.** A conservative 15-minute penalty is added to all international connections to account for time lost at border-crossings (it is accepted that this is a gross underestimate of the time to cross borders in the region, which often takes several hours if not days). The strongest connections are found on the Kenyan sections of the A2 (Kenya)-A7 (Ethiopia) corridor connecting Addis Ababa with Nairobi via the cross-border city of Moyale, with some inter-city connections allowing for an average speed of up to 1.3km/min. Road connectivity is, however, much subtler than mere (potential) average speed: it is also defined by the distance that needs to be covered (reflecting time and potentially capital 'lost' when making the connection) and population size effects (reflecting the magnitude of the benefits offered by a high-quality connection). Rather than simply using distance per time, we therefore specify a road connectivity measure that draws on a spatial interaction approach: our specifiation jointly considers the population sizes of the cities being connected and the road quality when making the connection. As to not overestimate the virtuous effects of larger population sizes and shorter driving distances and driving times we use logarithms, thus arriving at the following road connectivity measure for a pair of cities a and b:

$$Road_{a\text{-}b} = \frac{\log(Pop_a)*\log(Pop_b)}{\log(Distance_{a\text{-}b)}*\log(TravelTime_{a\text{-}b)}} \quad (1)$$

This results in a distribution with a theoretical minimum of 0 but in practice infinitesimally converging upon 0 (small cities divided by extremely long driving distances and/or driving times) and – based on experimentation – a practical maximum of around 30 (large twin cities divided by a very short distance and efficient infrastructure). Table 1 shows the 10 strongest national and international road connections. The strongest national connections are between (very) proximate cities, e.g. between of Dese and Tita (Ethiopia, 10 km, Roada-b = 23,9) and Nairobi and Ndenderu (Kenya, 15 km, $Road_{a\text{-}b}$ = 18,6). Note, however, that as per Equation 1 road connectivity is not a mere matter of distance. For example, although being located in relative proximity, Ndenderu and Athi River in Kenya are not that strongly connected ($Road_{a\text{-}b}$

= 8,2) because it takes on average 73 minutes to cover the 46 km separating them in light of the congestion around Nairobi. The strongest international road connections are between cities located near borders, e.g. between Dolo (Ethiopia) and Mandera (Kenya) and between Jijiga (Ethiopia) and Hargeisa (Somalia). The connection between Nairobi and Kenya, requiring 22h50 min to cover 1556kms, falls just out of the international top 10 ($Road_{a-b}$ = 4,4). Overall, international road connectivities are markedly lower than the national connections. This is partly due to the (modest) time penalties for border crossings but, as will be discussed below, also reflects the poor road infrastructures between these cities.

**Table 1:** Major national and international road connections in the HoA

| National | | | International | | |
|---|---|---|---|---|---|
| City a | City b | $Road_{a-b}$ | City a | City b | $Road_{a-b}$ |
| Dese | Tita | 23,9 | Dolo | Mandera | 8,0 |
| Nairobi | Ndenderu | 18,6 | Jijiga | Hargeysa | 6,5 |
| Debre Zeyit | Dukem | 16,6 | Harer | Hargeysa | 5,2 |
| Nairobi | Ruiru | 15,5 | Dire Dawa | Hargeysa | 5,1 |
| Mojo | Nazret | 15,3 | Djibouti | Dire Dawa | 5,1 |
| Arsi Negele | Shashemene | 15,0 | Asmera | Mekele | 4,7 |
| Awasa | Shashemene | 14,7 | Djibouti | Hargeysa | 4,7 |
| Mombasa | Utange | 14,5 | Ali sabieh | Dire Dawa | 4,6 |
| Adis Abeba | Sululta | 14,0 | Kisii | Busia | 4,6 |
| Nairobi | Athi River | 13,4 | Dolo | Baydhabo | 4,6 |

Notes:

- Population data were derived from https://ghsl.jrc.ec.europa.eu/degurba.php for 2015, unless stated otherwise via * or **. * Additional cities for Djibouti were derived from http://citypopulation.de/Djibouti.html. ** Additional cities for Eritrea cities were derived from https://www.geonames.org/ER/largest-cities-in-eritrea.html.
- Road distance and travel time data were derived from GoogleMaps.

Air connectivity is measured by recording the number of weekly direct flights. This information was derived from Google searches, after which it was cross-referenced with secondary online data sources such as Skyscanner (globally one of the largest metasearch travel engines) and details of operations at the different airports. Google's information on weekly direct flights draws on ITA Software's QPX software, which uses algorithms to combine and parse multiple sets of flight information from airlines. This includes availability data, which allows Google to keep an up-to-date database that can be searched just like Google's overall search engine. Using the logarithm of weekly flights as to not inflate the importance of the few sizable air transport links that exist in the HoA leads to the following air connectivity measure for a pair of cities a and b:

$$Air_{a-b} = \log(\#weekly\ direct\ flights_{a-b} + 1) \quad (2)$$

And finally, train connectivity is measured by recording the number of weekly trains, and this by drawing on national railway enterprise websites, most notably for Kenya (e.g., https://metickets.krc.co.ke/) and Ethiopia (http://www.erc.gov.et/). Results were cross-referenced with online searches of operations in specific cities. Again, using the logarithm of weekly trains leads to the following train connectivity measure for a pair of cities a and b:

$$Train_{a\text{-}b} = \log(\#weekly\ direct\ trains_{a\text{-}b} + 1) \quad (3)$$

Table 2 shows the 10 strongest air transport and train connections. The strongest air connection are Nairobi-Mombasa and Nairobi-Kisumu with a total of 169 and 85 weekly direct flights, respectively. This is followed by a range of connections between Addis Ababa and major cities in northern and eastern Ethiopia (Bahir Dar, Dire Dawa, Jijiga, Gondar, and Mekelle). The strongest international connection is between Nairobi and Addis Ababa with a total of 38 weekly direct flights. The strongest train connection is again Nairobi-Mombasa with a total of 21 weekly trains. Although most of the – presently scarce – railway corridors in the HoA are national, there is an international corridor: the Addis Ababa–Djibouti Railway, a new standard gauge international railway that also serves as the backbone of the new Ethiopian National Railway Network. It also connects Nazret and Dire Dawa (Ethiopia) and Ali Sabieh (Djibouti) on a near-daily basis and provides landlocked Ethiopia with access to the Gulf of Aden and the Red Sea via Djibouti.

Table 2: Major air and train connections in the HoA

| Rank | City a | City b | Weekly flights | City a | City b | Weekly trains |
|---|---|---|---|---|---|---|
| 1 | Mombasa | Nairobi | 169 | Mombasa | Nairobi | 21,0 |
| 2 | Kisumu | Nairobi | 85 | Addis Ababa | Dire Dawa | 7,5 |
| 3 | Addis Ababa | Bahir Dar | 84 | Djibouti | Dire Dawa | 7,5 |
| 4 | Addis Ababa | Dire Dawa | 75 | Addis Ababa | Nazret | 7,5 |
| 5 | Addis Ababa | Jijiga | 56 | Djibouti | Ali sabieh | 7,5 |
| 6 | Addis Ababa | Mekele | 46 | Dire Dawa | Nazret | 7,5 |
| 7 | Addis Ababa | Gonder | 42 | Ali sabieh | Dire Dawa | 7,5 |
| 8 | Eldoret | Nairobi | 39 | Nairobi | Ruiru | 7,0 |
| 9 | Addis Ababa | Nairobi | 38 | Nairobi | Athi River | 7,0 |
| 10 | Nairobi | Ukunda | 34 | Mombasa | Athi River | 7,0 |

Notes:

- Air transport data was derived from Google, which draws on ITA Software's QPX software using algorithms to combine and parse multiple sets of flight information from airlines.
- Train data was derived from national railway enterprise websites, most notably for Kenya (e.g., https://metickets.krc.co.ke/) and Ethiopia (http://www.erc.gov.et/).
- Note that actual measures (Aira-b and Traina-b) used in the subsequent analyses are logarithms of these weekly connections as to not inflate the importance of the most sizable connections. In the table we report initial measures as this allows for a more intuitive discussion.

## 3.3 Analytical framework

### A. Network specification

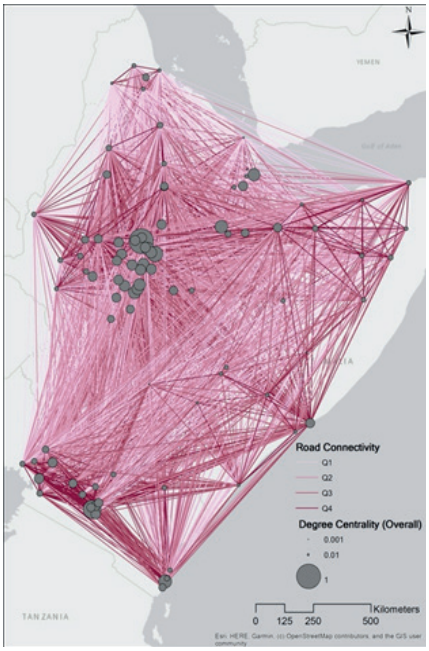
The specification of the connections produces three networks: a fully connected road network, a sparse air transport network, and an even sparser train network. The three networks are combined into a composite network. This integration is needed because it allows assessing how, for example, strong connectivity via road or train to a well-connected air transport hub influences a city's position in the overall network. This integration consists two steps: combining the three networks and deleting all non-viable connections.

First, the three sub-networks are combined into a composite network. To this end, we first standardize all three measures given by Equations 1-3 by applying a min-max normalization, producing distributions between 0 (minimum connectivity) and 1 (maximum connectivity). These normalized connectivity scores are then combined into an overall connectivity score between each pair of cities by averaging the three scores:

$$Connectivity_{a\text{-}b} = \sum(Road_{a\text{-}b} + Air_{a\text{-}b} + \mathrm{Train}_{a\text{-}b})/3 \quad (4)$$

The second step entails 'preparing' the network for formal network analysis. The network specified in Equation 1 and subsequently Equation 4 is fully connected because of the road network: Equation 1 produces infinitesimally small numbers rather than actual 0s for weakly connected cities. Indeed, as can be seen in Figure 3, it is always possible to get from city a to city b, no matter how (in)efficient that connection is. However, in addition to these connections being conceptually negligible, a fully connected network is also not very interesting from an analytical point of view. For example, it is difficult to identify the gateway function of specific cities in a fully connected network and/or corridors of enhanced connectivity when every city is deemed to be connected to every other city. We therefore imposed a connectivity threshold that removes small connections. To decide on the cut-off point, starting with the poorest connection (between Barentu in Eritrea and Ukunda in Kenya: no air or train connections, and 2958 min required to cover 3345 km all the way through Ethiopia), we eliminated connections in a stepwise fashion. After each elimination, we calculated the Pearson correlation coefficient between the original, fully-connected network and the newly-derived network to assess how strongly they resemble each other (Figure 4). Ultimately, we decided on a cutoff point of Connectivitya-b = 0,035, shown as a vertical dashed line in Figure 4. This produces a network that has a very sizable correlation of 0.96 with the original network, but only retains 563 of the 4278 (13,16%) original city-pairs. However, it is important to stress that each city has at least one connection and is therefore connected to the network at large. The 'strongest' connection that was thus dropped is between the Ethiopian cities of Tita (Dessie) and Mojo, which requires 504 min to cover 463 km. The retained connections are shown in Figure 5: this network very closely resembles the structure of the original network, but with a density that allows for a more thorough network analysis of its topology and structure as only the most meaningful connections are retained. All 4278 inter-city connections as measured and subsequently specified and transformed in this framework are given in Appendix 3.

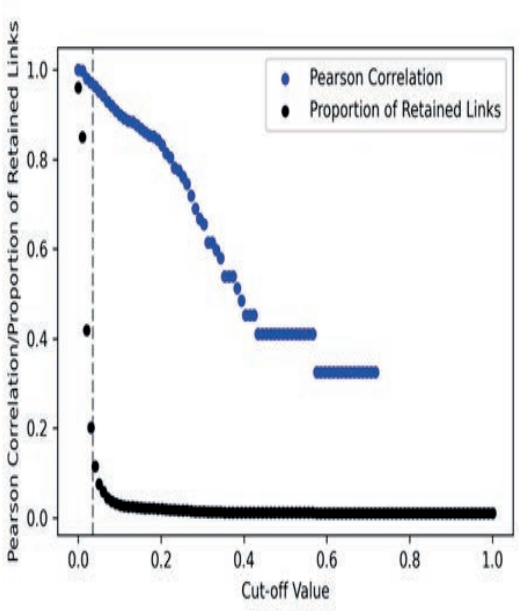
Figure 3: The (fully connected) road network in the HoA




Note:

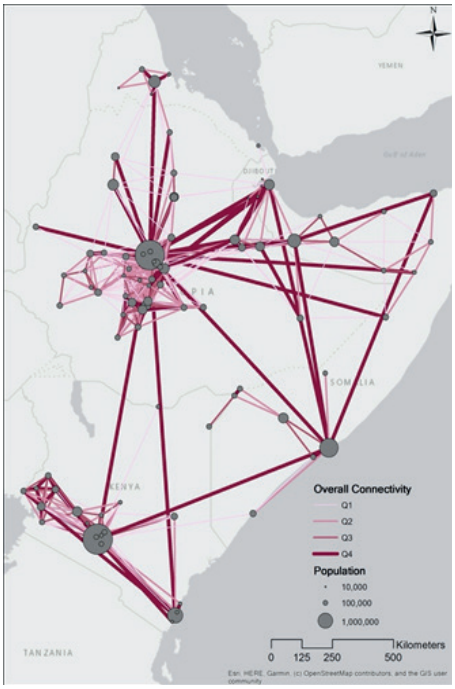
- To be able to differentiate between the relative strength of the different connections, we divided the distribution into quartiles.

Figure 4: Impact of stepwise removal of weakest connections on network density and resemblance with the original network




Source:

Figure 5: Geographical distribution of Connectivity$_{a\text{-}b}$ in the HoA after network parsing




Note:

- To be able to differentiate between the relative strength of the different connections, we divided the distribution into quartiles.

## B. Formal network analysis of connectivity matrix

Network analysis offers the opportunity for a systematic appraisal of city connectivity. In our research, we implemented three complementary centrality measures that collectively inform our understanding of the position of individual cities within the HoA's infrastructure networks. To specify these measures, we adopt a graph-theoretical conceptualization in which a node is a 'vertex' and a connection is an 'edge'. The formal mathematical specification of this is that a network $G(V,E)$ is constructed with each of the $N=|V|$ nodes representing a city, with the connections between them being encoded in the set of links E. This network is fully described by the non-negative adjacency matrix $W=\{w_{ij}\}$. An element $w_{ij}$ of $W$ is different from zero if there is a connection between two cities $i$ and $j$ as per Equation 4 (and subsequently pruned as shown in Figures 4 and 5). Obviously, $i \neq j$.

The reason for calculating and discussing different centrality measures is that there are different reasons why a node can be important in a network. For example, a node can be important because it has many connections, but it can also be important because it connects otherwise unconnected nodes. Different centrality measures have been devised to capture these different dimensions, and here we report on three of the most commonly used measures: degree centrality (DC), betweenness centrality (BC), and eigenvalue centrality (EC). Here we restrict ourselves to an intuitive interpretation of what these measures capture.

The first and most straightforward centrality measure is a node's degree centrality **(DC)**, which accounts for the total strength of a node's connections. For each city $i \epsilon V$ **DC** can be computed from **W** as follows:

$$DC\,(\mathrm{i}) = \sum_{i=1}^{N} w_{ij} \qquad (5)$$

In topological terms, this is a 'local' measure in that it only considers nodes' first-order neighbours: their direct connections. In our research, **DC** will foreground cities that are well-connected in more than one of the three network layers and/or cities along major transport corridors as this provides them with connections with many other cities.

The second measure is a node's betweenness centrality **(BC)**, which accounts for a node serving as the most efficient gateway for otherwise unconnected nodes. For each city $i \epsilon V$ **DC** can be computed from $W$ as follows:

$$BC\,(\mathrm{i}) = \sum_{a \neq i \neq b \epsilon V} \frac{\sigma_{ab\,(i)}}{\sigma_{ab}} \qquad (6)$$

Where $\sigma_{ab}$ is the total number of shortest paths between nodes a and b and $\sigma_{ab}(\mathrm{i})$ is the number of those paths that pass through i. In our research, **BC** will foreground cities with a number of near-exclusive connections that cities can use to make otherwise unfeasible connections. In doing so, these cities serve the most efficient gateways for accessing the remainder of the city network. In topological terms, this is a 'global' measure in that it looks beyond nodes' first-order neighbours. More concretely, cities combining air transport connections with strong road connections to otherwise not very well connected cities will have large **BC**. However, **BC** can be more subtle, with also cities along long road corridor acting as the most efficient gateway for entire parts of the network that would otherwise be unconnected. This also implies that cities with poor connections can emerge with sizable **BC** if one of those poor connections nonetheless serves to link other cities to the remainder of the network. **BC** is typically much more skewed than **DC**, as often only a limited number of nodes perform this role.

The third measure is a node's eigenvalue centrality **(EC)**, which accounts for the strategic value of a node's connections. A city has a large **EC** if it is, on average, well connected to well-connected cities. This also a 'global measure' in that it looks specifically beyond first-order neighbours. **EC** can be cast as a generalization of **DC** in that it is given by:

$$EC\,(\mathrm{i}) = u_{1,i} \tag{7}$$

with $u_{1,i}$ representing the $i^{\mathrm{th}}$ component $u_1$, the eigenvector associated with the eigenvalue $\lambda_1$ of $A$, so that it satisfies:

$$Au_1 = \lambda_1 u_1 \tag{8}$$

In this case $A = \{a_{ij}\}$ is the adjacency matrix of $G$, whose non-zero elements denote the presence of a connection between cities $i$ and $j$. In our research, EC will above all foreground smaller cities located near well-connected nodes such as Addis Ababa and/or cities located along major transport corridors because of the externalities associated with having access to multiple nodes that are in turn also connected. In contrast, cities that have above all connections with poorly connected cities will have small EC.

In addition to these centrality measures, we will also present the results of a community detection exercise. In network analysis, 'communities' refer to the occurrence of cohesive sub-networks in the sense that there are groups of nodes (i.e. communities) that are, on average, more densely interconnected than with other nodes in the network. Conceptually similar to standard cluster analysis for multivariate datasets, a community detection algorithm reveals these communities and presents them through mutually exclusive partitions of nodes. We applied the InfoMap community detection method to disaggregate the network into subnetworks. Based on the cursory overview of connections in Tables 1 and 2 as well as visual inspection of Figure 5, it can be expected that communities will broadly reflect national spaces. However, this overlap between geographical space and topological space can well be more complex than this: national patterns can be variegated in their own right, while some geographically peripheral nodes may hold a specific position. Applying community detection and cross-referencing this with national and regional geographies can shed light on the network structure.


StarTimes
Pareto

SECTION 4

# Results: city connectivity in the HoA

The presentation of our results proceeds in three consecutive steps. First, we focus on the inter-city connections by discussing some notable examples of strong and weak connections. Second, we present the results of the centrality analysis, zooming in on the most significant patterns. Third, we reflect on the overall integration of the HoA through the lens of inter-city connections by exploring the results of the community detection in combination with the most notable international connections. This descriptive overview will then be used in the fifth and final section to elaborate on policy perspectives.

## 4.1 Inter-city connections in the HoA

The most obvious starting point is a discussion of the region's strongest connections. Table 3, which shows the 10 strongest connections in the HoA, shows that Nairobi-Mombasa is the most connected dyad: it has both the strongest air and train connections alongside a moderate level of road connectivity via the (often-congested) A109. This is followed by the Addis Ababa-Dire Dawa connection, which likewise has air and train connections alongside road connectivity via the A1 and A10 highway system. The strongest connections are clearly at the national level, with Djibouti-Dire Dawa and Djibouti-Addis Ababa being the sole non-national connections in the top 10. Overall, the strongest connections are unsurprisingly between the few city-pairs that are connected by more than one mode: all three modes in the case of Nairobi-Mombasa and Addis Ababa-Dire Dawa; air and road in the case of Nairobi-Kisumu (Kenya) and Addis-Ababa-Bahir Dar (Ethiopia); and train and road in the case of Nairob-Ruiru (Kenya), Nairobi-Athi River (Kenya), and Addis Ababa-Nazret (Ethiopia). Beyond and alongside these multimodal connections, the importance of road connectivity shows from the strongest road-only connection making it into the top 10 (Dese-Tita in Ethiopia).

**Table 3: Strongest inter-city connections in the HoA**

| Rank | City a | Country city a | City b | Country city b | $Road_{a-b}$ | $Air_{a-b}$ | $Train_{a-b}$ | $Connectivity_{a-b}$ |
|---|---|---|---|---|---|---|---|---|
| 1 | Mombasa | Kenya | Nairobi | Kenya | 0,177 | 1,000 | 1,000 | 0,726 |
| 2 | Addis Ababa | Ethiopia | Dire Dawa | Ethiopia | 0,162 | 0,843 | 0,692 | 0,566 |
| 3 | Nairobi | Kenya | Ruiru | Kenya | 0,623 | 0,000 | 0,673 | 0,432 |
| 4 | Nairobi | Kenya | Athi River | Kenya | 0,527 | 0,000 | 0,673 | 0,400 |
| 5 | Djibouti | Djibouti | Dire Dawa | Ethiopia | 0,157 | 0,313 | 0,692 | 0,387 |
| 6 | Djibouti | Djibouti | Addis Ababa | Ethiopia | 0,124 | 0,467 | 0,552 | 0,381 |
| 7 | Kisumu | Kenya | Nairobi | Kenya | 0,177 | 0,867 | 0,000 | 0,348 |
| 8 | Addis Ababa | Ethiopia | Nazret | Ethiopia | 0,349 | 0,000 | 0,692 | 0,347 |
| 9 | Addis Ababa | Ethiopia | Bahir Dar | Ethiopia | 0,159 | 0,865 | 0,000 | 0,341 |
| 10 | Dese | Ethiopia | Tita | Ethiopia | 1,000 | 0,000 | 0,000 | 0,333 |

Note:

- Grey shaded connections are international.

The observation that 8 out of the 10 strongest connections are between cities located in the two largest economies in the region shows the imprint of national economies on connectivity. This also implies that a nuanced discussion of inter-city connections has to move beyond the strongest connections at large. Therefore, in the remainder of this section we elaborate on two complementary perspectives on HoA connections: one focusing on individual countries and one focusing on the major international connections. The latter also includes a preliminary overview of border cities, the specific position of which will be further discussed in 4.2, 4.3 and 5.

Table 4 shows the 5 strongest national inter-city connections for each of the five countries. In Djibouti, the Djibouti-Ali Sabieh connection towers over the rest due to the combination of train connectivity and the road connectivity (mostly) provided by the RN-1 national highway. The latter is part of the larger Ndjamena–Djibouti Highway as part of the Trans-Africa Highway network and the most important road link in the country. The remaining connections in Djibouti are all road-based, with above all Tadjourah being constrained by the relative lack of well-developed road infrastructure in the face of the physical boundary of the Gulf of Tadjourah . In Eritrea, the relatively small number of internal flight connections and the defunct train system results in small national inter-city connectivities in comparison with Kenya and Ethiopia. The connections between Asmara and Mendefera (via the asphalted P-4 primary road) and Keren (via the asphalted P-2 primary road) emerge as the strongest links. Four of the five strongest connections in Ethiopia involve Addis Ababa, showing the marked urban primacy of the country. In addition to the three-mode connection with Dire Dawa, there are also strong connections with Bahir Dar and Jijiga (air transport and moderate road connections) and Nazret (train and fairly strong road connections). In contrast to Ethiopia, Kenya has a slightly more polycentric system with also major connectivity vested in the port city of Mombasa. As already pointed out, the Nairobi-Mombasa link is the strongest in all of the HoA, which in Kenya is trailed by inter-city connections via more than one mode: Nairobi-Ruiru via daily trains and the A2 highway, Nairobi-Athi River via daily trains and the A104/A109 system branching off to Arusha/Mombasa, and Nairobi-Kisumu via sizable air transport connections. Finally, Somalia largely replicates the pattern of Eritrea with poor national air connectivity and no train connectivity implying that road connectivity is the key national connectivity infrastructure. The twice-weekly flights between Mogadishu and Hargeysha make this into the strongest connection, followed by other cities being connected by air, even if only weakly so. The fact that a limited number of air connections shapes the national ranking is reflective of the combination of long distances between cities and poor road infrastructure: the road system in the north detours via Berbera (reflected in the Berbera-Burco connection), while despite recent investments in the Garowe–Bossaso Highway – the major thoroughfare in the autonomous Puntland region in northeastern Somalia connecting Garowe with the commercial hub of Bossaso – average speeds still being limited.

Table 4: Strongest national inter-city connections in the HoA for each of the countries

| City a | City b | Connectivity a-b |
|---|---|---|
| | **Djibouti** | |
| Djibouti | Ali Sabieh | 0,305 |
| Djibouti | Arta | 0,106 |
| Ali Sabieh | Dikhil | 0,074 |
| Djibouti | Dikhil | 0,061 |
| Ali Sabieh | Arta | 0,061 |
| | **Eritrea** | |
| Asmara | Mendefera | 0,102 |
| Asmara | Keren | 0,090 |
| Asmara | Massawa | 0,074 |
| Keren | Mendefera | 0,048 |
| Keren | Barentu | 0,046 |
| | **Ethiopia** | |
| Addis Ababa | Dire Dawa | 0,102 |
| Addis Ababa | Nazret | 0,090 |
| Addis Ababa | Bahir Dar | 0,074 |
| Dese | Tita | 0,048 |
| Addis Ababa | Jijiga | 0,046 |
| | **Kenya** | |
| Mombasa | Nairobi | 0,726 |
| Nairobi | Ruiru | 0,432 |
| Nairobi | Athi River | 0,400 |
| Kisumu | Nairobi | 0,348 |
| Mombasa | Ukunda | 0,308 |
| | **Somalia** | |
| Mogadishu | Hargeisa | 0,136 |
| Bossaso | Hargeisa | 0,134 |
| Mogadishu | Bossaso | 0,097 |
| Mogadishu | Merca | 0,082 |
| Berbera | Burco | 0,065 |

Table 5 shows the 10 strongest international connections. The ranking is dominated by connections along the corridor from Addis Ababa to Djibouti, above all by cities connected by more than one mode: Addis Ababa-Djibouti and Dire Dawa-Djibouti by all three modes, and Djibouti-Nazret, Dire Dawa-Ali Sabieh, Nazret-Ali Sabieh, and Addis Ababa-Ali Sabieh by both train and road. Importantly, however, this 'international' connectivity builds on national connectivity projects, most notably the national railway system in Ethiopia (consisting of three lines, with further expansions being planned) and the Addis Ababa–Adama Expressway. This toll road is the first six-lane highway in Ethiopia, constructed to abate the heavy traffic between its two endpoints and to reduce the time required to reach Adama from Addis Ababa by more than 50% to 45 minutes. This is a relevant observation from a policy perspective as it shows that national and international connectivity improvements can be complementary (see section 5).

Overall, international connections reveal stronger east-west corridors than south-north corridors in the HoA, which can in large part be explained by the importance of access to the coast and more specifically the ports. This is further corroborated by the Addis Ababa-Djibouti corridor via Dire Dawa also being extended further east to northern Somalia via air transport connections such as Addis Ababa-Hargeisa and moderate yet viable connections between Dire Dawa and Jijiga in Ethiopia on the one hand and Hargeisa and Berbera in Somalia on the other hand (see Figure 5). The exception to this pattern is Nairobi-Addis Ababa. This connection is ranked 3rd for international connections and 17th in the HoA at large. In addition to the all-tarmac road connecting both cities via Moyale (further discussed below), where recently also a One-Stop Border Post was inaugurated to further facilitate connectivity across the border, the connection is also defined by sizable air transport connections.

Table 5: Strongest international inter-city connections in the HoA

| City a | Country city a | City b | Country city b | $Road_{a-b}$ | $Air_{a-b}$ | $Train_{a-b}$ | $Connectivity_{a-b}$ |
|---|---|---|---|---|---|---|---|
| Djibouti | Djibouti | Dire Dawa | Ethiopia | 0,157 | 0,313 | 0,692 | 0,387 |
| Djibouti | Djibouti | Addis Ababa | Ethiopia | 0,124 | 0,467 | 0,552 | 0,381 |
| Addis Ababa | Ethiopia | Nairobi | Kenya | 0,123 | 0,713 | 0,000 | 0,279 |
| Ali Sabieh | Djibouti | Dire Dawa | Ethiopia | 0,136 | 0,000 | 0,692 | 0,276 |
| Addis Ababa | Ethiopia | Mogadishu | Somalia | 0,106 | 0,627 | 0,000 | 0,244 |
| Addis Ababa | Ethiopia | Hargeisa | Somalia | 0,133 | 0,593 | 0,000 | 0,242 |
| Djibouti | Djibouti | Nazret | Ethiopia | 0,102 | 0,000 | 0,552 | 0,218 |
| Ali Sabieh | Djibouti | Addis Ababa | Ethiopia | 0,095 | 0,000 | 0,552 | 0,216 |
| Nairobi | Kenya | Mogadishu | Somalia | 0,120 | 0,514 | 0,000 | 0,211 |
| Ali Sabieh | Djibouti | Nazret | Ethiopia | 0,078 | 0,000 | 0,552 | 0,210 |

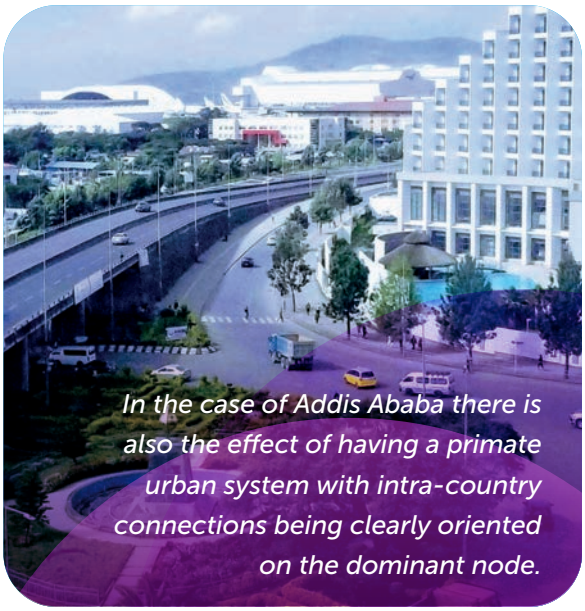
## 4.2 City centrality in the HoA

Table 6 gives an overview of the 92 HoA cities' centrality measures, with cities rank-ordered based on their average position in the DC, BC, and EC rankings.

The DC ranking above all foregrounds the region's main economic centers, with Addis Ababa and Nairobi being much more connected than the other cities in the HoA. This reflects both the size of their national economies and the diverse ways in which both cities are connected with a large number of cities. Furthermore, in the case of Addis Ababa there is also the effect of having a primate urban system with intra-country connections being clearly oriented on the dominant node. In contrast, in Kenya, there is more of a dual-primate system with Mombasa as a second important node. The importance of capital cities is also shown from Djibouti (3rd), Mogadishu (29th) and Asmara (46th) being by far the most connected cities in their own country. The remainder of the top of the DC ranking is confined to cities along multimodal major transport corridors, such as Dire Dawa, Nazret, and Debre Zeit in Ethiopia and Athi River and Ndenderu in Kenya.

At the bottom of the ranking, there are above all Somalian cities, which reflects a combination of the lack of non-road based transport infrastructure, average or sometimes even poor road infrastructure, and large distances between the different cities. An obvious example is Beledweyne, located in central Somalia. Although a fairly large city, it is only connected to the HoA's broader transport networks via road. It has no formal connections into Ethiopia with the Ferfer border post being defunct. Although located along the north-south road axis connecting Mogadishu with northern Somalia via Garowe, these are the only viable connections that furthermore cover large distances at limited speeds. A broadly similar situation can be observed in Eritrea, although the somewhat denser cluster of cities around Asmara pushes these cities somewhat up in the ranking. Nonetheless, for a city such as Barentu, located in western Eritrea, the situation is comparable to that of Beledweyne in Somalia: it has no viable connections into Ethiopia, and only fairly low-speed road connections with Mendefera, Keren, and Asmara in Eritrea.

More generally, weak DC connectivities are associated with cities that are peripheral in their national context: Ceerigaabo in Somalia, Assab in Eritrea, Tadjourah in Djibouti, Tepi in Ethiopia, and El Wak in Kenya are clear examples here. These are invariably cities without commercial airport, are not located along major road corridors, often lack suitable inter-city road infrastructure at large, and are located fairly far away from other cities. Even though these cities often function as trading centers for their respective regions, their very modest connectivities reflect and reproduce patterns of peripheralization. The culmination of these patterns can be found in border cities, most prominently in the Kenyan-Ethiopian-Somalian border regions: Dolo (Ethiopia/Somalia), Mandera (Kenya/Ethiopia/Somalia), and Moyale (Kenya/Ethiopia) are among the weakest connected nodes, even if in the case of the latter city there being ongoing efforts to better connect the city as part of the Addis Ababa-Nairobi link.



*In the case of Addis Ababa there is also the effect of having a primate urban system with intra-country connections being clearly oriented on the dominant node.*

Table 6: DC, BC, and EC centrality for 92 cities in the HoA

| City | Country | DC | DC rank | BC | BC rank | EC | EC rank | Average rank |
|---|---|---|---|---|---|---|---|---|
| Addis Ababa | Ethiopia | 1,0000 | 1 | 0,8050 | 1 | 1,0000 | 1 | 1,00 |
| Nairobi | Kenya | 0,5533 | 2 | 0,3376 | 2 | 0,4431 | 5 | 3,00 |
| Djibouti | Djibouti | 0,2554 | 7 | 0,0689 | 7 | 0,4550 | 4 | 5,50 |
| Dire Dawa | Ethiopia | 0,2749 | 5 | 0,0215 | 15 | 0,5546 | 2 | 6,00 |
| Nazret | Ethiopia | 0,3962 | 3 | 0,0227 | 14 | 0,5486 | 3 | 6,25 |
| Mombasa | Kenya | 0,2843 | 4 | 0,0435 | 9 | 0,3337 | 6 | 6,50 |
| Awasa | Ethiopia | 0,2529 | 8 | 0,0938 | 4 | 0,3242 | 7 | 7,00 |
| Muqdisho | Somalia | 0,1484 | 29 | 0,1459 | 3 | 0,2306 | 15 | 13,25 |
| Ali Sabieh | Djibouti | 0,1522 | 26 | 0,0191 | 19 | 0,3198 | 8 | 17,50 |
| Jima | Ethiopia | 0,1518 | 27 | 0,0413 | 12 | 0,2038 | 21 | 18,75 |
| Debre Zeyit | Ethiopia | 0,2638 | 6 | 0,0000 | 28 | 0,2985 | 9 | 19,00 |
| Hargeysa | Somalia | 0,1253 | 34 | 0,0757 | 6 | 0,1887 | 24 | 19,25 |
| Mojo | Ethiopia | 0,2244 | 11 | 0,0000 | 28 | 0,2733 | 10 | 20,75 |
| Shashemene | Ethiopia | 0,2403 | 9 | 0,0000 | 28 | 0,2433 | 11 | 21,00 |
| Jijiga | Ethiopia | 0,1047 | 41 | 0,0215 | 16 | 0,2102 | 18 | 21,25 |
| Arsi Negele | Ethiopia | 0,2317 | 10 | 0,0002 | 23 | 0,2367 | 13 | 21,50 |
| Sululta | Ethiopia | 0,1695 | 19 | 0,0000 | 28 | 0,2269 | 16 | 21,50 |
| Dese | Ethiopia | 0,1148 | 39 | 0,0432 | 10 | 0,1853 | 26 | 22,25 |
| Kisumu | Kenya | 0,1627 | 24 | 0,0625 | 8 | 0,1268 | 39 | 22,50 |
| Mek'i | Ethiopia | 0,2217 | 12 | 0,0000 | 28 | 0,2408 | 12 | 22,75 |
| Dukem | Ethiopia | 0,1818 | 15 | 0,0000 | 28 | 0,2338 | 14 | 23,00 |
| Bahir Dar | Ethiopia | 0,1022 | 42 | 0,0000 | 28 | 0,2144 | 17 | 23,75 |
| Genet | Ethiopia | 0,1667 | 20 | 0,0000 | 28 | 0,2088 | 19 | 24,25 |
| Athi River | Kenya | 0,1652 | 22 | 0,0000 | 28 | 0,1585 | 32 | 25,00 |
| K'olito | Ethiopia | 0,2031 | 13 | 0,0005 | 21 | 0,1973 | 23 | 27,00 |
| Ruiru | Kenya | 0,1515 | 28 | 0,0000 | 28 | 0,1324 | 38 | 27,50 |
| Ziway | Ethiopia | 0,1934 | 14 | 0,0000 | 28 | 0,2062 | 20 | 28,00 |
| Asela | Ethiopia | 0,1791 | 16 | 0,0000 | 28 | 0,2019 | 22 | 28,00 |
| Robe | Ethiopia | 0,1205 | 38 | 0,0203 | 18 | 0,1674 | 29 | 29,00 |
| Eldoret | Kenya | 0,1549 | 25 | 0,0000 | 28 | 0,1170 | 42 | 29,00 |
| Giyon | Ethiopia | 0,1712 | 18 | 0,0000 | 28 | 0,1780 | 27 | 29,25 |

| City | Country | DC | DC rank | BC | BC rank | EC | EC rank | Average rank |
|---|---|---|---|---|---|---|---|---|
| Butajira | Ethiopia | 0,1763 | 17 | 0,0000 | 28 | 0,1858 | 25 | 29,50 |
| Hagere Hiywet | Ethiopia | 0,1665 | 21 | 0,0000 | 28 | 0,1771 | 28 | 29,50 |
| Asmera | Eritrea | 0,0856 | 46 | 0,0858 | 5 | 0,0964 | 47 | 30,50 |
| Gonder | Ethiopia | 0,0599 | 53 | 0,0000 | 28 | 0,1574 | 33 | 31,25 |
| Mekele | Ethiopia | 0,0584 | 54 | 0,0000 | 28 | 0,1526 | 35 | 32,25 |
| Ndenderu | Kenya | 0,1301 | 33 | 0,0000 | 28 | 0,0951 | 48 | 33,50 |
| Debre Birhan | Ethiopia | 0,1439 | 31 | 0,0000 | 28 | 0,1655 | 31 | 33,75 |
| Ukunda | Kenya | 0,0916 | 45 | 0,0000 | 28 | 0,1154 | 44 | 34,75 |
| Hosaina | Ethiopia | 0,1635 | 23 | 0,0000 | 28 | 0,1657 | 30 | 35,00 |
| Arba Minch | Ethiopia | 0,0810 | 49 | 0,0000 | 28 | 0,1373 | 37 | 35,25 |
| Welkite | Ethiopia | 0,1470 | 30 | 0,0000 | 28 | 0,1564 | 34 | 37,00 |
| Tita | Ethiopia | 0,0993 | 43 | 0,0000 | 28 | 0,1028 | 46 | 37,25 |
| Thika | Kenya | 0,1227 | 36 | 0,0000 | 28 | 0,0763 | 52 | 38,25 |
| Kitale | Kenya | 0,0832 | 47 | 0,0000 | 28 | 0,0651 | 53 | 38,50 |
| Garoowe | Somalia | 0,0435 | 63 | 0,0393 | 13 | 0,0789 | 51 | 38,75 |
| Sodo | Ethiopia | 0,1334 | 32 | 0,0000 | 28 | 0,1373 | 36 | 39,75 |
| Asosa | Ethiopia | 0,0341 | 71 | 0,0000 | 28 | 0,1161 | 43 | 40,50 |
| Dila | Ethiopia | 0,1101 | 40 | 0,0000 | 28 | 0,1249 | 40 | 41,25 |
| Baco | Ethiopia | 0,1241 | 35 | 0,0000 | 28 | 0,1196 | 41 | 41,25 |
| Harer | Ethiopia | 0,0635 | 52 | 0,0000 | 28 | 0,1032 | 45 | 41,75 |
| Nakuru | Kenya | 0,1206 | 37 | 0,0000 | 28 | 0,0565 | 55 | 43,25 |
| Gaalkacyo | Somalia | 0,0347 | 70 | 0,0000 | 28 | 0,0804 | 50 | 44,25 |
| Nekemte | Ethiopia | 0,0978 | 44 | 0,0002 | 24 | 0,0882 | 49 | 45,25 |
| Utange | Kenya | 0,0531 | 59 | 0,0000 | 28 | 0,0479 | 57 | 45,50 |
| Naivasha | Kenya | 0,0818 | 48 | 0,0000 | 28 | 0,0454 | 58 | 46,50 |
| Nyeri | Kenya | 0,0685 | 50 | 0,0000 | 28 | 0,0382 | 62 | 49,50 |
| Agaro | Ethiopia | 0,0533 | 58 | 0,0000 | 28 | 0,0435 | 59 | 50,00 |
| Boosaaso | Somalia | 0,0359 | 69 | 0,0022 | 20 | 0,0241 | 73 | 51,25 |
| Burco | Somalia | 0,0562 | 56 | 0,0213 | 17 | 0,0405 | 61 | 52,50 |
| Kebri Dehar | Ethiopia | 0,0388 | 66 | 0,0000 | 28 | 0,0305 | 68 | 52,75 |
| Kisii | Kenya | 0,0666 | 51 | 0,0000 | 28 | 0,0314 | 66 | 53,50 |

| City | Country | DC | DC rank | BC | BC rank | EC | EC rank | Average rank |
|---|---|---|---|---|---|---|---|---|
| Arta | Djibouti | 0,0275 | 77 | 0,0000 | 28 | 0,0351 | 64 | 54,00 |
| Kilifi | Kenya | 0,0379 | 67 | 0,0000 | 28 | 0,0314 | 67 | 54,00 |
| Weldiya | Ethiopia | 0,0465 | 61 | 0,0000 | 28 | 0,0505 | 56 | 55,00 |
| Bungoma | Kenya | 0,0567 | 55 | 0,0000 | 28 | 0,0250 | 72 | 55,25 |
| Ginir | Ethiopia | 0,0458 | 62 | 0,0000 | 28 | 0,0637 | 54 | 55,50 |
| Bedele | Ethiopia | 0,0543 | 57 | 0,0000 | 28 | 0,0406 | 60 | 55,50 |
| Meru | Kenya | 0,0426 | 64 | 0,0000 | 28 | 0,0259 | 71 | 57,75 |
| Dikhil | Djibouti | 0,0284 | 75 | 0,0000 | 28 | 0,0377 | 63 | 58,25 |
| Busia | Kenya | 0,0513 | 60 | 0,0000 | 28 | 0,0232 | 74 | 58,25 |
| Metu | Ethiopia | 0,0419 | 65 | 0,0000 | 28 | 0,0323 | 65 | 59,50 |
| Garissa | Kenya | 0,0374 | 68 | 0,0000 | 28 | 0,0300 | 69 | 59,50 |
| Merca | Somalia | 0,0216 | 82 | 0,0000 | 28 | 0,0101 | 78 | 62,00 |
| Keren | Eritrea | 0,0298 | 74 | 0,0000 | 28 | 0,0047 | 85 | 63,00 |
| Tepi | Ethiopia | 0,0322 | 73 | 0,0000 | 28 | 0,0291 | 70 | 63,25 |
| Laascaanood | Somalia | 0,0340 | 72 | 0,0005 | 22 | 0,0084 | 80 | 63,25 |
| Mendefera | Eritrea | 0,0246 | 80 | 0,0000 | 28 | 0,0052 | 84 | 63,50 |
| Baydhabo | Somalia | 0,0254 | 79 | 0,0002 | 25 | 0,0075 | 82 | 64,00 |
| Dolo | Ethiopia | 0,0283 | 76 | 0,0428 | 11 | 0,0045 | 86 | 65,00 |
| Berbera | Somalia | 0,0214 | 83 | 0,0000 | 28 | 0,0113 | 76 | 65,25 |
| Massawa | Eritrea | 0,0207 | 84 | 0,0000 | 28 | 0,0038 | 87 | 67,75 |
| Kismaayo | Somalia | 0,0149 | 85 | 0,0000 | 28 | 0,0135 | 75 | 68,00 |
| Tadjoura | Djibouti | 0,0060 | 90 | 0,0000 | 28 | 0,0106 | 77 | 69,00 |
| Qardho | Somalia | 0,0270 | 78 | 0,0002 | 26 | 0,0034 | 88 | 69,25 |
| Beledweyne | Somalia | 0,0060 | 89 | 0,0000 | 28 | 0,0054 | 83 | 70,75 |
| Assab | Eritrea | 0,0051 | 91 | 0,0000 | 28 | 0,0090 | 79 | 71,00 |
| Mandera | Kenya | 0,0240 | 81 | 0,0002 | 27 | 0,0004 | 91 | 72,25 |
| Moyale | Kenya | 0,0046 | 92 | 0,0000 | 28 | 0,0080 | 81 | 72,50 |
| Barentu | Eritrea | 0,0114 | 88 | 0,0000 | 28 | 0,0021 | 89 | 73,25 |
| Ceerigaabo | Somalia | 0,0148 | 86 | 0,0000 | 28 | 0,0011 | 90 | 73,75 |
| El Wak | Kenya | 0,0120 | 87 | 0,0000 | 28 | 0,0001 | 92 | 74,75 |

Note:

- Cities are rank-ordered based on their average position in the three rankings.

The BC ranking adds a different dimension to the discussion of centrality. It replicates and even accentuates the dominance of Addis Ababa and Nairobi, which clearly act as the HoA's regional gateways in addition to their broader international gateway function. Beyond this leading pair of cities, however, patterns are very different compared to the DC ranking. Mogadishu (3rd) and Asmara (5th) are now ranked much higher, reflecting their crucial role in connecting other cities in their country to the rest of the HoA network, most crucially via the air links they offer. Awasa in Ethiopia (ranked 4th) also emerges as a major gateway, as it connects secondary Ethiopian cities located in the south to the rest of the network via its strategic location along the A8 highway (the Cairo-Cape Town link) and its direct air connection with Addis Ababa.

Only 27 cities have a non-zero value for BC, whose ranking is – as expected – much more skewed than the DC ranking: the majority of cities do not perform a gateway function for other cities. Nonetheless, a number of HoA cities that are (relatively) weakly connected make an appearance here. Examples are Hargeisa (Somalia, 6th), Kisumu (Kenya, 8th), and Robe (Ethiopia, 18th). What sets these cities apart from, say, Bahir Dar and Gondar in Ethiopia is that they can also be 'used' by other cities in their region to connect to the network.

Finally, there is the eigenvalue centrality ranking (EC). This perspective on the importance of being connected to well-connected nodes above all foregrounds the privileged position of cities along major transport corridors: this allows them to connect with cities with sizable air transport connectivity and/or with a large number of other cities located along these corridors. Obvious examples are cities with strong connections with Addis Ababa: Dire Dawa (2nd) and Nazret (3rd) by rail and road, and Debre Zeit (9th) and Dukem (14th) along the expressway to Adama. A similar interpretation holds for Ali Sabieh (8th) in Djibouti. The EC perspective also emphasizes the strategic importance of having a major direct air service to the HoA's major gateways, as this brings other key centers in closer reach. Kenya's somewhat more polycentric system works to its disadvantage here, as the variegated nature of connections does not allow for consistent fast connectivity to major HoA centers. However, at the same time and from another perspective, Ethiopian cities' clear dependence on Addis Ababa raises questions from a network resilience point of view: Addis Ababa acting as the de facto provider of HoA connectivity for the majority of Ethiopian cities implies that a 'failure' of this node (e.g. the airport being down) threatens to cut their connectivity.

The importance of air connectivity, no matter how small, shows from the example of Kismayo (Somalia, 76th). Although it is one of the least connected cities in the HoA, its small direct links with Mogadishu allows for potentially faster access to the other major cities in the HoA than could be expected on the strength of its connections alone. This logic also applies to road connectivity, with Moyale's links in Kenya along the A2 highway to Nairobi bringing it somewhat 'closer' to other major cities in the HoA when compared with other peripheral cities such as El Wak, Ceerigaabo, Mandera, and Dolo.

## 4.3 Regional integration in the HoA

An implicit but nonetheless evident finding running through the above discussion is that even though there are some notable international connections in the HoA – above all air transport connections between the capital cities and the rail corridor between Addis Ababa and Djibouti – the vast majority of connections are within-country linkages. Although connectivity is almost always to a degree co-defined by distance decay in general and national functional spaces in particular, the lack of regional integration in the HoA is manifest, especially compared with other regional spaces across the world. For example, unlike transnational infrastructure connectivity in Europe and across Asia (especially in the context of the Belt and Road Initiative), HoA connectivity can still first and foremost be described as a collection of 'national spaces'. This is clearly shown by the average value of intra-country connectivities (0.02905) being more than 15 times larger than the average value of inter-country connectivities (0.00182). In short, the lack of regional economic integration results in, and also results from, the lack of connectivity between the HoA's major cities.

Table 7 presents the average values of inter-city connectivities aggregated at the level of country-pairs. The five largest values are uniformly for the intra-country connections, with Djibouti – unsurprisingly given its small size compared with other countries – featuring the strongest connections. The connections between the Djibouti-Ethiopia-Somalia triad form a second block, with most connections emanating from the relatively strong connections by road and train in the Djibouti-Dire Dawa-Hargeisa triangle, arguably the only part of the HoA where multiple cities are reasonably well connected across borders. Given the strategic importance of the Djibouti, Berbera, and Bossaso ports for landlocked Ethiopia, further developing connectivity in this corridor will prove important.

There are very minor connections between Djibouti and Eritrea, Ethiopia and Eritrea, Kenya and Somalia, and Somalia and Ethiopia. The latter is to some degree an artifact of both countries' size with no major connections expected between Ethiopia's north and Kenya's south. However, the low average connectivities between cities in the region's two largest economies require attention. Indeed, beyond (1) the flights between Addis Ababa on the one hand and Nairobi and Mombasa on the other hand and (2) the Addis Ababa-Nairobi road link via Moyale, there are as good as no viable connections between both countries. And finally, there are no connections between Djibouti and Kenya, Eritrea and Kenya, and Somalia and Eritrea.

Table 7: Average value of inter-city connections for country-pairs in the HoA

| Rank | Country 1 | Country 2 | Average Connectivity |
|---|---|---|---|
| 1 | Djibouti | Djibouti | 0,06996 |
| 2 | Kenya | Kenya | 0,04714 |
| 3 | Eritrea | Eritrea | 0,03256 |
| 4 | Ethiopia | Ethiopia | 0,02622 |
| 5 | Somalia | Somalia | 0,01557 |
| 6 | Djibouti | Ethiopia | 0,00890 |
| 7 | Djibouti | Somalia | 0,00338 |
| 8 | Ethiopia | Somalia | 0,00219 |
| 9 | Eritrea | Ethiopia | 0,00134 |
| 10 | Djibouti | Eritrea | 0,00130 |
| 11 | Kenya | Somalia | 0,00088 |
| 12 | Ethiopia | Kenya | 0,00060 |
| 13 | Djibouti | Kenya | 0 |
| 13 | Eritrea | Kenya | 0 |
| 13 | Eritrea | Somalia | 0 |

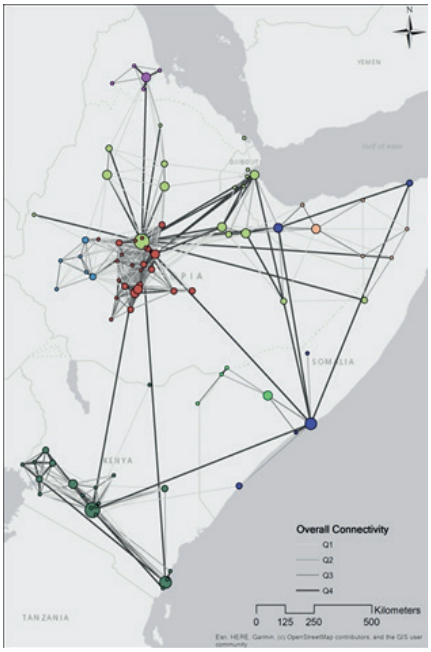
The strong imprint of national spaces is also visible in the network communities shown in Figure 6, in which national borders are very visible, above all in Kenya, Eritrea, and Ethiopia. The latter is itself subdivided into four communities, which can roughly be described as north (Addis Ababa with air connections to cities in the north), west (regional road connections), south (regional road connections and connectivity among corridors to Addis Ababa), and east (train and road corridors in the direction of Dire Dawa). However, community detection also picks up the relevance of international connections which, no matter how small, change the picture. For example, the Ethiopian community in the east actually takes a northeastern bent to include the Djibouti centers and the Eritrean port city of Assab, while continuing to the east Jijiga is more strongly connected with cities in northern Somalia. The latter community reflects the de facto 'split' within Somalia, with Somaliland cities and cities in the southern part of Somalia forming cohesive subnetworks.

Some of the strongest international road connections, for example Addis Ababa-Burco and Nazret-Hargeisa, are along the west-east corridor running from central Ethiopia to Djibouti and northern Somalia. A key node here is Awash: here the A1 highway branches off to Djibouti in a northeasternly direction, while there is also connectivity further to the east in the direction of Dire Dawa and onwards to Jijiga and Hargeisa. The latter connections bring Dire Dawa and Jijiga in the realm of the Djibouti and Somaliland communities, respectively. The rail link between Dire Dawa and Djibouti on the one hand, and the envisaged rail link between Awash and Weldiya on the other hand, (will) further strengthen the road-based connectivity in this part of the HoA. Another long-distance transborder connection is between Nairobi and Kismayo along the A3, an important artery from Nairobi to the east that is in relatively

good condition for most of the way. And finally, there are some connections between Asmara on the one hand and northern Ethiopian cities on the other hand (Bahir Dar, Tita, and Gonder). Proposed road upgrades and negotiations on a rail corridor connecting northern Ethiopia via Mekelle and Asmara to Massawa's port could further strength this potential.

Notably present/absent international connections of cities located near the border are identified in Table 8 and Figure 7. Figure 7 shows the strength of international road connections of city-pairs that made the threshold as per Figure 4. Table 8, in turn, shows the 10 least proximate international city-pairs that nonetheless have a meaningful road connection on the one hand, and the 10 most proximate international city-pairs that have no meaningful road connection on the other hand. The former set of connections allow assessing how and where there is already some potential for regional integration via inter-city connectivity. The latter connections allow identifying the most striking missing links that call for obvious policy attention.

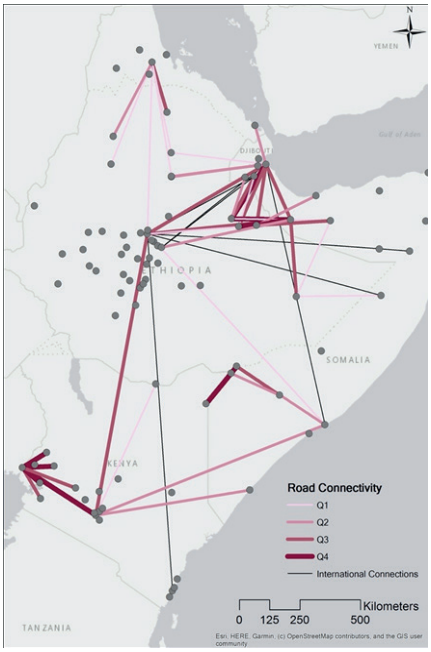
Figure 6: Network communities in the HoA




Note:

- Node size varies with cities' total population.
- To be able to differentiate between the relative strength of the different connections, we divided the distribution into quartiles.

Figure 7: International inter-city road connections




Note:

- To be able to differentiate between the relative strength of the different connections, we divided the distribution into quartiles.
- Direct air or train connections are shown for reference.

The focus on road connections bring the dominance of the west-to-east orientation even clearer to the fore. Some of the strongest connections, for example Addis Ababa-Burco and Nazret-Hargeisa, connect central Ethiopia to Djibouti and northern Somalia. A key node here is Awash: here the A1 highway branches off to Djibouti in a northeasternly direction, while there is also connectivity further to the east in the direction of Dire Dawa and onwards to Jijiga and Hargeisa. The latter connections bring Dire Dawa and Jijiga in the realm of the Djibouti and Somaliland communities, respectively. The rail link between Dire Dawa and Djibouti on the one hand and the envisaged rail link between Awash and Weldiya on the other hand, (will) further strengthen the road-based connectivity in this part of the HoA. Another long-distance transborder connection is between

Nairobi and Kismayo along the A3, an important artery from Nairobi to the east that is in relatively good condition for most of the way.

Although there are fewer international road connections run from north to south, there are some connections between Asmara on the one hand and northern Ethiopian cities on the other hand (Bahir Dar, Tita, and Gonder). Proposed road upgrades and negotiations on a rail corridor connecting northern Ethiopia via Mekelle and Asmara to Massawa's port could further strengthen this potential. The strongest north-south connection is the earlier-mentioned connection between Addis Ababa and Nairobi, reflecting the size of both cities and – by the standards of the region – reasonable connectivity along the A2 (Kenya) and A7 (Ethiopia) via Moyale. On the one hand this shows that previous road upgrades have paid off: when not factoring in the time at the Moyale border-crossing, our data suggests a possible average speed of up to 1.3km/min. In addition, the opening up of a border facility at Moyale easing the flow of goods and people allows capitalizing on this potential: when experimenting with our data, it became apparent that if border crossings times were set to an – often more realistic – two-hour penalty, then international road connections all but disappeared. This shows that upgrades to road connectivity also require upgrades to border services and facilities, which in the case of the Nairobi-Addis Ababa link has been well understood.

At the same time, and from another perspective, it can be said that the road connectivity between both cities still falls short of their economic potential (and that of southern Ethiopia and northern Kenya more generally). For example, the anticipated 22h25 needed to cover the 1556kms between both cities is much higher than the time needed to connect major economic centers in other parts of the world that are also separated by a border and a roughly similar distance, e.g. Paris-Warsaw (15h47), Vancouver-San Francisco (14h43), and Bangkok-Kuala Lumpur (17h59). Although the road upgrades and the efforts at the Moyale border crossing serve does serve as an exemplar, it is clear that there is scope further improvements, especially when considering that Moyale is the only authorized/formal gateway between both countries.

Table 8: **Notable presences/absences among international inter-city connections without air/train component**

| Longest distances where a viable road connection is present | | | | |
|---|---|---|---|---|
| Addis Ababa | Ethiopia | Burco | Somalia | 748 |
| Nairobi | Kenya | Kismaayo | Somalia | 644 |
| Asmara | Eritrea | Bahir Dar | Ethiopia | 448 |
| Nazret | Ethiopia | Hargeisa | Somalia | 538 |
| Asmara | Eritrea | Tita | Ethiopia | 472 |
| Dire Dawa | Ethiopia | Burco | Somalia | 403 |
| Djibouti | Djibouti | Weldiya | Ethiopia | 386 |
| Kebri Dehar | Ethiopia | Burco | Somalia | 338 |
| Djibouti | Djibouti | Tita | Ethiopia | 386 |
| Asmara | Eritrea | Gonder | Ethiopia | 341 |

| Shortest distances where a viable road connection is absent | | | | |
|---|---|---|---|---|
| Tadjoura | Djibouti | Assab | Eritrea | 206 |
| Arta | Djibouti | Dire Dawa | Ethiopia | 294 |
| Mendefera | Eritrea | Mekele | Ethiopia | 308 |
| Arta | Djibouti | Assab | Eritrea | 315 |
| Dikhil | Djibouti | Harer | Ethiopia | 328 |
| Ali sabieh | Djibouti | Assab | Eritrea | 333 |
| Arta | Djibouti | Harer | Ethiopia | 347 |
| Dikhil | Djibouti | Assab | Eritrea | 355 |
| Ali sabieh | Djibouti | Jijiga | Ethiopia | 382 |
| Tadjoura | Djibouti | Dire Dawa | Ethiopia | 393 |

The weakest connections – defined here as the shortest distances without a viable road link – are found in the borderlands between Ethiopia, Djibouti, and Eritrea. This is to some degree a physical-geographical artifact with the Gulf of Tadjourah acting as a barrier. However, above all it shows that the connectivity coming from Ethiopia into Djibouti is presently not extended into southern Eritrea. In the face of poor intra-Eritrea connections between Assab and the major centers in northern Eritrea, Assab is presently isolated on all possible fronts, and this in spite of its potential importance as a port. In order to build a resilient and stronger network in this part of the HoA, a complementary strategy is needed. This will involve extending connections from Assab into Djibouti and Ethiopia, a national policy strengthening connectivity across the Eritrean coastline into Massawa and Asmara and connecting this to the links coming in from northern Ethiopia. Given that connectivity in this part of the HoA will have a strong logistics dimension, this should ideally involve both road and rail connections that are furthermore connected to wider networks that either exist or in the making.


SECTION 5

# Policy perspectives of connectivity for the HoA

Investments in trade and transport corridors seek to reduce the friction associated with often vast distances between economic centers and trade gateways. The increased inter-city connectivity that ensues from these investments facilitates the mobility of goods, people, capital and ideas, further unleashing the economic potential contained within the cities and the regions which they are at the centre of. In the HoA, the following corridors have been put forward as potential levers for regional integration:

A Kismayo, Lamu and Mogadishu Corridor: Ethiopia (Negele – Filtu – Siftu) to Somalia (Mogadishu – Baidoa – Dolo) and (Kismayo – El Wak – Mandera) to Kenya (Lamu – Isiolo – Wajir – Mandera);

B Assab and Djibouti Corridor: Ethiopia (Adama – Awash) and (Manda – Bure) to Eritrea (Bure – Assab) to Djibouti (Galafi – Dikhil – Djibouti Port) and (Balho – Tajoura Port);

C Berbera and Djibouti Corridor: Ethiopia (Harar – Jigjiga) and (Diredawa – Meiso) to Somalia (Togochale – Berbera) to Djibouti (Loyada – Borema – Hargessa);

D Mogadishu, Berbera and Bossasso Corridor: Ethiopia (Ginir – Gode) to Somalia (Mogadishu – Baladwen – Ferfer) and (Turdibi – Galdogobi – Galkayo – Bossasso) to Ethiopia (Kebridhar – Warder – Turdibi) and (Ferfer – Warder – Aware – Hargessa) to Djibouti (Djibouti Port – Holl Holl – Dewele).

These and other policy ideas surrounding infrastructure coordination, policy and procedure harmonization, railway connections, dry ports, road upgrades, joint border posts, airports, free trade zones and pipelines that are currently being implemented or envisaged by regional organisations and national governments in the HoA are promising, but must be grounded in the development of coherent and comprehensive connectivity corridors. Rather than a range of blanket-type strategies, this calls for diverse, integrated and complementary approaches tailored to the needs of different stakeholders and cities. Drawing on our analyses, we propose four key elements as potential complements to already-envisaged policies.

**(a) National level level connectivity is much more evident in the HoA than in other parts of the world.** There are a number of reasons for this, ranging from the development context to evolving geopolitical and geoeconomic tensions. As a result, connectivity provision often follows a logic that promotes national cohesion rather than regional integration. This is very clear in Ethiopia, where connectivity provision has above all been oriented on centrally located Addis Ababa. Although a degree of national coordination is reasonable and even desirable, the relative lack of regional integration in the HoA in terms of inter-urban connectivity is presently striking. In addition to the regional plans being drawn up, there are however already a number of encouraging exceptions to this general pattern. Prime examples of these exceptions include the rail and road connectivity on the west-east axis running from Addis Ababa on the one hand to Djibouti and cities in northwestern Somalia on the other hand, as well as the Addis Ababa-Nairobi road link via Moyale. Other obvious instances where national policies would have 'regional spillovers' are connections between landlocked Ethiopia and a range of Read Sea ports, the Liboi-Kismayo Road facilitating connectivity between Nairobi and southern Somalia, and aligning upgrades to Eritrean infrastructure with connections into northern Ethiopia. A first element of policies is that existing initiatives, often having both national and regional effects, can be strengthened and serve as exemplars for consolidating regional integration through inter-city connectivity provision.

**(b) Thick borders result in distinct lagging borderlands.** The debilitating effect of national borders on intra-regional connectivity in the HoA is nowhere more manifest than in border cities, which tend to suffer from national development policies often being characterized as 'borderland blindness' (cf. Trémolières and Walther, 2019). Border cities find themselves at the very bottom

of the degree centrality and eigenvalue centrality rankings because they tend to suffer from the combined effects of limited infrastructure provision (often only road connectivity) and long distances to other cities via poor roads. The market town of Mandera (in the border region between Kenya, Ethiopia, and Somalia) and Dolo (at the Ethiopia-Somalia border) are arguably the most striking examples. However, there is a broader logic here with peripheral cities often being deprived of connectivity (e.g. El Wak in Kenya, Tepi in Ethiopia, Assab in Eritrea, Tadjourah in Djibouti, and Beledweyne in Somalia). This is a relevant observation in its own right, but there is a further debilitating effect here because border cities stand to benefit the most from connectivity investments aimed at promoting regional integration, because they are often veritable trans-border agglomerations with a high potential for social and commercial exchanges. For example, Dolo is an Ethiopian market market town at the Somali border that has been extended with refugee camps that were created around 2010. According to UNHCR registration data, these camps now host around 220,000 almost exclusively Somali refugees so that refugees outnumber the host population. The lack of health facilities at the Somali side of the border and regional tensions in Somalia do not preclude that, according to a recent report by the University of Oxford's Refugee Studies Centre, Dolo can only be fully understood as part of a cross-border economy, interconnected to the national economy of Somalia. However, the current state of infrastructure does not reflect this as the nearest tarmac road is more than 300km in every direction.

The case of Moyale again serves to illustrate the potential of an enhanced focus on borderlands. There have been joint infrastructure initiatives over the past decade to develop it into a commonly administrated cross-border East African trade hub that establishes the surrounding region on both sides of the border as a strong economic zone. Concrete initiatives have been the development of a highway corridor linking Kenya and Ethiopia and a one-stop border post to streamline and curtail illicit trade. Importantly, this has not only facilitated connections between Nairobi and Addis Ababa, but also reduced Moyale's peripheral position in both Kenya and Ethiopia. At the same time, the vast distances and the border post often being little used reveal the intricacies of such development policies. Thus, a second element of policies is that these should build on, facilitate, regulate, and further develop actually existing exchanges across borders.

**(c) There is a need for complementary investments in connectivity at the national, regional, and global gateway levels.** However, investments in cross-border connectivity – whether in general or focused on border cities – should not be detached from investments and policy visions at other scales. This is very clear in discussions surrounding the opening up of new ports such as Assab in southern Eritrea as gateways for the HoA at large, landlocked Ethiopia in particular. Port competitiveness is increasingly tied to developing trade corridors, integrating the port in a multimodal transportation network to improve market access, fluidity of trade and the integration of emerging industrial networks. From

*Concrete initiatives have been the development of a highway corridor linking Kenya and Ethiopia and a one-stop border post to streamline and curtail illicit trade.*

this perspective, a port is an interface between maritime trade, economic activities of ports and inland terminals that provide intermodal structures and connections with the vast hinterlands. Conversely, the amplification capacity of transport corridors may allow the expansion of trade via the port. These bonds of mutual causality are key to understanding connectivity to port cities: the quality and capacity of hinterland modalities, roads, and relays are essential to any expansion of trade. In the HoA, this crucially requires coordination between national, bilateral, region-wide, and border city connectivity plans. The case of the border region between Eritrea, Ethiopia, and Djibouti serves to illustrate: to fully unleash the potential of the strategic Eritrean port city of Assab will require (1) action on the Eritrean side (better connections by road and rail to Asmara), (2) coordination between Eritrea, Ethiopia and Djibouti to (re)open cross-border road connections and possibly develop rail links, (3) integration with plans for expanding the Ethiopian railway system. A third element of policies, therefore, is the need for coordination across different scales of action, especially in the case of connectivity to port cities, an element that was somewhat snowed under in this study given the focus on air transport. Further research could explore the potential of multi-modal and topological resilience of port access from a network perspective, also opening up the discussion beyond the HoA given that Port Sudan provides an alternative for landlocked Ethiopia.

**(d) There is a need for policies tailored at enhancing connectivity within metropolitan regions.** The emphasis on connectivity provision for border cities and port cities should not preclude the need for improving connectivity around the capital cities' metropolitan regions, even though these presently emerge as the connectivity hotspots within the HoA. This additional focus is justified because the virtuous effects of air transport connectivity and rail corridors between major cities tend to spill over to proximate cities. The eigenvalue centrality ranking reveals these regional spillover effects: cities such as Athi River in Kenya, Ali Sabieh in Djibouti, and Debre Zeit in Ethiopia 'profit' from their connectivity with Nairobi, Djibouti, and Addis Ababa, respectively. More generally, when multiple cities form a dense regional network, a larger number of producers and consumers can be connected. The infrastructure built by public authorities in these urban regions is also more profitable than elsewhere because it is shared. This paper has implicitly charted the emergence of metropolitan regions centered on Nairobi and Addis Ababa, with – albeit to a lesser degree – broadly similar patterns of urbanization emerging around Asmara and Djibouti. It has been argued that cities in these polycentric metropolitan regions enjoy the benefits of centralized connectivity provision while suffering less from the drawbacks of overcrowding. A fourth element of connectivity policies, therefore, is the need for tailored policies for emerging metropolitan regions, where tackling congestion and thinking outside the box of road/rail can strengthen connectivity can unleash network spillover effects. In the case of Addis Ababa, this could focus on an extension or further development of the light rail system now running from the city centre to industrial areas in the south of the city into a fully-fledged metropolitan network.

# References


Brooks, D. H. and Hummels, D. 2009. Infrastructure's Role in Lowering Asia' s Trade Costs: Building for Trade, Cheltenham, UK, Edward Elgar Publishing.

Calderon, C. A. and Serven, L. 2004. The effects of infrastructure development on growth and income distribution. World Bank Policy Research Working Paper No. WPS 3400. Washington, DC: World Bank.

Camagni, R., Capello, R. and Caragliu, A. 2013. One or infinite optimal city sizes? In search of an equilibrium size for cities. The Annals of Regional Science, 51, 309-341.

Camagni, R. P. 1993. From city hierarchy to city network: reflections about an emerging paradigm. Structure and change in the space economy. Heidelberg: Springer Verlag.

Capello, R. 1996. Industrial enterprises and economic space: the network paradigm. European Planning Studies, 4, 485-198.

Capello, R. 2000. The city network paradigm: measuring urban network externalities. Urban Studies, 37, 1925-1945.

Chen, C. L. and Vickerman, R. 2017. Can transport infrastructure change regions' economic fortunes? Some evidence from Europe and China. Regional Studies, 51, 144-160.

Derudder, B., Liux, Kunaka, C. 2018. Connectivity along overland corridors of the Belt and Road Initiative. World Bank Policy Research Working Paper No. 130490. Washington, DC: World Bank.

Derudder, B. 2020. Network analysis of 'urban systems': potential, challenges, and pitfalls. Journal of Economic and Social Geography, https://doi.org/10.1111/tesg.12392.

Glaeser, E. L., Ponzetto, G. A. and Zou, Y. 2016. Urban networks: Connecting markets, people, and ideas. Papers in Regional Science, 95, 17-59.

Haggett, P. and Chorley, R. 1969. Network Analysis in Geography, London, Butler and Tanner.

Katz, M. L. and Shapiro, C. 1985. Network externalities, competition, and compatibility. The American economic review, 75, 424-440.

Kunaka, C. and Carruthers, R. 2014. Trade and Transport Corridor Management Toolkit, Washington, DC, World Bank.

Limao, N. and Venables, A. J. 20 Trémolières, M and Walther, O.J. 201901. Infrastructure, geographical disadvantage, transport costs, and trade. The World Bank Economic Review, 15, 451-479.

Meeteren, M., Neal, Z. and Derudder, B. 2016. Disentangling agglomeration and network externalities: A conceptual typology. Papers in Regional Science, 95, 61-81.

Neal, Z. 2012. The connected city. New York and London, Routledge.

Nystuen, J. D. and Dacey, M. F. 1961. A graph theory interpretation of nodal regions. Papers of the Regional Science, 7, 29-42.

Trémolières, M. and Walther, O.J. 2019. Accessibility and infrastructure in border cities. OECD West African Working Papers N. 23, Paris, OECD.

Yin, M., Bertolini, L. and Duan, J. 2015. The effects of the high-speed railway on urban development: International experience and potential implications for China. Progress in Planning, 98, 1-52.

# Footnotes

[i] See Trade and Transport Corridor Management Toolkit, World Bank.

[ii] Although this background paper is cast in the language of a 'connectivity' analysis, in practice our analytical framework consists of a mixed connectivity/accessibility setup. The sometimes-subtle difference between both concepts can be summarized as follows: in infrastructural terms, connectivity refers to the actual interaction between cities, while accessibility refers to the potential capacity or ease with which other cities can be reached. The distinction between both concepts is sometimes blurry: the number of weekly flights between two cities can clearly be seen as a measure of both connectivity and accessibility; large values point to a large potential accessibility of and large de facto connections.

[iii] For example, as shown in a recent World Bank blogpost by Dijkstra et al. (2020), the cost of service provision tends to increase from cities to towns and semi-dense areas and then to rural areas as defined by the DoU. As a result, access to services is highest in cities and lowest in rural areas, so that 'cities' as conceived in the DoU are de facto economic centers.

[iv] There are, broadly speaking, two main road network datasets: OpenStreetMap and Google Maps. OpenStreetMap (OSM) is currently the largest openly licensed collection of geospatial data. It is now regularly used in research projects as an alternative to/or integrated with authoritative data. Brovelli and Zamboni (2018) point out that OSM maps can often considered to be a valid base map for direct and derived usage. Moreover, they show that OSM maps could be used for integrating with authoritative maps where they are not complete and a rigorous quality certification in terms of metric precision is not always required. However, one of the possible drawbacks of this dataset in the HoA context is that, being a collaborative product created mainly by citizens without formal qualifications, its quality is spatially heterogenous. Because the data collection depends on volunteers, data quality and consistency can be irregular. In places where a community of local mappers make a concerted effort to improve the database, base maps are detailed and accurate. However, it is unclear whether this is the case for parts of the HoA, and this is why we settled for Google Maps (GM). GM uses a variety of sources to collect data including satellite imagery, geological surveys, municipality maps, third-party surveys and street view cars (5M+ miles covered). These disparate data sources are combined using proprietary technology to create the maps. One of the advantages of using Google Maps is that it continually refreshes based on anonymously tracked user data, traffic sensors, and satellite data to make sure it is displaying the most accurate traffic conditions possible as it assesses driving time.

[v] In practice, there are number of ferries running between Djibouti and Tadjourah that boost the strength of this particular city-dyad.

[vi] There used to be Massawa-Asmara link that has been partly rebuilt, but the functional parts are above all used for charter trains for tourists rather than regular, scheduled services between both cities.

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**HORN OF AFRICA REGIONAL ECONOMIC MEMORANDUM BACKGROUND PAPER 6**

# Overview of Digital Development in the Horn of Africa

- Tim Kelly & Eric Dunand

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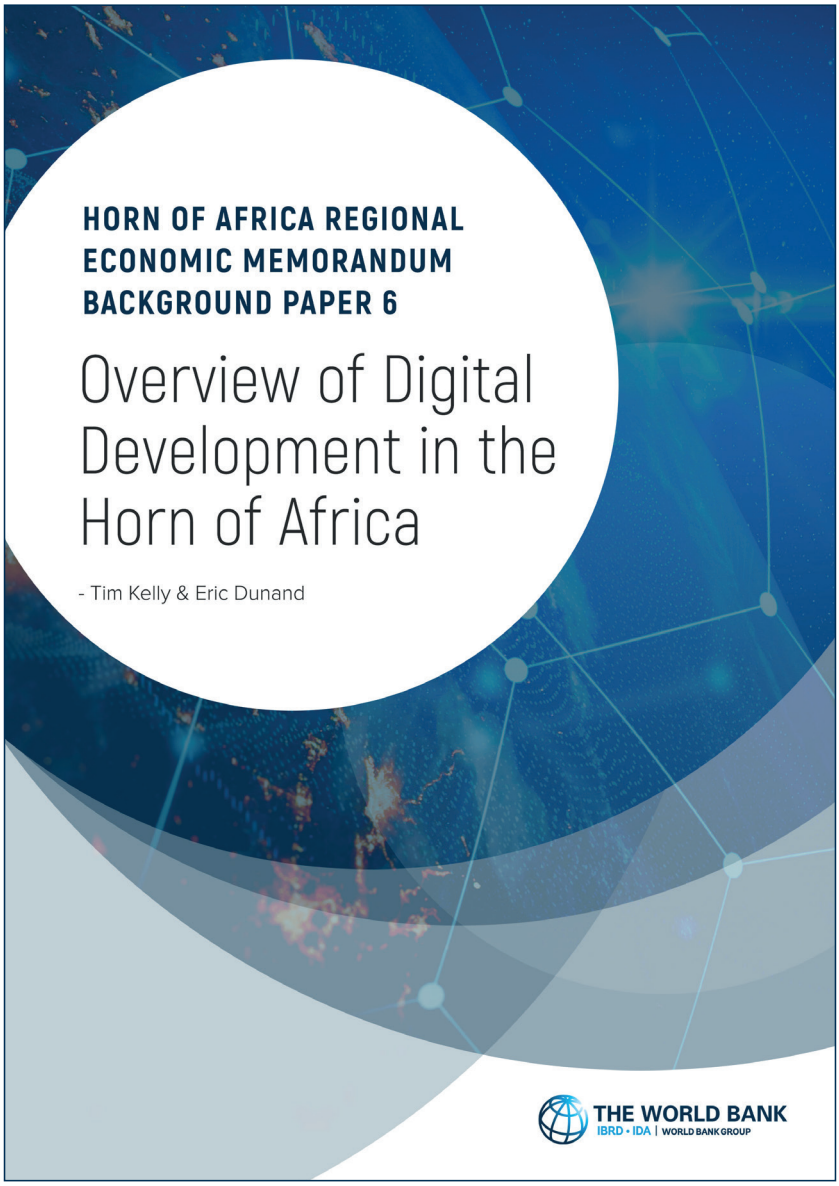

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SECTION 3

# Digital Development

This section follows the World Bank Group's approach to Jobs and Economic Transformation (JET)[1] which identifies economic transformation as key to creating more and better jobs. It builds on the Digital Economy for Africa (DE4A) approach to developing a digital economy to create the jobs of the future,[2] which is aligned with the African Union's Digital Transformation Strategy, 2020-2030.[3] Helping countries build new digital infrastructure, and to develop regulations, skills and platforms that are compatible with neighboring countries should enable them to develop a larger and more efficient digital market that can facilitate economic transformation by enabling technological leapfrogging, and the creation of new jobs in old and new sectors. New forms of market connectivity can bring opportunities for new services and regional economic development in the HoA.

Figure 1: Policies and Investments to Create Productive Jobs Vary by Stage of Economic Transformation

| | Commodities to simple manufacturing & services | Simple to advanced agriculture, manufacturing & services | Advanced agriculture manufacturing & services to innovative activities |
|---|---|---|---|
| **4. Digital economy, technology and innovation** | • ***Basic ICT connectivity*** | • ***Advanced ICT services:*** Infrastructure, competitive markets (liberalized ICT services environment) | |
| | • ***Enabled ecommerce*** (digital id; eKYC etc.) | • ***Enabled digital markets:*** new business models, services and products, industry 4.0, market regulation 2,0 and expand GovTech | |
| | • ***Innovation:*** basic standards, technology adoption, agricultural productivity innovation policies | | • ***Innovation:*** innovation ecosystem (R&D policy, industry-academia links) |

Source: WB – IMF – JET September 18, 2019.

**This section is prepared in the context of Covid-19 pandemic that threatens decades of hard-won development gains and is likely to have triggered the deepest global recession since the World War II.** The economic crisis is generating massive unemployment, particularly affecting the poor and vulnerable, and highlights the importance of jobs and economic transformation. The HoA countries already faced the challenge of a population growth at a rate around 3% pre-Covid-19, and now need to address the health issue and the social and economic impacts.

**Kenya was the first country to enter a Bank-facilitated procurement contract for urgent medical supplies and equipment to strengthen medical services and reduce the spread of the virus, as well as budget support to help close the fiscal financing gap while supporting reforms that help advance the government's**

1 https://ida.worldbank.org/theme/jobs-and-economic-transformation.
2 https://www.worldbank.org/en/programs/all-africa-digital-transformation.
3 https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030.

**inclusive growth agenda.** The HoA countries need to maintain a line of sight to their long-term development vision, which can be best achieved in cooperation and there has been no better time than now to accelerate the digital transformation in and between HoA countries to mitigate the impact of Covid-19.

### 3.1.1 Regulatory environment

**An optimal ICT regulatory framework is critical to supporting the development of digital economies in the HoA.** The deployment and use of the latest digital technologies, providing reliable infrastructure and affordable services to citizens, associated with infrastructure sharing, networks interconnection, quality of service indicators and effective use of scarce resources, in particular spectrum, allows to unlock the full potential of digital services. They can be a key driver for inclusion and can have a significant positive impact on consumers, businesses and governments. In adopting best practices policymakers / regulators can rely on a strong and agile regulatory framework necessary to adapt to and facilitate the digital transformation of all sectors of the economy.

**The level of ICT regulatory development and readiness is heterogeneous in the HoA sub-region, ranging from the absence of a national regulatory authority in Eritrea to an advanced modern authority in Kenya, created in the 1990s, with policies driven by economic and social policy goals.** In contrast the national authorities created in 2018 in Somalia and 2019 in Ethiopia are still in the early process of implementing policies. The government of Djibouti is establishing a multi-sectorial regulator, covering Telecom and Energy, that should be operational by the end of 2021. The following table provides a summary of the development of ICT legal and regulatory frameworks in each country.

Table 1: Status and level of development of legal and regulatory frameworks in the HOA

| | Regulatory Authority (max 20) | Regulatory Mandate (max 22) | Regulatory Regime (max 30) | Competition Framework (max 28) | Overall Score (max 100) | Level of Regulatory Environment | Regulatory Group[4] |
|---|---|---|---|---|---|---|---|
| Djibouti | 0 | 2.5 | 2 | 0 | 4.5 | Regulated Monopolies | G1 |
| Eritrea | 8 | 11 | 4 | 2 | 25 | Regulated Monopolies | G1 |
| Ethiopia | 7 | 12 | 8 | 2 | 29 | Regulated Monopolies | G1 |
| Kenya | 18 | 21.5 | 21 | 27 | 87.5 | Collaborative Regulation | G5 |
| Somalia | 14 | 19 | 10 | 24 | 67 | Basic to enabling environment | G2/G3 |

Source: ITU ICT Regulatory Tracker 2018.

[4] The ICT Tracker is based on self-reported information gathered yearly by ITU. It facilitates benchmarking and the identification of trends in ICT legal and regulatory frameworks G1: Regulated public monopolies– command and control approach G2: Basic reform – partial liberalization and privatization across the layers G3: Enabling investment, innovation and access – dual focus on stimulating competition in service and content delivery, and consumer protection G4: Integrated regulation – led by economic and social policy goals. The assessment for Djibouti does not take account of the latest developments in creating a mult-sector regulator, supported by technical assistance from the World Bank.

**There is an opportunity to upgrade national authorities based on best regulatory practices, potentially learning from Kenya which benefits from the most advanced regulatory framework and liberalized market in the region, with the objective to establish a harmonized regulatory framework amongst HoA countries.** This would facilitate private sector cooperation and partnership, including for cross national telecom and ICT projects. The 2019 reopening of the border between Eritrea and Ethiopia, and improved diplomatic relations between Somalia and Kenya are improving the opportunities for cross-border investment. The main risk to a regulatory reform agenda is an opposition from the incumbent operators (state owned in Djibouti, Eritrea, Ethiopia and in a dominant position in Somalia) who typically adopt delaying tactics because competition can be seen as a threat to their monopoly position.

### 3.1.2 National Digital Infrastructure

As a direct consequence of the heterogeneous regulatory environment in the HoA sub-region, the development of national markets is poorly competitive, with issues on availability, affordability and quality of national fixed and mobile broadband services, with the exception of Kenya leading the way, and Somalia to some extent, and unequal access to international connectivity.

Table 2: Key Telecom Indicators for the HoA

| | Fixed Broadband Penetration % | Mobile Penetration % | Number of Mobile Licensed Operators | Number of Fixed Licensed Operators | Mobile concentration index HHI* (GSMA) |
|---|---|---|---|---|---|
| Djibouti | 16.3 | 37.6 | 1 | 1 | 10,000 |
| Eritrea | 0 | 10.6 | 1 | 4 | 10,000 |
| Ethiopia | 1.3 | 46.9 | 1 | 1 | 10,000 |
| Kenya | 3.8 | 107.9 | 4 + | 8 | 5,135 |
| Somalia | 0.6 | 50.8 | 8 | 8 | 1,886 |
| Africa Average | 8.3 | 84.7 | n/a | n/a | 4,600 |

Notes: *The Herfindahl-Hirschman Index (HHI) is a measure of market concentration. A market with an HHI of less than 1,500 is considered to be a competitive marketplace, an HHI of 1,500 to 2,500 to be a moderately concentrated marketplace, and an HHI of 2,500 or greater to be a highly concentrated marketplace..

+ Kenya has also licensed three Mobile Virtual Network Operators (MVNOs) which can resell spectrum to offer more specialized financial services, for instance for the retail and financial services sectors.

Source: TeleGeography Globalcomms Database. GSMA.

**Djibouti Telecom (DT)** is wholly state owned, via a national sovereign wealth fund, and is the monopoly provider of mobile and fixed services in the country. DT's services include 2G, 3G and 4G (in the capital) technologies and fixed line voice, internet and data services (including corporate data, ADSL and Fibre), DT offers xDSL access primarily in Djibouti City, Ali Sabieh, Dikhil, Tadjourah and Balbala. Some nine submarine cables land in Djibouti forming a natural transit route for communications in the region between Europe and Asia. DT's objective is to consolidate its regional digital hub position via extending terrestrial connections with neighboring countries.

**Eritrea Telecommunications Services**

**Corporation (EriTel)** is majority-owned by the government and is the monopoly provider of mobile services limited to voice (3G still to be launched). Four ISPs were licensed in 2000: Eritrea Telecommunication Services Corporation (Eritel), Tfanus Enterprises, Computer Technology Service (CTS) and Ewan Technical Solutions (EWAN Net) – all with an initial international IP connectivity of 128kbps due to the absence in the country of undersea cable system. Eritrea is one of the only coastal countries in Africa that still lacks an undersea fiber connection to the internet. Discussion are ongoing to extend Liquid Telecom's 75,000km pan-African fibre-optic backbone network to the country.

State-run **Ethio Telecom** (formerly Ethiopia Telecom Corporation, ETC) was until recently the sole provider of mobile services in Ethiopia; however the Government has announced plans to award two new full service telecom licenses to open the market to competition. The first license was awarded, on May 22 2021, to the Global Partnership for Ethiopia consortium, which includes Vodafone, Vodacom, Safaricom, Sumitomo and CDC. A second planned license will be reauctioned. The government is working on a partial privatization of Ethio Telecom in parallel to opening the market. For the fixed market, Ethio Telecom faces some limited competition from the railway and electricity distribution companies, but this is limited to the trunk network, and both are state-owned.

In **Kenya,** there are currently three main operators: Safaricom, Airtel Kenya and Telkom Kenya, and several minor ones, Mobile Virtual Network Operators (MVNOs) and niche market players. A planned merger between Airtel and Telkom Kenya was called off in August 2020. The Communications Authority of Kenya (CA) is the sector regulator.

In comparison to the country's booming mobile data market, the Kenyan fixed broadband sector is still at a very early stage of development; following the shut down of the xDSL network of Telekom Kenya in 2015 several ISPs launched fiber to the home and DSL services, notably Zuku and Safaricom.

Despite being one of the poorest countries in the world, affected by recurrent security issues, the absence of regulatory barriers to entry in Somalia enabled mobile operators to freely operate, with regulation still catching up. **Somalia** was one of the last countries to be connected to the internet in 2000 and fixed broadband internet uptake is extremely low, partly because of the country's security situation (Al Shabaab has targeted users of mobile data and mobile money), as well as a lack of stable energy sources and the virtual absence of fixed line networks. The Hormuud Telesom Golis (HTG) group, which comprises three sister companies in different zones of the country, has come to dominate the market, mainly due to its dominance in mobile money services, where it refuses to interconnect with its main rivals, the Dahabshiil Group, including Somtel, and Amtel.

Table 3: Broadband Internet Quality of Service in HoA

| Country | Fixed Broadband Download Speed Mbps | Fixed Broadband Latency ms | Mobile Broadband Download speed Mbps | Mobile Broadband Latency ms |
|---|---|---|---|---|
| Djibouti | n/a | n/a | 9.65 | 41 |
| Eritrea | n/a | n/a | n/a | n/a |
| Ethiopia | 18.14 | 40 | 9.84 | 42 |
| Kenya | 21.33 | 39 | 14.98 | 34 |
| Somalia | 10.58 | 68 | 15.32 | 76 |

Source: Ookla Speedtest Global Index- June 2020; GSMAintelligence.com; accessed August 2020.

**Box 1:** Kenya National Optic Fiber Backbone (NOFBI) and linkages to HoA Neighbors

The NOFBI is a project aimed at ensuring connectivity in all the 47 counties of Kenya. The implementation of this project aims to ease communication across counties as well as improve government service delivery to the citizens such as application of national identity cards, passports and registration of birth and death certificates. The project is being implemented in 2 phases: NOFBI Phase 1 (4,300km) passes through 58 towns in 35 counties and NOFBI Phase 2 (2,100km), for which the Government of Kenya is requesting IDA financing under the Kenya Digital Economy Acceleration Program (P170941) will further be connecting all the 47 county headquarters. Operation of Maintenance of NOFBI is undertaken by Telekom Kenya on behalf of the Government, and there are plans to move towards a public private partnership (PPP) structure.

There are limited territorial fiber optic links between Kenya and Ethiopia and none with Somalia. High capacity submarine cables, such as Djibouti Africa Region Express (DARE) and Pakistan and East Africa Connecting Europe (PEACE), are within the vicinity of HoA and offer opportunities for comprehensive regional digital connectivity. The poor condition of the limited fiber optic cable network in Northeastern Kenya is a major hindrance to effective communication. The NOFBI is intended to connect to the undersea cable and deliver terrestrial broadband Internet to Ethiopia, Somalia, South Sudan, Uganda and Tanzania. As part of the HoA Gateway Development Project (P161305), leveraging on the creation and upgrade of transport corridors, the civil works related to laying territorial fiber optic cables will be integrated in the road works for protection and better management of utilities within the road reserve. There is a component to support the development and implementation of a MoU between Kenya, Ethiopia and Somalia on cross-border fiber optical cable traffic and negotiations on regional back-up capacity of submarine cables DARE and PEACE.

Source: Adapted from ICT Authority Kenya and World Bank HoA Gateway Development Project (P161305)

### 3.1.3 Regional Digital Infrastructure

The importance of the digital infrastructure, as an enabler for the development of a digital economy has been recognized by the 2016 World Development Report, with the 2021 update being prepared on this theme. However, the supply side for data infrastructure in the HoA region, with the exception of Kenya, is relatively poorly served. There are four main elements that compose a regional data infrastructure:

- Modern, efficient data centers, for the storage and recovery of critical data. Open access "Tier 4" data centers should be able to offer 99.995% uptime, and offer robust fault tolerance and full redundancy for every component.
- Internet Exchange Points (IXPs) that permit the peering of internet traffic between different operators, internet service providers (ISPs) and content service providers (CDNs);
- Data caches that store real-time copies of popular content (eg Facebook, Wikipedia, Google etc.). Having data stored locally reduces the need to constantly draw upon expensive

inter-continental links. It also reduces latency and improves user experience.

- Backbone networks based on high speed fiber links between data centers, IXPs and operators also form part of the broader regional data infrastructure.

Table 4: The market for data in the Horn of Africa

| Country | Tier III Data Center or below | Tier IV Data Center | Internet Exchange Point | Competitive International Connectivity | Direct access to submarine cables |
|---|---|---|---|---|---|
| Djibouti | 1 | No | **Yes** | No | **Yes** |
| Eritrea | 0 | No | No | No | No |
| Ethiopia | 2 | No | No | No | No |
| Kenya | 8 | No | **Yes** | **Yes** | **Yes** |
| Somalia | 2 | No | **Yes** | **Yes** | **Yes** |

Source: World Bank, adapted from TeleGeography and Packet Clearinghouse.

Cloud computing is now becoming the norm and the market has been dominated globally by companies like Amazon (AWS) and Microsoft (Azure), both of which have set up regional data centers in South Africa. The large social media companies, like Facebook and Google, or eCommerce companies like Alibaba, also tend to self-provide their data networks around regional hubs. They are also investing significantly in their own submarine cables. Alibaba has expressed interest in investing in Ethiopia through the Government ICT Park, located in Addis Ababa.

One implication of this trend towards decentralization of data is that a regional approach is more likely to be successful than a purely national one. The need for resilience also argues in favor of back-up data centers offshore. Counteracting that trend is the desire of some governments to impose data localization requirements (i.e. that national data, especially personal or confidential data, should be stored locally.

Within the region, Djibouti and Kenya's port city of Mombasa are perhaps best positioned to host regional data centers, IXPs and data caches, because of their privileged access to undersea fiber cables. In the case of Djibouti, however, the monopolistic nature of the market and high data prices might be deterrents. The region is in need of open access "Tier 4" data centers which could be developed near coastal landing stations.

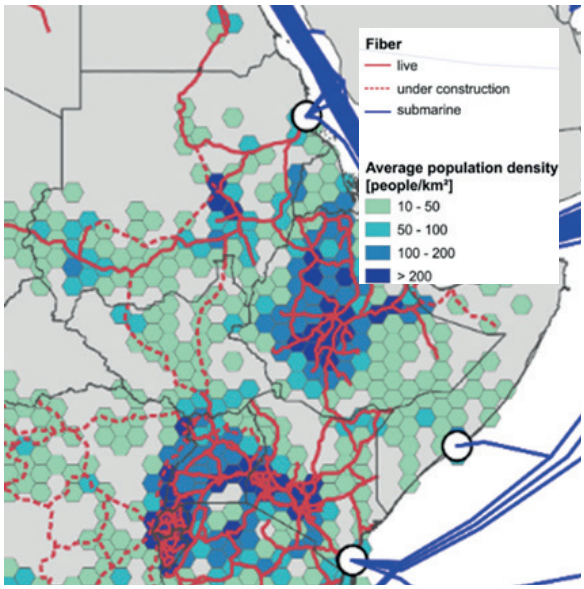
Currently, there are only three cities in the region served by submarine cables. While there are plans to connect several port cities in Somalia to the DARE and G2A cables, these are not yet operational.

- Djibouti is connected by nine submarine cables, and serves as the main gateway for international traffic to Ethiopia and northern Somalia via terrestrial cables to Addis Ababa and Hargeisa;
- Mogadishu (Somalia) is connected to one submarine cable, a branch from the EASSy (East Africa Submarine System cable), with a link to the DARE (Djibouti Africa Regional Express) due to open in 2021. However, while Mogadishu itself has a fiber metro ring, onward connectivity from Mogadishu to the rest of the country and into Kenya is limited to microwave connections;
- Mombasa (Kenya) is served by four submarine cables, and is connected to Kenya's relatively

dense domestic backbone. Mombasa also acts as a gateway for traffic to South Sudan and southern Somalia (albeit currently via microwave), and to Uganda, Malawi, Rwanda and elsewhere (via terrestrial fiber).

As shown in the Figure 2, there are large gaps between these three coastal landing stations, and many large cities are left unserved, notably Asmara (and the rest of Eritrea), Berbera (which would provide an alternative route to the sea for Ethiopia and Somaliland), Bossasso (which could serve Puntland) and Kismayo (which could serve Jubbaland and South West).

Figure 2: Digital Connectivity in the Horn of Africa




Source: World Bank, based on data from NSRC and TeleGeography Inc.

There are a number of projects that have been proposed by different players to meet this connectivity need (see https://www.submarinecablemap.com/):

- The DARE1 cable (Djibouti Africa Regional Express), that is proposed to serve the three existing stations plus Bossasso, with a possible DARE2 extension to other locations. Its principal proponent in the consortium is Djibouti Telecom.
- The PEACE cable (Pakistan East Africa Connecting Europe), this is proposed to serve the three existing stations, plus Bossasso and Kismayo, as well as other locations in Egypt, Europe (Marseilles) and Asia (Pakistan). Its primary promoters are the Chinese vendor, Huawei, and PCCW (formerly Hong Kong Telecom).
- The 2Africa Cable, whose consortium members include Facebook, Vodafone, MTN and China Mobile. This is a planned 37,000 km cable skirting the coast of Africa which is planned to enter service in 2023.

While these three projects have made some progress in raising funding, and have carried out feasibility studies, they nevertheless lack a source of financing that is neutral, in the sense of not belonging to a direct player or a beneficiary, such as IFC provided for the EASSy cable, one of the first cables to be laid off the coast of East Africa. They also lack a commitment to serve the region as a whole, including Berbera and Asmara. It is has also, to some extent, been sub-optimal to have the planning for the two cables underway concurrently, due, for example, to partners swapping between the two.

### 3.1.4 e-commerce and digital markets

Kenya is recognized as the Silicon Savannah and is the only country in the region that has been consistently highlighted as an innovation achiever, with technology leading entrepreneurs like M-PESA, Twiga Foods and Cellulant. Those entrepreneurial successes were possible due to a young population with a high risk-taking appetite, the proximity to regional markets and the existence of a support infrastructure to help the development including technology hubs, and substantial improvements in the digital infrastructure and facilities. The country is among the e-commerce and digital service leaders on the continent.

Table 5: Country scores on eCommerce and related legislation

| Country | Cybercrime Law UNCTAD 2020 | Data Protection Law UNCTAD 2020 | Country value in the UNCTAD B2C E-commerce Index - UNCTAD | ountry rank in the UNCTAD B2C E-commerce Index – UNCTAD+ | EGDI eGovernment development index value UN 2020 | EGDI eGovernment development index rank UN 2018 ^ | OSI Online Service Index UN 2020 |
|---|---|---|---|---|---|---|---|
| Djibouti | Yes | No | 27.7 | 125th | 0.2728 | 179th | 0.2235 |
| Eritrea | No | No | n.a. | n.a | 0.1292 | 192nd | 0.0118 |
| Ethiopia | Yes | No* | 27.5 | 126th | 0.2740 | 178th | 0.3647 |
| Kenya | Yes | Yes | 49.0 | 88th | 0.5326 | 116th | 0.6765 |
| Somalia | No | No | n.a. | n.a. | 0.1293 | 191st | 0.2941 |

Note*: In Ethiopia the constitution provides some principles for data protection. A new Proclamation on Data Protection is in draft form.
+ Ranking out of 152 economies in the UNCTAD B2C eCommerce Index, 2020.
^ Ranking out of 192 economies in the UN DESA eGovernment Survey 2020.

Kenya is still facing constraints including limited targeted support from government to entrepreneurship, rural and urban divide in the entrepreneurship ecosystem, limited access to capital and the low representation of women in the digital space. Addressing those constraints could further unlock economic growth. Proactive public investments and progressive policies and regulations have boosted access to broadband, resulting in better coverage, reduced prices and better quality of service. However due to low digital literacy in rural areas, limited relevant content and issues related to electricity and affordability barriers, a digital divide remains.

Inclusive and trusted systems are crucial tools for achieving sustainable development. Ensuring that everyone has access to identification is also the explicit objective of Sustainable Development Goal (SDG) Target 16.9—to "provide legal identity for all, including birth registration" by 2030. Furthermore, identification is also a key enabler or contributor to many other areas of development, such as financial and economic inclusion, social protection, healthcare and education for all, gender equality, child protection, agriculture, good governance, and safe and orderly migration.

Table 6: ID coverage gaps across the HoA

| | Pop. share without national ID (age 15+) | Pop. share without birth registration (<age 5) | Pop. share without foundational ID* (age 0+) | People without foundational ID* (age 0+) |
|---|---|---|---|---|
| Djibouti | no data | 8.3% | 48% | 464,000 |
| Eritrea | no data | 85.0% | 59% | 2,071,000 |
| Ethiopia | 41% | 97.3% | 66% | 73,865,000 |
| Kenya | 9.1% | 33.1% | 19% | 9,869,000 |
| Somalia | no data | 97.0% | 76% | 11,762,000 |
| Source | 2017 ID4D-Findex surveys | UNICEF/2019 ID4D Dataset | 2019 ID4D Dataset | 2019 ID4D Dataset |

Note*: Foundational IDs are provided by governments as a means for citizens to prove who they are, for example through civil registries, identity cards, passports or birth certificates. They are built with the wider national population in mind, are generally universally available to citizens and can be used for multiple purposes.

### 3.1.5 Digital Financial Services

Financial inclusion helps to develop entrepreneurship which can take people out of poverty and potentially create new jobs, supporting the JET agenda. This can be achieved by promoting mobile money transactions, establishing full interoperability, establishing interconnection between mobile money networks (domestic and regional) with a glidepath toward zero added fees for cross-platform, cross-border transactions, and lowering the tax burden.In Kenya Digital Financial Services are successful due to a permissive regulatory environment that encourages experimentation. The country has been at the forefront of embracing Fintech with multiple partnerships between Banks and mobile network operators, allowing third party providers to connect through open APIs. Some obstacles remain, such as an unequal treatment between banks and non-bank actors. Furthermore, in the absence of full interoperability between systems, Safaricom enjoys a dominant position for its M-PESA service.

In terms of digital financial services, mobile subscribers in Kenya and Somalia are already large users. By contrast, Ethiopia has some of the lowest levels of mobile money usage on the continent, at less than 1 per cent of the population, and the service is virtually unavailable in Eritrea. In Djibouti, Telecom Djibouti just launched its Mobile Money services and it is too early to draw conclusions. Mobile money has the potential to offer a pathway out of poverty for hundreds of millions of people, and to spur broad economic growth.[5] Mobile money was primarily designed for and succeeded in developing countries where mobile money systems often reach far beyond traditional banking systems to provide payment services to rural and low-income people across vast distances.

Although M-PESA itself does not guarantee financial inclusion, it does provide a glimpse of a commercially sound, affordable, and effective way to offer financial services to all. Cash is the main barrier to financial inclusion. As long as poor people are able to exchange value only in cash—or worse, physical goods—they will remain too costly for formal financial institutions to address in significant numbers. Few banks are willing to build the costly infrastructure necessary for collecting low-value cash deposits and redeeming savings back into small sums of cash in low-income or rural areas. But once poor people have access to cost-effective electronic means of payments such as M-PESA, they could, in principle, become profitable to financial institutions.

Source: Mobile Payments Go Viral- WB

Harmonizing and modernizing legal and regulatory frameworks for digital transactions including facilitating seamless, low cost, cross platform and cross-border digital payments could promote digital financial access for all. The possibility to perform digital payment within and between countries will have tremendous benefits for the HoA citizens, governments, and businesses,

5 Bill & Melinda Gates Foundation – Financial Services for the Poor.

increasing the region's competitiveness, growth, job creation and enabling it to excel in the economy of the future as more deeply integrated and dynamic digital investment, innovation, and growth hub.

The region has seen low penetration of credit cards and bank accounts, associated with traditional banking. Digital payment is an evolutionary path now offered by many mobile money providers across the region, and an opportunity for Ethiopia and Eritrea to enable a new wave of financial inclusion. Mobile money is also seen as having a positive impact in helping close the gender gap in both access to finance and supporting access to economic opportunities.

While mobile money is popular, few online services provide direct online mobile money payment capability. People in East Africa countries are used to face-to-face transactions, so building trust in digital payments and online services should be a central focus, including ensuring enough safeguards are in place to protect consumers. This can include the establishment of mutual recognition of national digital IDs and a regional platform for identification verification by governments and digital services providers to enable cross-border data exchange; and the need to meet requirements for multiple aspects of user identification essential for cross-border digital transactions.

There is a need for harmonized laws and regulations that affect the availability and ability to use 'traditional' electronic payment platforms and implement harmonized national e-transactions laws, including recognition of electronic signatures and harmonized consumer protection rules, in accordance with the EAC Electronic Transactions Act . Network interoperability between mobile money networks (domestically and regionally): Mobile payment systems in HoA are mainly domestic and limited to a single operator's network. The systems typically have limited interoperability with other domestic operators, let alone other regional and international operators One exception is Kenya's Safaricom which has enabled international money transfers to Vodacom Tanzania, MTN Uganda and MTN Rwanda subscribers. Issues include unequal regulatory constraints between banking and non-banking sectors, strict requirements from Central Banks (noting that, in the case of Kenya, the CB support was instrumental to the success of Safaricom), lack of agent interoperability to enable competition and weak SIM card registration procedures, to give but a few examples.

### 3.1.6 Cybersecurity

Digitization, or promotion of digital services in a digital economy, requires mass production of data and massive data transactions. Critical infrastructure and new services are becoming heavily data-driven. Since data-driven services involve sensitive data, they are vulnerable to data breach attempts. Data storage and processing require extra attention to good safety and security practices. Privacy concerns can deter the public from making online financial transactions and purchases in the region. Therefore, cyber risk management is key to developing and maintaining consumer confidence in data-driven services.

Having a comprehensive approach to data protection and cybersecurity would increase usage of the digital services. The rapidly growing threat of cybercrime in Africa further increases the importance of appropriate cybersecurity measures in the HoA. While there are no tools in place to monitor the exact trends of cybercrimes and data breaches, the African Union Commission (AUC) is conducting a survey with the security company Symantec recognizing the global rise of cybercrime.[6] Being amongst the latest in internet

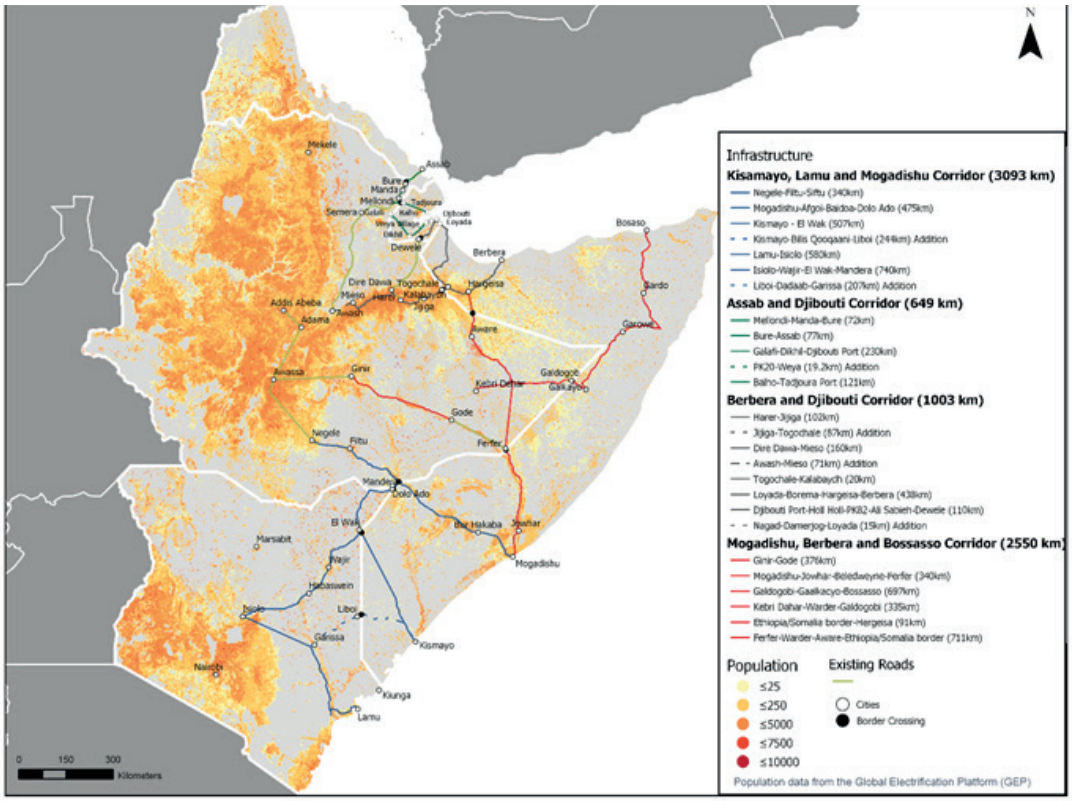
[6] https://www.thehaguesecuritydelta.com/media/com_hsd/report/135/document/Cyber-security-trends-report-Africa-en.pdf

development, HoA countries are highly vulnerable to the incidents, with Ethiopia and Somalia being the countries with highest risk of malware and virus infection due to low level of digital skills, and cybersecurity awareness, among the population.

The longer-term aim is the successful creation of a more regionally integrated **digital single market** in the sub-region, with relatively frictionless cross-border data flows, within a well-regulationed environment, This would require collaboration between countries to agree a common approach to data protection, data privacy and cybersecurity and it is in all countries' interests to support a coordinated regional framework. As more and more digital services evolve, the threat will also intensify. These threats have detrimental effects on regional e-commerce and e-health services, or critical infrastructures such as power grids, financial and customs systems, as well as digital ID schemes that rely on data and digital services. Harmonized data protection and privacy procedures would avoid a "race to the bottom," in terms of standards, in a bid to attract data-driven services investment at the expense of consumer protection.

Legislation to secure the security of data and privacy is almost non-existent except in Kenya, which developed the *National Cybersecurity Strategy (2014)* and enacted the *Computer and Cybercrimes Act (2018),* and in 2019 adopted a new data protection Act. The country also has a multi-stakeholder local collaboration between the government, the different CIRTs, and other key stakeholders, including financial institutions, telecommunication operators, critical information infrastructure providers, etc. None of the five countries have signed or ratified the African Union (AU) Convention on Cybersecurity and Personal Data Protection. There is thus scope to improve national policy in this area and develop a coordinated regional approach that is grounded in best practice and adopts common standards.

Figure 3: Horn of Africa - Proposed Infrastructure




Source:

Table 7: List of routes proposed

| Route proposed | Length | Feasibility Study | Estimated budget |
|---|---|---|---|
| **Djibouti to Ethiopia** | | Yes | $13m |
| Samara - Galafi - Dikhil – Djibouti | | Yes | $13m |
| Dire Dawa - Dewelleh – Ali Sabeh – Djibouti | | | |
| **Djibouti to Somalia** | | | |
| Djibouti - Loyada – Borama | | No | $5m |
| Kismayo – El wak | | No | |
| Kismayo – Liboi | | No | |
| NETIP: Isiolo – (1) Wajia - Madera – Dadaab (2) Mogadishu – Elwa | 744 km | No | $34m |
| LAPSSET: Lamu - Isiolo – Moyale | 1,000km | No | $60m |
| Bure-Assab | | No | |
| Zal ambassa-Asmara-Masawwa | | No | |
| Mogadishu – Firfir | | No | |
| Mogadishu – Dollo | | No | |
| Bossaso – Goldogob | | No | |
| Berbera-Togo Wojjale | | No | |

Source:

While new links proposed are likely to be able to attract private sector investment, commercial interest may vary. It is thus proposed that routes (detailed in Table 1) be financed predominately through public private partnerships (PPPs) with neutral financing from development partners complementing private sector financing from operators serving the region. The donor community could add value by serving as an anchor tenant for financing, and by supporting feasibility studies as well as providing needed technical assistance related to PPPs and other enabling regulation required for investments and implementation to be viable.

### Project Alignment with Key Objectives:

- Bringing more users online, across the Horn, will be the first step to creating a larger, integrated digital market in the region – able to attract greater investment, offer local firms the opportunity to scale on the back of a growing regional digital consumer-base and provide users wider a growing array of digital and data-driven services.
- Robust middle-mile infrastructure, composed of terrestrial backbone networks, are needed to distribute high-capacity bandwidth across each country, but also to channel international connectivity received through regional and global networks (i.e. first mile infrastructure), including the proposed regional sub-marine festoon cable.
- Related links are also essential to the roll-out of last-mile access networks that allow consumers to get connected. While access to high-speed broadband is growing, millions of people across the Horn currently remain unconnected.
- New terrestrial links will thus help expand backbone networks in underserved areas.
- Moreover, connecting backbone networks will help boost competition and resilience. Linking networks will help introduce

redundancy that limits the risk of outages (like the one experienced in Somalia in 2018, which resulted in substantial economic losses). Linking national backbone networks can also help introduce more competition in the wholesale market, with spill-over on price in the retail market, yielding lower cost connectivity services for end-users.

**Currently, national digital infrastructure markets diverge widely in their level of development, competition, and wider market maturity,** with disparities in access, pricing, and capacity. Substantial connectivity divides therefore persist both between and within countries, with widespread inequality in access. Market maturity (in terms of competition, enabling regulation etc.) is likely to determine both the level of complementary support required and the readiness of operators to invest.

- **Regulatory work will need to be undertaken in tandem,** both in terms of filling gaps at a national level but also related to regional harmonization. Licenses to build infrastructure are typically awarded on a national basis, which means that roll-out of cross-border links will require cross-border collaboration. This intervention should thus ideally be pared with regional cooperation and harmonization on licensing. In the past, regulatory gaps have also deterred investors e.g. related to investor protection, PPPs and right of way.
- **There is ample scope to crowd in the private sector.** Expansion of networks tends to be private sector led, though some government support may be necessary for coverage of areas where deployment would otherwise be unprofitable. At this stage, it is not clear which routes are commercially viable and which are not.
- **Pre-feasibility studies of most of the corridors detailed above are needed** to establish the length, cost, status of existing infrastructure, current and future demand, level of commercial interest etc.
- **Laying fiber along new transport / energy corridors should be a priority,** in line with "dig once" policies.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