Report



Regional infrastructure for trade facilitation – impact on growth and poverty reduction

A literature survey

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- Improvements in regional infrastructure for trade facilitation (RITF) in sub-Saharan Africa are very likely to result in growth and in poverty reduction, through both direct and indirect routes, although there may be specific negative effects on certain groups unless complementary policies are also adopted.
- Infrastructure reduces trade costs, which increases trade; however, there is a lack of studies that isolate the specific effects of regional infrastructure.
- Evidence of significant border effects on regional price levels indicates that there are opportunities for more and better regional infrastructure.
- The micro-level literature shows that connectivity through transport infrastructure helps to decrease poverty and increase welfare in sub-Saharan Africa and elsewhere.
- Regional infrastructure and regional integration can raise growth and productivity through increased trade and investment, and hence can increase competition as well as channels for productivity spillovers.
- Hard infrastructure (e.g. roads, ports) and soft infrastructure (e.g. relevant transport services, regional standards) interact in promoting impacts. It is important to combine hard infrastructure with improvements in price-transmission mechanisms; better logistics services, feeder transport networks, and access to storage targeted at the poorest and smallest producers; and improved access to credit for the poorest producers.

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Abbreviations

Abbreviation Description AfT Aid for Trade AIDS Acquired Immune Deficiency Syndrome Ad-valorem equivalent AVE Central African Economic and Monetary Community CEMAC Common Market for Eastern and Southern Africa COMESA DFID Department for International Development East African Community EAC **ECOWAS** Economic Community of West African States Food and Agriculture Organization of the United Nations FAO FDI Foreign Direct Investment HIV Human Immunodeficiency Virus Information and Communication Technology ICT IMF International Monetary Fund IT Information Technology LOP Law of One Price LPI Logistics Performance Index NTM Non-tariff measure OECD Organisation for Economic Co-operation and Development Regional infrastructure for trade facilitation RITF SADC Southern African Development Community Small and Medium Enterprises **SMEs** TradeMark East Africa TMEA West African Economic and Monetary Union **UEMOA** United Kingdom UK United Nations UN UNCTAD UN Conference on Trade and Development US United States USAID US Agency for International Development WAEMU West African Economic and Monetary Union

Glossary of technical terms

Agglomeration benefits	The benefits obtained by locating near each other: lower transaction				
	costs, knowledge spillovers and the effects of market size.				
Centrifugal forces	Forces leading to the consolidation of activities in space.				
Centripetal forces	Forces incentivising the dispersion of activities across space.				
Behind-the-border	'Border' barriers encompass port efficiency and customs				
barriers	administration, 'behind-the-border' barriers can be the provision and				
	quality of infrastructure and regulatory environment.				
Hard infrastructure	Includes roads, railways ports, storage facilities etc.				
Law of One Price (LOP)	When markets are fully integrated, commodity prices converted to a				
	common currency should be equal across locations.				
Regional infrastructure	Any kind of infrastructure that allows the connection of economic				
	actors (e.g. firms, households) along a defined route, connecting				
	agents to regional and other international markets.				
Regional integration	Refers to the process by which states within a particular region				
	increase their levels of interaction with regard to economic, political,				
	security, social and cultural matter/issues.				
Soft infrastructure	Includes public sector reforms such as non-tariff measures,				
	standards, customs procedures and competitive transport services.				
Spatial arbitrage	The ability to exploit differences in characteristics across space (e.g.				
	prices).				
Trade diversion	Trade is diverted from a more efficient exporter towards a less				
	efficient one by the formation of a free trade agreement or a customs				
	union.				
Trade facilitation	Simplification of the trade interface between partners. This trade				
	interface is composed in a broad sense of compliance to government				
	rules by traders, enforcement by authorities of these rules (including				
	taxes), exchange of information, financing, insurance, ICT and legal				
	services, transport, handling, measurement and storage.				

Executive summary

Regional infrastructure for trade facilitation (RITF) is an important feature of regional integration that has recently gained importance in policy circles. While regional integration is viewed as a tool to foster growth and poverty reduction, tensions are recognised within the literature, including potential increased economic volatility, economic divergence amongst countries, and increased inequalities within countries.

This paper reviews the literature describing the pathways of impacts between regional infrastructure, growth and poverty. To do so, the paper first discusses the importance and relevance of addressing trade constraints at the regional scale. Then, it gathers evidence from the literature about the pathways of impact of the reduction of trade costs resulting from investments in regional infrastructure. Then, it reviews evidence on growth and poverty reduction looking at the effects at both micro and macro scales.

Regional integration and in particular deep regional integration has a crucial role in reducing trade costs and supporting growth and poverty reduction, through both hard and soft infrastructure. RITF has an obvious role in supporting landlocked countries' access to international markets. Our review of the evidence at the micro and macro levels suggests there is a general consensus on the positive role of infrastructure investments in fostering growth and reducing poverty. However, there is a lack of specific studies on the effects of *regional* infrastructure. Moreover, the literature emphasises the importance of not only hard infrastructure but also the development of soft infrastructure (e.g. relevant transport services) for inclusive growth.

The overall objective of this literature review is to explore the available evidence regarding the following research questions:

- What is the evidence that improvements in regional infrastructure designed to increase cross-border trade in sub-Saharan Africa (through reducing the costs of trade) result in poverty reduction (a) indirectly, as a result of economic growth; (b) directly?
- What potential risks to the poor are created by trade growth resulting from improvements in regional infrastructure?
- What policy interventions have the capacity to increase benefits for the poor and mitigate potential harm to the poor?

The review is structured around discussing the importance and relevance of addressing trade constraints at the regional scale, and the impact of regional infrastructure on trade, trade costs and prices, and on household-level poverty, growth and productivity. It concludes with some observations on the strength of the evidence, as well as highlighting some research gaps.

The regional dimension of trade constraints

The literature looking at both (i) regional integration, and (ii) the effect of hard infrastructure on trade, growth and poverty, highlights the importance of behind-the-

border constraints to trade in fostering regional economic integration and reducing the cost of trading. There is agreement that a deeper integration agenda – one that includes not only hard infrastructure but also services, investment, competition policy and other behind-the-border issues and policies that affect logistics performance, and impacting on the domestic cost of trading – is likely to result in more trade gains than an agenda focusing on traditional trade policies and border measures.

The literature highlights the importance of complementarity in hard infrastructure (developing transport infrastructure and communication infrastructure jointly) and also between hard and soft infrastructure for the reduction of trade costs to be transferred to traders but also to consumers and producers.

However, deep integration processes can be particularly complex and marred by political economy constraints reducing the efficiency of hard infrastructure investments in supporting growth and poverty reduction. Two examples are competition in transport services and harmonisation of standards.

Deep integration processes addressing both hard and soft infrastructures are particularly important for landlocked countries. As they cross several borders, procedures and costs are incurred many times if customs agencies in the countries of origin, transit and destination do not cooperate.

Finally, coordinating investments through regional agencies might be the best way to avoid suboptimal levels of investment, as it could allow consideration of positive spillovers from infrastructure investment in neighbouring countries.

The motivation and promotion of regional infrastructure is complex, however, and involves multiple opposing interests. Regional infrastructure may lead to greater benefits or greater costs for some countries than for others, for some modes of transport rather than others, for large formal traders compared to smaller informal traders, etc. Past experiences provide a number of lessons on support for regional integration, with implications for supporting regional infrastructure.

First of all, it is important to recognise regional integration as a process. In the past, successful regional integration processes were primarily driven by the private sector and occurred at very different speeds across issue areas, depending on where demand by private sector actors and coalitions of governments was greatest. Second, it is important to recognise the limits of regions as drivers of change, particularly when countries present varying interests as well as limitations in terms of capacity, legitimacy, and costs and benefits in driving forward the full process. Sometimes it may be better to work bottom up at a more limited scale, e.g. for complex regional infrastructure projects. From this second point follows the third, that levels of ambition should perhaps be scaled back regarding regional integration plans, including for soft regional infrastructure.

And finally, we need to consider the potential 'losers' of regional projects or reform. Compensation mechanisms can be a central feature; thus, rather than purely supporting pro-change constituencies, outsiders aiming to foster integration may also be advised to facilitate dialogues and partnerships among groups affected by reforms at the value chain, sector and national levels.

Regional infrastructure, trade and prices

A key building block in analysing regional infrastructure is identifying the effects on trade integration and market integration (measured by the extent to which prices on either side of the border are equalised). In both instances, the literature points to the importance of regional infrastructure.

First, the literature suggests that hard infrastructure lowers trade costs and that lower trade costs increases trade flows. For example, one study suggests that hard infrastructure accounts for nearly half of the transport cost, highlighting the negative impacts of poor transport and communication infrastructure. Further, the literature shows that whilst some informal traders depend on trade restrictions and high trade costs, most, including women, would benefit from trade facilitation.

Second, good quality regional infrastructure will make borders thinner, and thus easier to cross. Without any regional infrastructure, prices can evolve very differently in locations either side of the border. With good infrastructure, and seamless borders, we can expect prices to evolve similarly, because if this were not the case, traders could exploit differences in prices in different locations (spatial arbitrage). The evidence suggests that there is indeed a significant border effect with differences in price levels of around 13-20%, indicating opportunities for better regional infrastructure. Price differences for food staples are lower, presumably because these are traded informally. There is scope for much better market integration, with research suggesting that more efficient border posts allow for faster price transmission resulting from arbitrage opportunities, thereby decreasing price volatility.

Household-level effects of regional infrastructure: welfare, food security, livelihood strategies, migration, and health and education

The micro-level literature provides clear evidence that connectivity through transport infrastructure helps to decrease poverty and increase welfare in sub-Saharan Africa and elsewhere. Rural roads may allow farmers in remote and often poor rural areas to obtain higher prices for their output and/or reduce the prices of their inputs and consumer goods. However, it should be noted that much of the evidence focuses on national or sub-national infrastructure and not cross-border infrastructure directly. When it comes to securing the benefits of regional corridors for small and medium enterprises (SMEs), some emerging findings suggest that regional infrastructure needs to be combined with the upgrading of feeder roads, storage facilities and access to credit.

By reducing trade costs and connecting surplus and deficit areas, RITF can enhance economic resilience, reduce food insecurity through greater market integration, and increase the scope for livelihood strategies. More stable policy and regulatory processes for regional trade can reduce price instability, whilst export bans increase instability and reduce trust between traders, producers, households and governments. Regional infrastructure also allows households to participate in markets that would otherwise not be accessible, and in doing so, it allows for much greater scope of livelihood strategies.

Unfortunately, very few studies examine the effects of regional infrastructure on migration. On the one hand, it promotes migration, as transport improvements help reduce distance to reach more profitable income-generating opportunities. On the other hand, better transport may provide incentives to stay by improving living conditions in the region of origin. Regional infrastructure may also hasten the spread of communicable diseases through increased mobility. However, better cross-border infrastructure can also reduce exposure of the population working at the border.

Growth, foreign direct investment (FDI) and productivity effects of regional infrastructure

Regional infrastructure and regional integration can raise growth and productivity through increased trade and investment, and hence increase competition and channels for productivity spillovers. However, while there are some well-known findings, there are also some research gaps. First, regional integration and infrastructure attract more trade and investment, but there are no studies examining the impact of *regional infrastructure* on FDI and economic convergence. Second, infrastructure and exporting correlate strongly with both growth and firm-level productivity, but again, there is very little evidence on the effects of *regional* infrastructure and *regional* exporting on productivity.

Strength of evidence and gaps

The body of evidence surveyed in this document consistently concludes that improvements in regional infrastructure designed to increase cross-border trade in sub-Saharan Africa are very likely to result in poverty reduction through both direct and indirect routes, although there may be specific negative effects, which are expected to be more than offset by the other channels. The quality of the evidence surveyed is sometimes high, depending on regressions at macro or firm level. However, looking at each type of impact inside the segmentation between direct and indirect effects, the size of the evidence remains quite small. Moreover, there is a lack of evidence on *regional* infrastructure.

According to the evidence surveyed, the main potential risk that increased trade from better regional infrastructure creates for the poor is that such initiatives will not spread sufficiently to the poorest and most vulnerable stakeholders or, even worse, will displace their activities without allowing them to seize the new opportunities opened up by regional integration.

The evidence consistently points to the importance of complementary measures to increase benefits for the poor and mitigate the potential harm. In particular, RITF has to be complemented by measures that enable connecting the poor to market opportunities (e.g. improvements in price-transmission mechanisms; better logistics services, feeder transport networks and access to storage targeted at the poorest and smallest producers; and improved access to credit for the poorest producers).

Policy suggestions

Two broad policy suggestions follow from this literature review.

The first is to recognise the importance of the complementarity of various types of infrastructure in ensuring the maximum contribution of (regional) hard infrastructure projects in fostering growth and poverty reduction.

The literature examining the pathways to growth and poverty reduction – through prices, jobs, investment and output -- emphasises the importance of complementary policies. Complementary policies enable the pass through of lower trade costs to lower prices in the entire economy. Such transmission is key in ensuring that even the most vulnerable and isolated people and regions benefit from regional trade integration and increased food security. It requires the participation of isolated stakeholders in commercial markets.

As jobs and activities are created and displaced, and trade facilitation presents new opportunities to workers and producers, complementary measures are needed to

allow a supply response. Such complementary policy could be, for instance, to make migration easier, to enable labour mobility across space.

Therefore, in order to optimise the contribution of regional infrastructure to inclusive growth investments in regional hard infrastructure and according to this literature review, we suggest the following complementary policies and initiatives:

- Coordination of large investments through regional agencies to avoid suboptimal level of investments and
 - allowing for multimodal corridors linking landlocked countries to gateway countries' ports
 - taking into account the complementarity among several types of infrastructure, for instance undertaking both transport and communication infrastructure development jointly. The same applies to customs and corridors.
- Policies supporting investment and competition in trade-related services including the logistics services sector. This can for instance include
 - regulatory reform that addresses the governance and political economy of freight logistics
 - facilitating and stabilising policy and regulatory processes. There needs to be more transparency and stable implementation of trade agreements and trade rules to prevent policy volatility. This would allow for more market predictability, necessary to unlock private sector investment.
- Improved intermediary hard infrastructure such as rural feeder transport networks and access to storage facilities.
- Increased transparency of markets and access to information to allow better price-transmission mechanisms so that consumers, traders and producers gain.
- Support of market access for the smallest producers, through the provision of various support services, including financial but also technical assistance and access to inputs.
- Increased flexibility and mobility of workers to allow them to benefit from new opportunities in the region.
- Scaled-back levels of ambition regarding integration planning, particularly on regulation and standards harmonisation. This can be done through targeted initiatives after the identification of specific regulatory bottlenecks, or through mutual recognition processes.

The second broad policy suggestion aims to provide support to the countries, population and activities that are the most vulnerable to being harmed by the effects of increased regional integration and reduction in trade costs.

• Support for regions needs to go beyond a simple sequential model, e.g. moving from goods to services to capital and labour mobility that may not be the most efficient. Planning and implementation of regional infrastructure should be carried out in consultation with institutions such as business associations in order to

- better identify barriers to regional integration, and identify relevant bottlenecks to be addressed
- better inform the private sector about new opportunities created by the increased regional integration that results from the development of regional infrastructure
- better prepare the private sector for potential increased competition.
- Identifying whether regional institutions are the most relevant level of aggregation in order to solve various trade-related issues: Regions should apply the principle of subsidiarity, according to which the responsibility of a public policy should be addressed by the smallest body able to address it. This would include regional infrastructure design and investment decisions.
- Creating compensation or support mechanisms to be built under a deep integration process, to allow countries with less attractive business environments (natural resources, infrastructure or skills) to make the necessary investments to become more attractive and spur convergence in the region rather than divergence.
- Facilitating dialogue and partnerships among groups affected by reforms at the value chain, sector and national level, particularly as they might entail political economy and governance issues.

1 Introduction

Regional integration refers to the process by which states within a particular region increase their levels of interaction with regard to economic, political, security, social and cultural issues (van Ginkel and van Langenhove, 2003). Integration processes have historically followed a largely linear structure, with governments aiming to sequentially integrate goods, labour and capital markets, and eventually monetary and fiscal policies (Hartzenberg, 2011). This is frequently complemented by increased cooperation in other non-economic areas. Thus, regional integration goes far beyond the context in which it is normally considered – trade liberalisation – and can include numerous domains relevant for development, including employment, natural resource management, health, security, education and infrastructure.

Regional integration is viewed as a tool to foster growth and poverty reduction. Regional infrastructure for trade facilitation (RITF) is an important feature of regional integration that has recently gained importance in policy circles. Yet tensions are recognised within the literature, including increased economic volatility, economic divergence amongst countries, and increased inequalities within countries.

It can sometimes be 'difficult to disentangle the effects on growth and poverty due to regional trade policies from those due to trade facilitation that could be undertaken on a regional or unilateral basis' (de Melo and Tsikata, 2014). Regional agreements often aim to increase trade among members first, through the reduction of tariffs, followed by the reduction of non-tariff measures, and finally the provision of trade facilitation infrastructure. While the outcome of the first two components, considered as 'shallow' integration, is discussed more widely in the literature, the third component, associated with 'deep integration', is more difficult to capture. But all three components affect trade costs, trade flows, and economies more generally. This paper specifically reviews the evidence of the third component: trade facilitation infrastructure. It reviews the academic evidence of the impact of RITF on growth and poverty reduction, with an emphasis on African experiences. The remainder of this introductory section explains key concepts and sets out the basic approach adopted in this analytical review.

Many analyses have now provided evidence about the importance of the cost of trading compared to trade policies as an obstacle to trade development in sub-Saharan Africa. In particular, the fact that African infrastructure levels lag far behind others in the developing world (World Bank, 2008), in addition to the specific geography of Africa with 40% of its population living in a landlocked country, reinforces the developmental impact potential of improving trade facilitation infrastructure.

We will focus on **regional infrastructure**, which we consider to be any kind of infrastructure that allows economic agents (e.g. firms, households) to connect with regional and other international markets along a defined route. Therefore, this definition encompasses modes such as regional roads and railways, as well as ports and airports, whenever they are connected to other countries in the region through a

corridor and can potentially act as a hub linking the region to the international market.¹

Maur (2008) defines **trade facilitation** as 'the simplification of the trade interface between partners. This trade interface is composed in a broad sense of compliance to government rules by traders, enforcement by authorities of these rules (including taxes), exchange of information, financing, insurance, ICT and legal services, transport, handling, measurement and storage' (Maur, 2008, p.4). Therefore, trade facilitation addresses customs, border and transit management issues as well as all other trade-related services that help to reduce trade costs along the entire trading chain. Therefore, the analysis of trade facilitation encompasses cross-border (between countries) barriers to trade, but also in-country barriers.

In other words, trade facilitation includes logistics and transport services as well as competition and regulation in those services; the supply of physical infrastructure such as transport, but also communication infrastructure, an important tool in reducing transaction costs; and finally, other barriers to trade and market entry such as mandatory or voluntary quality and safety standards. It encompasses both hard infrastructure, such as roads and railways, and soft infrastructure which can also be defined in the broadest terms as all trade-related services and regulations, for instance standards and customs procedures. Therefore, improving soft infrastructure includes the elimination of non-tariff barriers owing to the simplification of customs procedures as well as the simplification, harmonisation or mutual recognition of standards; and other non-tariff measures. Such actions can also provide signals about the credibility of trade and investment climate reforms, a 'deep integration' comprising both tariff reduction and broader regulatory reforms, thereby decreasing the cost of trading. Regional integration can therefore help attract capital flows and activities through improvements to the broader investment climate.

Fostering the **integration of markets at the regional level is expected to bring important benefits** for growth and poverty reduction. It is expected that reducing barriers to trade and investment through regional integration will increase intraregional trade and, in most cases and in the long run, lead to poverty reduction and increased employment (De, 2004; Winters et al., 2004). Although this is the case in many regions around the world, this statement seems to be particularly relevant in Africa. According to De Melo and Tsikata (2014, p.1), 'the small, sparsely populated, fragmented, and often isolated economies across Africa make a compelling case for these economies to integrate regionally to reap efficiency gains, exploit economies of scale, and reduce the thickness of borders'.

There is a long-standing consensus among academics and policy-makers on **the positive role of infrastructure investments in fostering growth and reducing poverty**. The 'big push' theory (Rosentein-Rodan, 1943; 1961) suggested that large amounts of investments are needed to embark on the path of economic development, and in particular, infrastructure investments. This question is now experiencing renewed interest after being cast aside during the late 1980s, when the productivity of public expenditure was questioned (Aschauer, 1989).

Despite the debate on the magnitude of their effects and the econometric challenges involved in rigorously assessing their impacts (see Straub, 2011; and Annex 1), the

¹ Infrastructure such as that associated with the Nacala corridor (railway, road, port and cross-border infrastructure) linking the port of Nacala in Mozambique to Malawi and Zambia is therefore considered as regional infrastructure. But such regional infrastructure also covers soft infrastructure influencing transport costs and ease of access and use of such corridors for neighbouring countries. For instance, transit regulation as well as standards regulation.

economic pathways through which infrastructure affects growth are clearly identified. Infrastructure represents a direct input into production through the services it provides (transport, energy, and information technologies). Indirectly, it can also alter the composition of other inputs and play a role through economies of scale and scope. Infrastructure is also at the core of structural transformation of economies.

In order to evaluate the effectiveness of (regional) Aid for Trade, it is particularly important to understand how – and through which channels – various regional infrastructures for trade facilitation directly and indirectly affect growth and poverty reduction. Identifying the pathways of impacts and those who gain and lose from regional trade integration is essential to define the most effective policies and regional initiatives, as well as complementary policies.

As the literature review emphasises, hard and soft infrastructure policies often work together to effectively achieve the objective of facilitating trade and decreasing the cost of trading. Infrastructure development will affect various stakeholders differently. Ensuring the inclusiveness of the impacts of trade facilitation initiatives will sometimes require specific complementary policies and initiatives. Therefore, it is important to understand how and under what conditions RITF can support growth and poverty reduction.

The overall objective of this literature review is to explore the available evidence regarding the following research questions:

- What is the evidence that improvements in regional infrastructure designed to increase cross-border trade in sub-Saharan Africa (through reducing the costs of trade, including costs caused by delays principally transport) result in poverty reduction (a) indirectly, as a result of economic growth; (b) directly?
- What potential risks to the poor are created by trade growth resulting from improvements in regional infrastructure?
- What policy interventions have the capacity to increase benefits for the poor and mitigate potential harm to the poor?

This literature review sets out and gathers the evidence on the pathways and impacts of RITF on growth and poverty reduction. While the main focus is on the reduction in trade costs through RITF, we also acknowledge that regional integration can affect transaction costs, investments, and growth and poverty reduction through other channels. First, regional integration might reduce the risk of political and military tensions between countries (Schiff and Winters, 1998). Second, regional integration can foster lock-in of reforms and credibility for the private sector investment.

The structure of this literature review follows the chart below, summarising the main pathways of the impact of infrastructure for trade facilitation on growth and poverty reduction. The first main step is to identify the **policy measure** that is being assessed. The overall measure is a regional infrastructure measure, and this can consist of both hard (e.g. roads) and soft (e.g. harmonisation of rules) infrastructure. The nature of this measure depends on the regional and domestic political economy context. The second main step is to identify the direct impact of the policy measure on **trade costs and trade flows**. Finally, the third step looks at how a change in trade costs and trade flows affects three main types of actors (households, firms and governments) and the impact on growth and poverty, through lower prices and increased product availability. While both growth and poverty reduction will be correlated and the actors dependant, **evidence on the**

poverty effects is provided by looking at households, while growth effect is often investigated by looking at macroeconomic indicators as well as the effect on firms. Some indirect effects through government revenues and spending are envisaged, though evidence linking infrastructure for trade facilitation is scarce, moreover, it is difficult to identify where this increase revenue will be directed. Therefore this channel hasn't been explored as much as the others.



Figure 1: Investigating pathways and impact of regional infrastructure for trade facilitation

Before examining the impact of RITF on growth and poverty, Section 2 discusses two major reasons why this is an important area of research, highlighting the role of deep regional integration in reducing trade costs, through both hard and soft infrastructure, and the role of RITF in landlocked countries. Section 3 examines the evidence on the main transmission channels between the provision of RITF, growth and poverty reduction, meaning the impact on prices and trade flows. The main impact of investment in RITF will occur through reducing trade costs (e.g. a decrease in transport and transaction costs, increase in transport reliability, and more efficient border posts). This will change prices and incentives to trade of economic agents, resulting in a range of direct and indirect impacts on poverty and growth. The impacts encompass changes in trade in goods and services, and in prices of inputs and outputs, which can then have further knock-on effects on employment and access to social services, etc.

Section 4 examines the impact of infrastructure for trade facilitation on poverty by discussing the impact on (household level) welfare, food security and livelihood strategies, and health and education. Section 5 reviews the evidence regarding the impact of the reduction in trade and transaction costs through regional infrastructure on the location of economic activities, on foreign direct investment (FDI) flows and on firm-level productivity.

Section 6 discusses the main pathways amongst RITF, growth and poverty reduction as analysed in this survey, comparing it to the approach of McCulloch et al. (2001). This section identifies where gaps remain to be filled. The conclusion summarises the findings of the literature review by providing a first assessment of the three questions that form the objective of the project.

2 The regional dimension of trade constraints

Before examining evidence on transmission channels and impact in more detail, the following sections explore two important motivations for focusing on RITF as a potential tool for growth and poverty reduction. Section 2.1 discusses the potential role of deep regional integration in reducing trade costs through both hard and soft infrastructure, using two examples of the political economy of deep integration through competition in transport services and harmonisation in standards. Section 2.2 highlights the particular importance of RITF for landlocked countries. Section 2.3 discusses potential approaches in dealing with political economy considerations in a regional context.

2.1 Reducing trade costs: deep regional integration and the political economy of behind-the-borders barriers to trade

The main role of infrastructure in facilitating trade is to decrease the cost of moving goods or services from one location (origin of production) to another (location of final consumption). A decrease in such costs can stem from reduced transport costs thanks to the provision of connected and efficient transport networks ('hard' component) and from reduced transaction costs thanks to the removal of intangible barriers of exchange ('soft' component). The evidence suggests it is important to consider both components to lower the costs of trading in order to reach full integration of markets and economies.

The way the 'hard' and 'soft' components are combined will also affect the ways the reduction in trade and transaction costs will affect stakeholders in the value chain, including the poorest. Lowering the transaction costs of a market exchange can boost net returns. From a value chain perspective, better market connections not only increase access to output markets but also increase the availability of inputs and other services, all of which are likely to increase productivity, outputs and, consequently, welfare.

The United Nations Conference on Trade and Development (UNCTAD) argued that the cost of trading is a major and much more important barrier to intra-African trade than tariffs (UNCTAD, 2009; Balistreri et al., 2014). Both the literature looking at (i) regional integration, and (ii) the effect of hard infrastructure on trade, growth and poverty, highlight the importance of behind-the-border constraints to trade, such as infrastructure and regulatory environment, in fostering regional economic integration and reducing the cost of trading.

Recent studies on regional integration in Africa (te Velde, 2006; Hartzenberg, 2011; and de Melo and Tsikata, 2014) emphasise that the focus has been on border measures, such as import duties, whilst leaving aside the supply-side constraints to economic integration that may have been more important. They agree that a deeper integration agenda that includes services, investment, competition policy and other behind-the-border issues and policies that affect logistics performance, and

impacting on the domestic cost of trading, is likely to result in more trade gains than an agenda focusing on traditional trade policies and border measures. Until recently, those behind-the-border measures aimed at reducing trade costs were largely ignored across African Regional Economic Communities. They suggest that a priority for both research and policy advice is to further 'unpack' these findings.

Since the 1990s, the analysis of hard infrastructure provision, growth and poverty has increasingly argued that the provision of hard infrastructure such as roads was not enough, and was only part of a wider issue of high transaction costs, market access and inclusion. For instance, in an analysis of the impact of rural roads in Nepal, Jacoby (2000) acknowledges that 'rural road construction is certainly not the magic bullet for poverty alleviation' (Jacoby, 2000: 735). The Aid for Trade agenda has stimulated the production of new analyses of the effect of investments in hard infrastructure. Most of them emphasise that the issue is not only physical trade costs but also transaction costs, particularly those caused by governance and policy issues.

New quantitative and descriptive analysis has focused on providing evidence about the need to address soft infrastructure to maximise the benefits of investments in hard infrastructure (Mbekeani, 2010; Portugal-Perez and Wilson, 2012). Kessides (2012) underlines that defragmenting Africa requires the removal of trade barriers created by both physical infrastructure bottlenecks and the lack of capacity-building and harmonised legal, regulatory and institutional frameworks. He suggests that increasing the efficiency of customs and reducing red tape seems to be an efficient way to reduce barriers to regional trade. Yet soft infrastructure for trade facilitation should encompass more than administrative border procedures, to ensure the benefits of freeing trade accrue efficiently across various stakeholders.

The literature highlights the importance of the 'logistics markets' to complement hard infrastructure projects in alleviating constraints and increasing incentives to trade, in particular for developing countries (Hoekman and Nicita, 2011; Portugal-Perez and Wilson, 2009). Using a comprehensive new international logistics index, Behar et al. (2011) compute that an improvement of a one standard deviation in the guality of logistics, which would put Rwanda on a par with Tanzania, raises exports by 27%. Brenton et al. (2014) examine the impact of removing constraints to trade on market integration of Central and Eastern Africa for three food staples: maize, rice and sorghum. They show borders are 'thicker' for countries affected by poor logistics performance, as measured by the World Bank Logistics Performance Index. This index provides an assessment of the perceptions of a country's logistics. It considers the efficiency of the customs clearance process in addition to the quality of trade- and transport-related infrastructure, ease of arranging competitively priced shipments, quality of logistics services, ability to track and trace consignments, and frequency with which shipments reach the consignee within the scheduled time.

Jouanjean (2013) reviews the literature on infrastructure for agricultural trade, highlighting the importance of 'behind-the-border' measures. Logistics infrastructure is found to be key for competitiveness and participation in agricultural value chains. Such infrastructure includes transport services, agricultural extension services, and sanitary and phytosanitary institutions, including inspection infrastructure, storage capacity and warehouse services.

Balistreri et al. (2014) examine Kenya, Tanzania, Uganda and Rwanda. While various studies examine the impact of regional preferential agreements on goods, they suggest examining the welfare effects of a deeper integration, the latter encompassing the decrease in the cost of trading. They decompose trade costs into

trade facilitation (addressing costs such as delays at border crossing, roadblocks for trucks and the necessity to pay bribes), non-tariff measures,² and the costs of business services for trade. In particular, their paper intends to analyse the importance of this later dimension, looking at the importance of services for trade costs, especially, in the context of preferential agreements.

Balistreri et al. use a computable general equilibrium (CGE) model to predict the aggregate welfare effects of deep preferential integration, by examining the impact of combined cuts in trade facilitation, non-tariff measures and services barriers. They find that all four countries gain from deep integration, with gains ranging from 0.9% of consumption in Tanzania to 1.4% of consumption in Rwanda. Looking at each component separately, they find that trade facilitation (reducing the time to trade) constitutes the largest share of the gains (two thirds of the total gains for Kenya and Tanzania and more than 80% for Uganda and Rwanda). In their model, non-tariff measures are captured as ad-valorem equivalent (AVE), in other words, the equivalent of a tariff. The AVEs are relatively low in their model, resulting in lower gains compared to trade facilitation. However, it is not clear whether the effect of non-tariff measures on delays at the border is considered in the trade facilitation effect or through the AVE. Finally, the reduction of barriers in services results in gains of .04% of consumption in the case of Kenya and .03% of consumption in the case of Tanzania. Although these results depend greatly upon the model parameters, they suggest that in terms of aggregate welfare effect, reducing the time to trade is the most efficient.

We discuss the complexity and political economy of two examples of deep regional integration in relation to infrastructure: competition in transport services and harmonisation of standards.

Deep regional integration and the political economy of competition in transport services

According to Portugal-Perez and Wilson (2008), large investments in physical infrastructure projects to improve infrastructure quality alone do not necessarily lead to lower transport costs. They emphasise that the lack of competition along the different segments in the trade logistics chain can keep transport prices high for end users. Trade logistics is a fertile ground for rent-seeking activities. The lobbying of interest groups and potential corruption can lead to inadequate regulation (such as market access restrictions, technical regulations, and customs regulations) that aim to protect inefficient logistics operators. It discourages the entry of more modern logistics operators with lower operational costs (Portugal-Perez and Wilson, 2008).

Looking more specifically at transport services, various studies suggest the 'physical' cost of transporting goods in Africa is not as disproportionately high as expected, but rather that it is lack of competition in the transport services that increases the price of transporting goods (Behar and Venables, 2010; Raballand and Macchi, 2008; World Bank, 2012). Therefore, complementary steps in regulatory reform are also fundamental. For instance, tackling the governance and political economy of freight logistics is crucial in order to reduce transaction costs (see analysis from CCRED on fertilisers trading and transportation in the Southern African Development Community (SADC), Nleya (2014)).

² Balistreri et al. (2014) use the expression "nontariff barriers". However their definition seems to cover non-tariff measures such as standards, as mentioned in Cadot, O. and Gourdon, J. (2014). 'Assessing the price-raising effect of non-tariff measures in Africa', *Journal of African Economies*.

Lall et al. (2009) examine the determinants of high transport costs in Malawi by looking at the respective impacts of hard infrastructure (coverage and quality of roads networks) and soft infrastructure (market structure of the trucking industry). They show both components significantly contribute to transport costs, as the extent of competition among transport providers and scale economies in the freight transport industry affects the cost of moving goods.

Teravaninthorn and Raballand (2008) evaluate international corridors in Africa and find that the transport of freight between Sahel countries and their ports – and thus the world market – features prices that significantly exceed the underlying costs. Their analysis suggests most of this situation owes to rent-seeking road transport cartels benefiting from oligopolies. Of particular concern is the trucking industry in West and Central Africa, which is characterised by cartels offering high prices and low service quality. The competitiveness of the East Africa market environment seems more mature, but is negatively affected by fuel prices and border controls. However, the most competitive trucking corridors of East Africa are marred by anti-competitive regulation. For example, Kenya prohibits international transit trucks on the Mombasa–Kigali corridor from taking domestic freight on the return trip, forcing them to travel empty for 1,700 km (Cadot et al., 2014).

However, Raballand et al. (2010) highlight that a one-size-fits-all approach to the development of roads and transport services does not work. They argue that the level of production influences which policies will be most effective: because of high risk and low returns, low agricultural production means low competition among truckers. Truckers need to cover their marginal costs, and in low-production areas this can already be difficult for a single trucker.

Porto et al. (2011) show that lack of competition along supply chains in export agriculture in sub-Saharan Africa, such as in transportation, results not only in high costs of transport but also in poor services and inefficiencies, to the detriment of the society as a whole. USAID (2011) shows that the transport and logistics costs of moving maize and livestock along key trading corridors between Benin, Burkina Faso and Ghana account for approximately 59% and 18% of the respective end-market prices. Of these, transport costs – that is, fees paid to transport service operators and losses in transit – were found to weigh most heavily on the end-market price along the corridors studied.

Deep regional integration and the political economy of regional standards

Increasing the efficiency of cross-border trade requires addressing the issue of nontariff measures (NTMs), and in particular sanitary and phytosanitary and technical barriers to trade. The effort to comply with production standards affects production costs. NTMs also affect trade costs due to red tape, as well as inspections and testing at the border, which can create delays both for imports and exports. There are two ways to address NTMs: harmonisation of standards and mutual recognition of standards – the latter is often recognised as a more feasible option compared to full harmonisation of standards (when all countries adopt exactly the same standards).

NTMs are a sensitive and complicated challenge for two reasons. The first is that to separate legitimate measures (e.g. consumer safety) from protectionist ones would be particularly difficult, as the latter would have created rents and there would often be complex political economy dynamics. The second is that in many cases, private standards are stricter, more burdensome but also more volatile and heterogeneous than public standards.

The issue of standards is being extensively discussed in the global value chain literature. Some analyses show that standards can prevent trade from occurring as they make it more difficult to enter high-quality value chains. They require higher investments and services, resulting in higher production costs. For others (see for example Maertens and Swinnen, 2007, 2009), such standards have often been considered as a catalyst rather than as a barrier to trade, as they allow countries with poor standards, institutions and infrastructure to integrate high-value additions to value chains and in particular global value chains (GVCs).

Analysts mention concerns about the effects of the harmonisation in the East African Community (EAC) of regional quality standards for food staples with international standards in an effort to facilitate trade between Member States and ensure global markets remain accessible to EAC exporters. In addition to the cost of harmonisation for producers, Keyser (2012) mentions that setting standards at a high level could negatively affect both small producers and poor consumers, and disconnect them from the regional and domestic markets. Further, the harmonisation of standards requires the identification of a benchmark, which is a highly political issue, particularly in the presence of rents, but also because of fundamental differences in the approach to consumer safety (Harris et al., 2011; Engel and Jouanjean, 2015).

The complexity of the political dynamic is mentioned by Chambers et al. (2012), who provide the example of the harmonisation of axle load policy in the Economic Community of West African States (ECOWAS). The issue of overloading is particularly important for trans-border shipments due to the significant variation in the engineered road tolerances by country. As a consequence, overloading can damage roads and trucks, generate safety concerns, and increase travel time. Harmonised standards have been agreed at the regional level, but the implementation is facing various collective-action issues. For instance, the cost of compliance across actors and across countries is asymmetric because of different baselines of prior regulation based on historical legacies (mostly Francophone and Anglo-Saxon countries). Also, the first movers to implement policies and regulations are facing negative impacts when it is not clear that others will comply.

2.2 Regional trade facilitation and landlocked countries

The regional focus for trade facilitation is of particular importance for landlocked countries. There are 15 landlocked countries in Africa: Botswana, Burkina Faso, Burundi, Central African Republic, Chad, Ethiopia, Lesotho, Malawi, Mali, Niger, Rwanda, Swaziland, Uganda, Zambia, and Zimbabwe. According to Behar and Venables (2010), being landlocked increases trade costs by 50% and reduces trade volumes by 30-60%.

Weak integration and connectivity result in lost economic opportunities by limiting the free flow of goods, services, capital and persons in Africa (Korinek and Melatos, 2009; OECD, WTO and World Bank Group, 2014). According to Naudé (2009), African countries experience a 'proximity syndrome' resulting from long distances to markets, many landlocked countries, and suboptimal agglomeration patterns, which requires strengthening regional cooperation in infrastructural investment. Reducing economic distances between African countries requires improving regional transport infrastructure and trade facilitation.3

³ Different types of infrastructure (transportation, energy, communications, water and sanitation, hard vs soft) will have different impacts on growth, poverty, and private sector willingness to finance. They may take precedence at different stages of development (Brooks and Go, 2013). When opportunity costs are taken into account, we may find that the best infrastructure for poverty reduction could be through water and sanitation, trade facilitation or some other investment.

Regional integration can help alleviate the economic fragmentation caused by borders, and integrate landlocked countries. However, as we have already highlighted, much of this depends on complementary policies and investments aimed at reducing transport costs and eliminating others costs within and between country barriers to trade (Hallaert and Munro, 2009). Of particular importance for landlocked countries is transit regulation.

As emphasised by Maur (2008), when crossing several borders, procedures and costs have to be incurred many times if customs from the country of origin, transit and destination do not cooperate. For Arvis et al. (2010) the complexity of transit regulation along corridors results in a 'triple clearance' time. The inefficiency of transit is also an incentive for traders to adopt inefficient trade routes. This is the example provided by McTiernan (2006), who reports that due to transit fees in Benin and Togo, products are transported by ships between Lagos and Accra.

Overall, Yang and Gupta (2005) show that if landlocked countries did not gain much from regional integration it is because of remaining important non-tariff barriers to trade imposed by coastal countries, both administrative and physical. This results in excessively high costs of transit and could be considered as a double taxation at entry.

According to Maur (2008), regional cooperation is a way to 'internalise the international externalities characterising infrastructure investments required to improve cross-border trade and maximise their social benefits'. This is also mentioned by Longo and Sekkat (2004) who highlight that while infrastructure is a key factor for enhancing intraregional trade, which may ensure a regional take-off in Africa, such investments are very costly. Taking into consideration positive spillovers from infrastructure, investment in neighbouring countries and coordinating investments through regional agencies might therefore be the best way to avoid suboptimal levels of investments.

2.3 Dealing with the political economy of regional infrastructure

The subsections above discussed the relevance of deep regional integration (both hard and soft infrastructure), particularly for landlocked countries. The motivation and promotion of regional infrastructure is complex, however, and it involves multiple opposing interests. Regional infrastructure may lead to greater benefit or greater costs for some countries compared to others, for some modes of transport rather than others, for large formal traders rather than smaller informal traders, etc.

Whist political economy considerations are not at the core of this review of channels of impact, they do permeate all aspects of regional infrastructure planning, financing and implementation, and hence need to be addressed. Jouanjean and te Velde (2015) discuss a number of lessons on support for regional integration, with implications for supporting regional infrastructure.

First of all, it is important to recognise regional integration as a process. In the past, successful regional integration processes in the Association of Southeast Asian Nations (ASEAN) and MERCOSUR (also known as the Common Market of the South) regions were primarily driven by the private sector and occurred at very different speeds across issue areas, depending on where demand by private sector actors and coalitions of governments was greatest. Asian regionalism was driven by the need to develop supply chains and services required for diversification in order to participate in global production networks driven by US, EU and Japanese-led

firms. Hence, support for regions needs to go beyond a simple sequential model; e.g. moving from goods to services to capital and labour mobility may not be the most efficient. Support needs to be tailored to the needs. The planning and implementation of regional infrastructure may need to be prioritised, but this requires the support of regional institutions such as (regional and national) business associations.

Secondly, it is important to recognise the limits of regions as drivers of change. Regions such as ECOWAS and West African Economic and Monetary Union (UEMOA) may have developed frameworks for regional integration and negotiation with external partners, but there will be varying interests and limitations in terms of capacity, legitimacy, and costs and benefits in driving forward the full process. Sometimes it maybe be better to work bottom up at a more limited scale for e.g. complex regional infrastructure projects.

Thirdly, perhaps one should scale back levels of ambition. Regions can be highly ambitious in their integration plans, including for soft regional infrastructure. However, ambition in regionalisation often leads to missed deadlines and lack of confidence in the process. It may be more useful to take a more piecemeal approach focusing, for example, on mutual recognition rather than full harmonisation when it comes to regulatory issues, as this alone has taken three decades in the case of the EU (e.g. the EU services sector is still not fully liberalised and harmonised).

And finally, we need to consider the potential 'losers' of regional projects or reform. One study of nine agricultural liberalisation processes in East Africa found that reforms were most likely to succeed if those stakeholders capable of organising and blocking reforms accepted the redistribution of income and were willing to support the reforms. Compensation mechanisms can be a central feature; thus, rather than purely supporting pro-change constituencies, outsiders aiming to foster integration may also be advised to facilitate dialogues and partnerships among groups affected by reforms at the value chain, sector and national levels.

3 The impact of regional infrastructure for trade facilitation on trade and prices

The starting point of our review of the effects of RITF is to consider the impact on trade flows and prices. The impact of investments in RITF will occur through reducing trade costs (e.g. a decrease in transport and transaction costs, increase in transport reliability and more efficient border posts). This will change incentives of economic agents that will result in a range of direct and indirect impacts on poverty and growth. Impacts encompass changes in trade of goods and services and prices of inputs and outputs, which can then have further knock-on effects on employment and access to social services etc. This section examines the evidence on those main transmission channels between the provision of RITF, growth and poverty reduction.⁴

3.1 The impact on trade flows

The impact of hard infrastructure on trade flows

Researchers have examined whether and why African countries were underperforming in trade. Various parameters have been analysed, including economic policies, conflict and political tensions and infrastructure (Rodrik, 1998, Longo and Sekkat, 2004). The impact of hard infrastructure on the volume and performance of intra-African trade through its impact on transport costs was established some 20 years ago. For example, Amadji and Yeat (1995) examine the determinants of Africa's high transport costs and highlight that the failure to develop and maintain an efficient transport network in the region has had a major role in subduing African export performance. However, while the role of infrastructure in trade development has been extensively discussed in policyoriented descriptive analyses, it has been addressed much less in the evidencebased formal literature because it is hard to identify the precise effects of infrastructure (see Annex 1).

The gravity equation (where bilateral trade flows between pairs of countries are explained by economic size and other variables in both countries) has become the standard tool for analysing bilateral trade flows. Such a method allows estimation of the effect of various factors on trade. Whilst the analysis of trade costs has

⁴ We acknowledge that there may also be effects on the macroeconomic implications of infrastructure but which we do not discuss in detail in this review. Note that these can be different for the same infrastructure investment, depending on the financing modality and the country context. For a small economy, a single infrastructure project that expands export potential (a large hydroelectric dam, say, or development of hydrocarbon deposits) can have significant macroeconomic impact. Given financing and possibly foreign exchange constraints, whether a project can be financed by foreign, domestic private, or domestic public sources will influence the macroeconomic impacts; see Brooks and Zhai (2008), IMF (2014), Group of Twenty (2013).

proven very appealing, the analytical basis for including trade costs in gravity equations is less clear. As a consequence, most authors⁵ analysed bilateral trade without explicitly modelling transport costs. As a major exception, Limão and Venables (2001) incorporated both transport infrastructure and transport costs into their model. They show that the inclusion of infrastructure indicators in standard gravity models changes the predicted values of trade considerably. Since then, many others have followed their approach in trying to specifically identify the effect of transport infrastructure. De (2004, 2005, 2006) provides further details of the studies that have dealt with the theoretical and empirical causal relationship between trade flows and trade costs.

Limão and Venables (2001) measure 'hard' infrastructure through a composite index of roads, rail and telephone lines. They show that it explains 50% of the total variation in the costs of transporting containers across destinations, whereas pure distance contributed only 10% of that variation. In particular, they estimate that an improvement from the 75th percentile to the median for their infrastructure index would be equivalent to a distance reduction of 3,466 km by sea or 419 km overland. Landlocked countries incur additional costs to overland distance because of border delays, higher insurance costs and charges by transit countries (Arvis at al, 2010). Finally, they find that a drop of 10% in transport costs for landlocked African countries could increase the volume of their international trade by as much as 25%.

Using a composite index for hard infrastructure as used by Limão and Venables (2001), Carrère (2013) examines trade performance of both the West African Economic and Monetary Union (WAEMU) and the Central African Economic and Monetary Community (CEMAC) over the period 1995-2010. She simulates the harmonisation of the infrastructure index among trade partners and sets it at the mean across partners. According to her model, such harmonisation would result in large increases in exports.

Also looking at seven WAEMU countries over the period 1996-1998, Coulibaly and Fontagné (2006) estimate the elasticity of trade performance to infrastructure endowments. This allows them to compute the extra trade flows created by a change in infrastructure endowment. In particular, they find that trade flows in this region would be 3.2 times higher if 100% of interstate roads were paved.

Testing the impact of insufficient infrastructure, mismanagement of economic policies, and internal political tensions on intra-African trade as well as on African trade with developed economies, Longo and Sekkat (2004) find that the availability of infrastructure is a crucial determinant of intra-African trade. This is supported by surveys amongst exporters who cite infrastructure as the most important bottleneck for trade in Africa. In particular, their analysis highlights the importance of focusing on the development of regional infrastructure.

Several studies (De, 2004) highlight that poor port infrastructure undermines the potential integration of African countries in international trade. For many of them, the in-country barriers created by poor infrastructure might be an even more important barrier. For instance, looking at African infrastructure development, Buys et al. (2010) estimate the returns of a pan-African programme of road infrastructure development on intercity corridors. Estimating the model parameters according to various econometric analyses, they simulate the effect of upgrading the road network, as well as the cost of such upgrading to a functional level. They find that the project would generate an additional \$254 billion of trade flows over 15 years for a cost of about \$32 billion, including initial investment and

⁵ With the exception of Bergstrand (1985, 1989), Deardorff (1998), Limão and Venables (2001), Fink et al. (2002), Clark, Dollar and Micco (2004), and Redding and Venables (2004).

maintenance cost. Abe and Wilson (2009) compute the cost and benefits of the reduction of transport cost resulting from investments in East Asian port infrastructure. They find that such investment would generate \$8 million of consumer surplus per year for a cost of less than \$3 million per year.

Bouët et al. (2008) examine the impact of different types of infrastructure on trade, highlighting the complementarity among several types of infrastructure. They show that poor transport and communication infrastructure accounts for most of Africa's underperformance in trade. Moreover, investments in infrastructure are likely to have a much greater impact if transport infrastructure development and communication infrastructure development are undertaken jointly. Their key finding is that hard infrastructure accounts for nearly half of the transport cost penalty borne by intra-sub-Saharan African trade, explaining the underperformance of the continent's trade.

There is also relevant evidence from South Asia. Asian Development Bank (2009) finds that reforms improving the quality of transport and information technology (IT) infrastructure have a strong impact on trade flows. A 1% improvement in infrastructure leads to a 5% increase in trade flows. Shepherd and Wilson (2008) suggest that improving port facilities in the Southeast Asia region could expand trade by up to 7.5% (\$22 billion). Wilson et al. (2003) find that improvements in port efficiency have a large effect on trade. Half of the 21% (\$254 billion) increase in intra-APEC (Asia-Pacific Economic Cooperation) trade obtained through trade facilitation reforms comes from improved port efficiency in the region.

Most analyses are done for trade in goods. But there is clear potential for infrastructure to support services trade as well. The African Economic Outlook reports that 'regional negotiations on services tend to move more slowly and with lower ambition than for trade in goods' (AfDB, OECD, UNDP, 2014, p. 83). In terms of trade in services, the discussion about RITF usually focuses on improved information and communication technology (ICT) infrastructure and greater access to IT. However, transport costs and delays at the border are still important, as trade in services might require efficient cross-border movement of people. The regional integration of the African financial and business services sectors is already strong, thanks to increasing use of IT. Other promising opportunities could be seized in developing regional value chains of services in Africa, for instance in the tourism sector (AfDB/OECD/UNDP, 2014).

The complementarity between hard and soft infrastructure to increase trade flows

Both hard and soft infrastructure facilitate trade and lower the cost of trading. Hard and soft infrastructure measures also tend to be complementary as they reinforce their mutual positive impact on increasing trade and its profitability. In particular, soft infrastructure is crucial to ensure an equitable distribution of the benefits. Various papers have examined the impact of reducing trade costs through more efficient soft infrastructure for trade facilitation.

Mbekeani (2010) describes the complementarity between hard and soft infrastructure to achieve trade performance. On the one hand, even if physical infrastructure is functional, defective regulatory and administrative practices impeding the quality of transport services can deter trade. On the other hand, no structural reforms of the policy and institutional environment for trade and transport can substitute for the minimal transport and communications infrastructure required to connect markets.

Using an augmented gravity model, Iwanow and Kirkpatrick (2009) show that reforms to improve the quality of the regulatory environment and the transport and

communications infrastructure are key determinants of export performance in Africa. Using a sample of sub-Saharan African countries, they highlight the specific role of customs procedures (trade facilitation) for intra-African trade. Cudmore and Whalley (2003) go even further. In their model, without an increase in the efficiency of administrative procedures and customs clearance, the effect of tariff liberalisation will be to lower tariff revenues and increase queuing costs, the latter defined as an increase in resource use. For instance, perishable commodities can be adversely affected by queuing at the border. Using a computable general equilibrium model taking into consideration such increase in resource use, and testing it on data from Russia, they show that trade liberalisation without enhanced cross-border trade efficiency can negatively affect welfare.

Freund and Rocha (2011) study the shipment of a standard 40-foot container from a large sample of African countries. They report inland transit to be the most important component of domestic delays (documentation, transit time, port handling and customs clearance). Accounting for the quality of roads, they also conclude that inefficient inland transit is more an issue of soft infrastructure (border delays and/or efficiency of security checkpoints) than hard infrastructure (the quality of the road network).

Portugal-Perez and Wilson (2012) find that trade facilitation reforms based on investment in both physical infrastructure and regulatory reform strengthen the business environment and improve developing country export performance. Using four aggregate indicators of soft and hard infrastructure, their analysis highlights the complementarity between soft and hard components. They use their results to simulate the impacts of improving both the hard and the soft infrastructure for trade facilitation, setting the levels of the worst-off countries halfway to the levels of the best performers. For example, improving Chad's physical infrastructure quality to half the level of South Africa's would lead to an increase in exports equivalent to a 24% reduction in tariffs faced by Chadian's exporters in their partner countries. Regarding soft infrastructure, defined here as border and transport efficiency, improving the quality of infrastructure in Malawi halfway to the level of that in Mauritius would lead to an increase in exports equivalent to a reduction in tariffs of 10% of its partner countries.

A reduction in trade costs through trade facilitation is not only relevant for increasing the volume of exports, but also for promoting export diversification and economic transformation. Dennis and Shepherd (2011) find that 10% reductions in international transport costs and domestic exporting costs are associated with export diversification gains of 4% and 3%, respectively, in a sample of 118 developing countries. Trade facilitation has particularly strong effects on diversification in poorer countries.

The impact of regional infrastructure on informal trade

Evidence on the effect of increased trade facilitation on informal traders is scarce. The decrease in time and costs (official red tape as well as rent-seeking officials and bribery) to cross the border, as well as the increase in formal trade flows, can affect informal traders in many ways according to their behaviour at the border.

The complexity and cost of formal trade is one reason for informal trade in the first place (Brenton and Isik, 2012), hence reducing the costs of trading will necessarily affect informal traders. But it is not a priori clear whether the outcome of a reduction in trade cost will be positive or negative for informal traders. Descriptive evidence on the determinants of informal cross-border trade in Africa seems to show that RITF, in particular in reducing red tape, should result in more positive rather than negative impacts (see Brenton and Isik, 2012, for a detailed report on

Africa). Rippel (2012) shows that trade facilitation measures that improve hard and soft trade infrastructure are essential in supporting small-scale informal traders in the Great Lakes region in Central Africa, as well as in improving access to price information and the regulatory framework.

Among the various factors contributing to trade costs, Lesser and Moisé-Leeman (2009) show that inefficient border management, compliance requirements and corruption are factors contributing to transaction and trade costs. Simplifying and reducing regulations and documentation at the border could be a first step toward moving informal traders to more organised and formal activities. This in turn could facilitate access to various financial and public services.

Informal traders also face serious security issues when crossing borders: beatings, insults and stripping are very common, and victims do not usually report them. Yoshino et al. (2012) report increasing feelings of insecurity among Ugandan traders in South Sudan, who in 2009 and 2010 were facing more harassment and acts of violence against them. Reforming borders and transport infrastructure would therefore be an efficient way to improve security for informal traders.

Women are even more subject to violence, threats and sexual harassment. Brenton et al. (2012), in a study of cross-border trade between the Democratic Republic of Congo and Burundi, Rwanda and Uganda, conclude that women experience high levels of harassment and physical violence when crossing the border. Brenton et al. (2013) emphasise that helping women to realise their potential for trading in Africa requires addressing these specific risks. Also, they mention that simplifying border procedures to save time and mobility would help in supporting women's participation in formal trade, as they are also often constrained by household responsibilities.

3.2 The impact on market integration, evidence from market prices

This subsection reviews evidence on the impact of RITF on prices and market integration. If barriers are high in the absence of quality regional infrastructure, it will be possible for prices to evolve differently as markets are not integrated.

The existence of food-surplus regions located next to food-deficit regions (e.g. in East Africa) suggests a lack of integration. While there is evidence of an increase in intra-African trade, especially in manufactured goods, trade in agricultural goods still remains below its potential (OECD, 2014). Countries in sub-Saharan Africa appear to be natural partners for trade in food staples, as different sub-regions have comparative advantages in complementary food staples, with diverse ecosystems yielding a wide range of produce. However, surplus food-producing zones in Africa lie across the border from the markets they serve, with political borders often separating surplus food production zones from the deficit markets that they would normally serve (Haggblade, 2013). This points to the need to reinforce efforts in regional integration in order to seize the opportunities that an increased flow of agricultural products could open for food security and resilience, and the need to development of intra-African services to connect the region with global value chains.

Jouanjean (2013) provides an overview of the literature looking at infrastructure, agricultural trade and market integration. She highlights that while investments in hard infrastructure are necessary to ensure the success of agricultural market integration, sound logistics services and a transparent and reliable legal and regulatory framework for transport markets, as well as standards and sanitary and

phytosanitary measures are also important. This will have an effective impact, in terms of increased trade opportunities in agricultural products, on both producers (by allowing their participation in the market) and consumers (to pass through price changes up to them).

Spatial analysis (Dorosh et al. 2010, Haggblade and Nyembe, 2008; Haggblade, 2013; Haggblade et al. 2012) and the 'Law of One Price' (LOP) (Aker et al., 2014; Brenton et al., 2013; Versailles, 2012) methodologies allow for an indirect measurement of barriers to trade. They provide not only evidence of forgone arbitrage (the ability to exploit differences in prices) as a consequence of borders but also put forward the importance of in-country informal barriers to trade (e.g. road blocks).

The degree of market integration is usually measured by examining prices in different locations and the extent to which prices in different locations move together. Several research papers (e.g. Aker et al. 2014; Brenton et al., 2013; Versailles, 2012) have tried to assess the level of integration and the impact of infrastructure and borders by looking at the price of food staples between and within neighbouring countries in Africa. To do so, they use deviations from LOP, a methodology developed by Engel and Rogers (1996) and augmented by Broda and Weinstein (2008) in order to estimate a distance equivalent to the economic impact of crossing borders. The rationale behind LOP is that when markets are perfectly integrated and final goods perfectly homogenous, economic agents will arbitrage until goods prices are equalised (until the LOP holds, Brenton et al., 2013).

According to LOP, when markets are fully integrated, commodity prices converted to a common currency should be equal across locations. However, the movement of goods is not free, and spatial arbitrage can be impeded by trade and transaction costs as well as market imperfection, preventing perfect market integration. This methodology allows the capture of between-country as well as in-country barriers to trade, for instance the effect of crossing a border but also the importance of various infrastructure for market integration.

Versailles (2012) and Brenton et al. (2013) assess the importance of trade barriers both within and between countries. Versailles (2012) demonstrates the importance of borders and distance for market integration both between and within countries on a sample of 39 cities in Eastern Africa between 2003 and 2008. The results highlight a significant border effect, moving prices between 13% and 20% away from the LOP benchmark. However, disaggregating the results according to product types, including food staples (rice, maize flour, maize grains, potatoes, sweet potatoes), fruits and vegetables (oranges, onions, cabbages, ripe bananas, cooking bananas, tomatoes and carrots) and other food items (sugar, salt, eggs, margarine, preserved fish, milk), they find that, relative to other categories, distance drives less of a wedge between prices in different locations for food staples. This could be an indication that trade in food staples is more integrated. Evidence on the importance of informal trade in food staples supports those findings (Lesser and Moisé-Leeman, 2009), with local producers selling on both sides of the border.

Brenton et al. (2013) estimate the effects of distance and border-crossing impediments in Central and Eastern Africa for three food staples: maize, rice, and sorghum. They find that, on average, crossing a border has the same effect on relative prices as travelling 518 hours between towns of the same country.

Araujo-Bonjean and Brunelin (2013) estimate the effects of distance and of border impediments on the standard deviation of relative prices in 14 West African countries for three to five staple foods between 2007 and 2011. They highlighted a

decrease in relative price differences across countries, which reflects a reduction in trade costs. They see this result as a positive consequence of improved communication infrastructure and greater efficiency of the transport sector.

Decreasing distance and trade costs by improving infrastructure provision between trading partners at the regional level should translate into a reduction in price differences. However, it is worth noting that the impact of decreasing the costs of trading may not directly transfer to prices. The level of this transmission will depend on the level of the price pass-through: the extent to which the reduction in trade costs will be transmitted to consumers rather than being captured by intermediaries. Low pass-through occurs when there is poor domestic infrastructure and high in-country transport costs, or disabling market structures which lead to lack of competition and high markups by intermediaries (Calì et al., 2014). Using data on Ethiopia and Nigeria, Atkin and Donaldson (2014) show that price passthrough decreases with the distance to the goods' port of entry. Nicita (2009) finds that this same effect explained why the impact of the North American Free Trade Agreement (NAFTA) on households' welfare in Mexico was more pronounced in regions bordering the US. Calì (2014) provides evidence of a greater reduction in prices of traded goods in districts that hosted or were close to a major border post following trade liberalisation in Uganda in the 1990s. Finally, Calì et al. (2014) analysing the potential for regional integration between Bangladesh, India and Nepal, report similar evidence of incomplete price transmission to areas further away from border regions.

3.3 Conclusions

A key building block in analysing regional infrastructure is identifying the effects on trade flows and market integration measured by the extent to which prices on either side of the border are equalised. In both instances, the literature points to the importance of regional infrastructure.

First, the literature suggests that hard infrastructure lowers trade costs and that lower trade costs raise trade flows. For example, one study suggests that hard infrastructure accounts for nearly half of the transport cost, highlighting the negative impacts of poor transport and communication infrastructure. Further, the expectation of the authors analysing this topic is that whilst the livelihoods of some informal traders depend on trade restrictions and high trade costs, most, including women, would benefit from trade facilitation.

Second, good quality regional infrastructure will make borders thinner and thus easier to cross. Without any regional infrastructure, prices can evolve very differently in locations either side of the border. With good infrastructure, and seamless borders, we can expect prices to evolve similarly, meaning that traders are able to fully exploit the potential differences in surplus and deficit and therefore difference in prices in different locations (spatial arbitrage). The evidence suggests that there is indeed a significant border effect, with differences in price levels of around 13-20%, indicating opportunities for better regional infrastructure. Price differences for food staples are lower, presumably because these are traded informally. There is scope for much better market integration, with research suggesting that more efficient border posts allow for faster price transmission and hence better arbitrage.

4 The impact of regional infrastructure for trade facilitation on poverty

This section examines the impact of RITF on poverty by discussing the impact on (household level) welfare (Section 4.1), food security (Section 4.2), livelihood strategies (Section 4.3) and health and education (Section 4.4). Section 5 discusses the effects on economic growth at firm and country level.

4.1 Infrastructure and (household) welfare

The provision of infrastructure services to the poor is crucial in order to ensure their connectivity with economic activities and additional productive opportunities. Isolation from economic centres, on the other hand, hampers the development of local markets. Transportation and transaction costs, and in particular the link between market access and poverty, are at the core of the isolation problem (Platteau, 1996).

The micro-level literature provides clear evidence that connectivity through transport infrastructure helps to decrease poverty and increase welfare in sub-Saharan Africa. However, it should be noted that much of the evidence focuses on national or sub-national infrastructure and not cross-border infrastructure. Using household surveys, Dercon et al. (2009), drawing from previous research (Dercon 2004; 2006) examine the impact of roads on poverty reduction in Ethiopia. They find that access to all-weather roads or quality roads – defined as roads capable of supporting (1) truck traffic and therefore trade, and (2) bus traffic, therefore facilitating the movement of people in all seasons – increases consumption growth by 16.3% and reduces the incidence of poverty by 6.9%.

Also on Ethiopia, Chamberlin et al. (2007) show isolation leads to a reduction in per capita consumption. Stifel et al. (2012) show that cutting transport costs by \$50 per metric tonne results in benefits of around 35% of total consumption for the most remote households (10% for the average household) in Ethiopia.

In Madagascar, Jacoby and Minten (2009) estimate the willingness-to-pay for a reduction in transport costs. Estimating the transport price per kilogram of porter services and of ox-cart transport, they found that by making the most remote villages as accessible as the least, which was equivalent to a reduction in transport cost of \$75 per ton, would nearly double the annual income of households. A third of this effect is due to the decrease in prices of imported consumption goods. Stifel and Minten (2008) find similar results in Madagascar.

Positive evidence on the link between infrastructure and welfare is also found in Asia. In Indonesia, Kwon (2001) shows that a 1% increase in road investments is associated with a 0.3% decrease in the incidence of poverty. Jalan and Ravallion (2002) find that road density is one of the significant determinants of household-

level prospects of escaping poverty in rural China: for every 1% increase in the number of kilometres of roads per capita in poor regions in China, household consumption rises by 0.08%. Dillon et al. (2011) provide evidence about the welfare-improving effects of rural investments in roads on households in Nepal, measured by land values, consumption growth, poverty reduction or agricultural income growth.

An increasing number of evaluations using household surveys and various indicators provide evidence on the factors influencing the extent of the benefits of investing in roads, including the size and nature of the road. Among others, Gannon and Liu (1997), Escobal and Ponce (2004), Lokshin and Yemtsov (2005), Dercon (2006) and Khandker et al. (2009) provide evidence about the positive welfare effect of rural roads. By reducing transport costs and prices, rural roads may allow farmers in remote and often poor rural areas to obtain higher prices for their output and/or reduce the prices of inputs and consumer goods.

Stifel et al. (2012) highlight the relatively high rates of return on investments in rural feeder roads and their relevance as a tool to reduce poverty 'even in unfavourable settings where (a) poor agricultural households have relatively low agricultural productivity/commercial surplus, (b) off-farm income earning opportunities are negligible, and (c) the provision of motorised transport services is not guaranteed' (Stifel et al., 2012, p.8).

A further question is whether infrastructure investments should focus on a 'transport corridor' development strategy or on a 'rural feeder road' strategy. The nascent literature suggests that investments in corridors may not have large effects on smallholders and agricultural production. Rather, as reported by Byers and Rampa (2013) in a study of corridors in Tanzania and Mozambique, these routes are likely to be 'corridors of power' that benefit relatively few rather than 'corridors of plenty', with 90% of smallholders likely to be left out of value chains. Byers and Rampa (2013) conclude that additional opportunities and support should be provided to smallholders to help them to benefit from corridors by linking those large infrastructure developments with the upgrading of feeder roads and storage facilities.

4.2 Infrastructure, shocks and food security

By reducing trade costs and connecting surplus and deficits areas, RITF can enhance economic resilience and reduce food insecurity through greater market integration (Brenton et al., 2014). Byerlee et al. (2005) discuss how to manage food price risks and instability in the context of market liberalisation in developing countries. They underline the potential of combining regional trade with good transport infrastructure to reduce price instability.

Shocks are not systematically transmitted to 'remote' stakeholders along the value chain. Improving connectivity through 'big' regional infrastructure such as large transport corridors may not be sufficient to fully achieve market integration between international and local markets. The transmission of price shocks will depend on the connectivity of the local economy with regional and international markets. While isolation can prevent economies from suffering from an ""imported" instability', Galtier (2013) suggests it makes them more sensitive to 'natural' instability stemming from harvest concentration and sensitivity to natural hazards such as rainfall, disease and attacks by pests. To ensure food security and resilience, trade-facilitating infrastructure projects have to be complemented by measures that create incentives to participate in commercial regional food markets, mainly by removing 'behind-the-border' constraints.

Investments in infrastructure may also have potentially negative effects, at least in the short run, for food security. For instance, in Burkina Faso, Ruijs et al. (2004) find that the construction of a road between two cities can have unintended negative spillovers on competitiveness of farmers and traders in other regions, with an effect similar to the diversion effect analysed in regional integration theory. They highlight the need to address transaction costs through improvements to market institutions, along with investment in road infrastructure, as only the reduction in transaction costs will benefit both consumers and farmers simultaneously.

High transaction costs are a form of natural protection to local producers of importcompeting products (Winters et al., 2004). Whilst this can be vital for local producers to survive, it also acts as a source of inefficiency by preventing more productive activities from taking place. In particular, the expected stabilising impact of regional trade on prices can be realised only if traders face the right incentives to seize the opportunities developed by regional integration (Jayne et al., 2010). Here again, it appears that adequate provision of both hard and soft infrastructure has a role to play in creating the appropriate framework by removing transaction costs that otherwise impede the stabilising role of increased trade.

Jayne et al. (2010) investigate grain marketing policy in Eastern and Southern Africa to ensure food security in the region. They emphasise the role of high costs of transport in the region in causing food price instability. Poor transport and communication infrastructure reinforce price gaps and fluctuations between export and import prices. Customs clearance procedures within the African continent are generally cumbersome (Brenton and Isik, 2012; Food and Agriculture Organization of the United Nations (FAO), 2011). By increasing transaction costs to traders, these regulatory barriers negatively affect prices for producers and prices for consumers, by lowering the former and increasing the latter.

Political economy analysis of food staples trade in sub-Saharan Africa have emphasised the detrimental effect of the discretionary use of trade policies, particularly pronounced during the 2007-2009 spikes in global food prices (Staatz et al. 2008; Bryan, 2013). Many countries implemented counter-cyclical policies, including temporary export bans, which resulted in high levels of price volatility. Such policy volatility undermined trust between farmers and producers, private sector traders and the government (Dorosh et al., 2010). In East Africa, numerous countries imposed export bans on maize and other food staple crops. Facilitating and stabilising the policy and regulatory processes for regional trade can reduce price instability by making the trade environment more sustainable (Jayne et al., 2010).

According to Haggblade et al. (2008), Kenya provides the centre of gravity for the East African market shed. It not only absorbs surplus maize production from Kenya's own central highlands but also attracts formally and informally traded maize from Uganda and northern Tanzania. Ariga and Jayne (2010) analyse domestic and trade policy in Kenya and highlight that the underperformance of the maize value chain and food price instability result from the existence of transaction and marketing costs. They recommend investment in both hard and soft infrastructure and 'solid regulatory frameworks to support the development of transport, communication and [...] services' to ensure well-functioning markets.

4.3 Infrastructure, market participation and livelihood strategies

A further important effect of (regional) infrastructure is that it allows households to participate in markets that would otherwise not be accessible, which allows for a much greater scope of livelihood strategies.

Market participation

Remoteness is a barrier to market participation, and increased connectivity through the provision of infrastructure can help to address this. High transaction costs decrease incentives to participate in commercial food markets (Poulton et al., 2006; Renkow et al., 2004). A range of studies demonstrate that remoteness and the related high transaction and transport costs are a critical barrier to participating in commercial farming. According to Minot (1998), physical isolation of rural, lowincome households in Rwanda and the consequent isolation from the cash economy prevented them from gaining from the trade liberalisation reforms in the early 1980s.

Barrett and Swallow (2006) develop a theory of poverty traps and conclude that access to infrastructure enhances active engagement in markets. Analysing rural poverty in Madagascar, Stifel et al. (2003) and Minten and Barrett (2008) demonstrate that isolation negatively affects market participation, exports and food security. Also for Madagascar, Cadot et al. (2006) estimate the costs of exiting the subsistence sector and taking part in markets. They identify isolation as the main contributor to the costs of entry into agricultural markets.

Regional infrastructure on its own would not be sufficient to secure food security, and complementary measures are important. For instance, most smallholders would generally still lack specific endowments such as storage facilities or access to credit, making them unable to cope with remaining price fluctuations. Byers and Rampa (2013) conclude that benefits of large infrastructure developments between Mozambique and Tanzania would accrue to smallholders only by combining infrastructure development with the upgrading of feeder roads and storage facilities. Minten et al. (2007, 2009) show that, in Madagascar, households have been able to seize new opportunities for more profitable market-oriented production, thanks to improvements in both physical and institutional infrastructure.

Livelihood strategies: jobs, labour mobility and migration

Other direct impacts from RITF on poverty are effects on the creation and displacement of jobs and on economic activity. On the one hand, construction of new infrastructure can reduce poverty by creating employment and new job opportunities (Jacobs and Greaves, 2003). The construction and maintenance of transport infrastructure are labour-intensive operations and can provide job opportunities to people living nearby. Focusing on the Middle East and North Africa region, Ianchovichina et al. (2013) estimate that over the next decade, infrastructure projects could generate about 2 million in direct jobs annually.

On the other hand, deepening regional integration through the provision of tradefacilitating infrastructure, both hard and soft, can result in destroying or displacing some specific activities taking place at the border as a response to delays and long truck queues. Therefore, trade facilitation initiatives are likely to disrupt some livelihood strategies at the border. The main response to the inherent difficulties of cross-border trade in Africa is incentives to trade informally (Little, 2010). Unofficial cross-border trade can be subject to positive and negative outcomes of changes to the trade and business environment relating to investment in RITF. It is important to take into consideration all of these impacts, when assessing the poverty reduction benefits from trade facilitation, as poor people and women in particular are the main actors in informal trade across African borders (Brenton et al., 2013).

Although mobility and transport are closely linked, there is no theoretical or empirical consensus on the direction of the impact: 'Whether easier or cheaper transportation [...] promotes or diminishes outward movement is not obvious.

Evolution of the transport system can [...] either [discourage] or [promote] out-migration' (Lucas, 2000).

On the one hand, regional infrastructure may promote migration, as transport improvements help reduce distance to reach more profitable income-generating opportunities. The decrease in transportation cost may reduce migrants' informational cost about labour opportunities (transaction cost), as well as the financial and psychological costs of migration. On the other hand, better transport may provide incentives to stay by improving living conditions in the region of origin, for instance by providing more livelihood opportunities, which reduces the incentive to migrate. In other words, better integration within and between countries will influence the opportunity cost of migrating - the difference between the potential income of those staying in the region of origin, and the income of those who decide to migrate. The change in opportunity cost will depend on many other factors, and it is therefore difficult to know whether the net result will be to increase or decrease migration. However, in either case, the result seems to be more choices of income-generating opportunities.

Very few and relatively dated empirical studies assess the impact of access to transport infrastructure on migration in developing countries, and their results are mixed. Udall (1981) fails to conclude that road improvements reduce migration in Colombia. By contrast, Hugo (1981) shows that improved transport in Indonesia increased population mobility. Hugo (1982) has 'no doubt that the extension of roads [...] has led to greatly increased spatial mobility for a wide spectrum of Indonesia's rural dwellers' (Hugo, 1982, p. 73). Findley (1981) concludes that the expansion of rural road networks in developing countries tends to increase migration in the short run, but the effect is reversed in the long run as commuting and local development improve.

Recent econometric studies include Fafchamps and Shilpi (2009) on Nepal, and Castaing Gachassin (2013) on Tanzania. Both studies show access to better roads generally reduces migration. However, Castaing Gachassin (2013) shows that the results vary according to the initial economic endowment of the potential migrants' communities. For those communities less well endowed, better transport fails to generate new income opportunities locally, resulting in an increase in migration.

4.4 Infrastructure and access to health and education

We have not been able to find much evidence regarding the effects of infrastructure on cross-border access to health and education. We are aware of various initiatives looking at cross-border education, but no publication is yet available on the topic. The research is based on the idea that arbitrary frontiers in Africa have separated communities sharing similar culture and language. Therefore, communities at the border might have an incentive to send their children to school on the other side of the frontier. Access to health services might be affected the same way, as the nearest health facility might be on the other side of the border.

Improving regional transport infrastructure should eventually lead to more mobility. A conventional idea related to opening or strengthening transport corridors is that they help spread health risks by increasing contacts between people. The literature particularly looked at the potential role of transport infrastructure in the spread of HIV/AIDS in Africa and investigated the risk profile of mobile populations in this context. Studies generally share the view that mobile people are more likely to be HIV-infected but also to undertake HIV-related risky behaviour.

In Nigeria, Orubuloye et al. (1993) show long-distance truck drivers are more likely to engage in multiple sexual partnerships. In East Africa, Ferguson and Morris (2007) analyse truck drivers and their assistants' rates of reported sexually transmitted infections. Despite high reported rates, many continue to exhibit highrisk sexual attitudes. Adaji and Ajuwon (2004) focus on naval personnel and also demonstrate that mobility is a significant factor in risky behaviours. Personnel posted abroad have more sexual partners, are more likely to use female sex workers, and are less likely to use condoms when they do.

Going back to infrastructure and trade, two recent studies can be used to highlight the negative health impacts of regional integration. Using Demographic and Health Surveys collected in Cameroon, Ethiopia, Ghana, Kenya, Malawi and Zimbabwe, Djemaï (2009) shows that the individual risk of HIV infection increases with proximity to a road and that the effect is sensitive to use of the road. Oster (2012) analyses the relationship between trade openness and HIV prevalence and finds level of trade increases prevalence.

Finally, this negative direct impact could be exacerbated in cases where tradefacilitating infrastructure would lead to migration. For instance, Meekers (2000) reports similar results for temporary labour migrants living far from home, in the case of mine workers in South Africa.

4.5 Conclusions

RITF can affect poverty through a number of household-level effects (welfare, food security, livelihood strategies, migration, and health and education). The microlevel literature provides clear evidence that connectivity through transport infrastructure helps to decrease poverty and increase welfare in sub-Saharan Africa and elsewhere. Rural roads may allow farmers in remote and often poor rural areas to obtain higher prices for their output and/or reduce the prices of their inputs and consumer goods. However, it should be noted that much of the evidence focuses on national or sub-national infrastructure and not cross-border infrastructure directly. When it comes to securing the benefits of regional corridors for SMEs, some emerging findings suggest that regional infrastructure needs to be combined with the upgrading of feeder roads, storage facilities and access to credit.

By reducing trade costs and connecting surplus and deficit areas, RITF can enhance economic resilience, reduce food insecurity through greater market integration, and increase the scope for livelihood strategies. More stable policy and regulatory processes for regional trade can reduce price instability, whilst export bans increase instability and reduce trust between traders, producers, households and governments. Regional infrastructure also allows households to participate in markets that would otherwise not be accessible and, by doing so, allows for much greater scope of livelihood strategies.

Unfortunately, very few studies examine the effects on migration. On the one hand, regional infrastructure promotes migration, as transport improvements help reduce the distance to reach more profitable income-generating opportunities. On the other hand, better transport may provide incentives to stay by improving living conditions in the region of origin. Regional infrastructure may increase the spread of communicable diseases through increased mobility, although it could also be part of the solution by reducing the exposure of households to such risks from contact with informal workers who are dependent on barriers around borders.

5 The impact of regional infrastructure for trade facilitation on growth

The links between infrastructure and economic growth are multiple and complex. They affect production and consumption directly in the short run, but also indirectly in the longer run through changes in the strategy and investment decisions of economic actors. Although there might be losers from such changes in dynamics, it is usually expected that the overall effect would be the creation of additional economic opportunities and employment.

Most of the studies on macroeconomic impacts suggest that infrastructure does contribute to increases in output, income and employment growth, but also to the quality of life (see De and Ghosh, 2005, for an overview). Using panel data covering more than 100 countries over the period 1960-2005, Calderón and Servén (2010) estimate the impact of infrastructure on growth and inequality. Focusing on African countries, they show infrastructure development has a robust and significant positive impact on growth in the long run. However, they report that the impact in Africa has been more modest than expected compared with other developing regions, given 'a lack of progress on the quality of infrastructure services over the sample period'.

This section reviews the evidence regarding the impact of a reduction in trade and transaction costs, through regional infrastructure, on the location of economic activities (Section 5.1), on FDI flows (Section 5.2) and on firm-level productivity (Section 5.3).

5.1 Infrastructure, growth and the location of the economic activity

Growth theory analyses the determinants and mechanisms of economic growth and the prospects of convergence or divergence of economies. Endogenous growth theories identify four key growth factors: returns to scale, research (or innovation), knowledge (or human capital) and strategic government intervention. Economic geography examines the sources and mechanisms of the agglomeration of economic activities. In other words, growth theories look at the issue of the creation of new firms or new industries, and economic geography theories raise the question of the location of these new activities.

According to new economic geography, increasing returns to scale and the existence of externalities are the basis of both processes of spatial agglomeration of economic activities and dynamic accumulation of growth factors. In the early 1990s, various authors emphasised the conceptual and empirical analogies between endogenous growth and new economic geography (Engelmann and Walz, 1995; Kubo, 1995; Martin and Ottaviano, 1996, 1999; Pavilos and Wang, 1996; Walz,

1996). The objective was to integrate geographic factors (transport costs, agglomeration economies, mobility and immobility of factors or goods) and economic determinants of growth.

The introduction of spatial factors into the mechanisms of endogenous growth can be understood as follows. As the concentration of economic activities promotes economic growth, all the sources of agglomerations also help to explain and determine growth. Agglomeration is the result of a balance between

- **centrifugal forces** that incentivise the dispersion of activities across space, including low transport costs that allow the spread of production tasks, tariffs, non-trade barriers, competition over immobile factors (in particular the cost of land), pollution, congestion and other types of negative externalities
- **centripetal forces** leading to the consolidation of activities in space. Such forces include the existence of economies of scale and pooling of labour forces, technology transfer, grouping of buyers and sellers (inputs, final goods), also termed the 'linkage effects' related to other positive externalities. Spatial proximity provides a multitude of benefits in the form of 'economies of agglomeration', which is the benefit that firms obtain by locating near each other: lower transaction costs, knowledge spillovers and the effects of market size (companies locate where they find customers, labour, services and infrastructure required).

These forces result from the combination of spatial mechanisms related to the spatial organisation of activities, as well as classic economic mechanisms affecting production and consumption decisions of agents.

The choice of the location of an economic activity depends on the benefits of dispersion compared with the benefits of proximity. The balance between centripetal and centrifugal forces affects the creation of agglomeration, which therefore relies on geographic parameters (such as transport costs, the mobility of economic agents, the tradability of inputs or outputs, the importance of the economies of agglomeration) and on economic parameters (such as the complementarity between economic activities).

For instance, there are opposing effects from competition and market size. Dispersion mitigates the level of competition between firms producing the same goods, but agglomeration and the increase in the consumer base allow for the viability of different varieties of the same product (Gabszewicz and Thisse, 1986; Fujita and Krugman, 1995).

Krugman (1991, 1995) examines the role of geographical and locational factors in driving regional inequality in the context of trade. An increase in trade can potentially facilitate economic catch-up. But facilitating trade can involve externalities, and a reinforcement of initial advantages (economies of agglomeration) or disadvantages (movement of production factors towards the specific countries presenting economies of agglomeration). Therefore, a country's initial endowments in immobile factors or non-tradable goods will guide the movement of spatial concentration of economic activities. Hence, trade facilitation can lead to divergence rather than convergence between countries.

Investments in infrastructure for trade facilitation at the regional level can create economic divergence as a result of falling transport costs, as removing distance empirically is likely to result in more spatial concentration rather than dispersion of production activities, eventually creating divergence in economic growth (Lall et al., 2009).

Pre-existing differences between countries can be reinforced as a consequence of trade facilitation reforms. Venables (2003) shows that when participants of a regional integration process already perform well, convergence occurs as resources flow to the weaker members. On the contrary, when no strong economy participates in the regional cluster (as would be the case in Africa), the strongest country attracts resources, and regional integration ends with divergence.

Venables (2011) builds a model to analyse the results of regional integration when members have unequal natural resource endowments. Regional integration allows resource-poor countries to benefit from exports to the resource-rich partner. By contrast, gains for the resource-rich countries are very low and even negative. Carrère et al. (2012) estimate similar effects when analysing the trade impacts of regional integration: resource-rich countries suffer from trade diversion, whereas resource-poor participants see trade creation.

Of course, it is still possible to combine convergence in living standards across countries with geographic concentration of economic activities, including through the provision of adequate trade-related infrastructure, both hard and soft. While Venables (2011) points to a conflict of interest between the two partner countries, the combination of trade opening and regional infrastructure improvement could be a solution. Resource-rich countries will benefit from the first, while infrastructure will connect the resource-poor country to its neighbour. Another way to circumvent the negative divergence effects highlighted above is to enable the geographic mobility of labour (World Bank, 2009). Transport infrastructure can be part of the solution by decreasing the physical cost of migration, both between and within countries. Relying on efficient and affordable transport services, temporary migration could be an answer to the first diverting effect of regional trade integration.

There is little evidence on the specific role of regional infrastructure on economic growth and convergence. The growth effects are at best indirect, e.g. through examining the regional dimension of growth constraints. The World Bank's country economic memorandum (World Bank, 2008), as part of its growth diagnostic for Uganda, concludes that the following factors are binding constraints: underinvestment in railways, trunk roads and main roads; electricity with high costs of power and fuel; financial intermediation; and coordination gaps, which are leading to inefficiencies in infrastructure.

Most of these key growth constraints have a regional dimension. For example, a shortage of electricity-generating capacity in Uganda can be overcome through the use of effective regional electricity grids. There are also regional constraints to further rail transport. Uganda's imports and exports make heavy use of the port in neighbouring Mombasa. The Uganda–Kenya railways operate under a private franchisee, which needs more effective regional approaches towards safeguarding a stable investment environment in order to stimulate more investment. The rail link was broken during a period of conflict in Kenya a few years ago, with large impacts on Uganda. Selassie (2008) notes that with better roads and other transportation links, more regional exports would be possible than recorded.

Te Velde (2011) surveys convergence studies and finds conflicting evidence on convergence in SADC, ECOWAS, the Common Market for Eastern and Southern Africa (COMESA) and UEMOA. The studies discuss the following factors behind convergence and divergence of incomes within regions: the size of the group,

harmonisation policy, institutions and trading rules, macroeconomic policy convergence and competitive advantage. He tests the effects of regional integration on growth and convergence and finds that regions do not affect growth except through their effect on trade and investment. Neither this nor any other study has studied the specific effects of *regional infrastructure* on convergence, although below we discuss the effects through investment.

5.2 Infrastructure and foreign direct investment

Stimulating investments is often a stated objective of regional integration agreements. However, what is the evidence on the effect of regional integration on FDI? It depends on the motivation and strategy of the investment, for example, taking advantage of lower production costs or a 'tariff-jumping' effect because it can be more efficient to develop a production site in each country in order to avoid high tariffs.

Regional integration can attract investment, thanks to improvements to the investment environment because of a reduction in non-trade barriers, such as simplification of customs procedures, harmonisation of standards etc. It is also a signal about the credibility of trade reform (shallow integration versus deep integration). Regional integration can in theory foster lock-in to reforms and be a signal of their credibility. Such issues are particularly important, as FDI in value chains requires commitment mechanisms on trade policy to rely on stable institutional and economic conditions.

This new economic geography approach (Krugman, 1991) is particularly relevant to understand the potential dynamic effect of regional integration, especially on the locational decision of foreign firms. A firm's decision will be a trade-off between production costs, market size and market access. Market fragmentation and political uncertainties have undermined African countries' capacity to attract FDIs. Free trade between African countries will reinforce the cost incentives to locate in Africa because of the resulting increase in the market size, as well as access considerations. Barriers to trade between African countries will reduce those effects and the incentive to invest (Blomstrom and Kokko, 1997; Baldwin, 1992). Intra-African integration may act as a catalyst for FDI flows to the region (see Elbadawi and Mwega, 1998).

Levy Yeyati et al. (2003) analyse the effect of regional agreements on the location of FDI. They show that belonging to a regional integration agreement increases FDI between two member countries by 27% on average. Moreover, they show that the potential loss of FDI related to the disappearance of 'tariff jumping' FDI is more than offset by other factors encouraging FDI. However, they highlight that regional integration is not sufficient to attract FDI and that only members with an advantageous investment environment take advantage of the effect on FDI promotion (consistent with the new economic geography literature). There is a risk that less attractive countries may lose FDI following regional integration.

Te Velde and Bezemer (2006) estimate a model explaining the real stock of UK and US FDI in developing countries during 1980-2000 and find that membership of a region as such is not significantly related to inward FDI. However, when a country is a member of a region with a sufficient number and level of trade and investment provisions (e.g. provisions describing treatment of foreign firms, large trade preferences), this will help to attract more inward FDI to the region. Importantly for the debate on convergence and divergence within regions, they find that the relative size of a country's economy within a region matters for attracting additional FDI, as does a central location in relation to the largest market. Countries

that have larger economies or are geographically closer to others can expect a larger increase in FDI as a result of joining than countries that have smaller economies or are located on the periphery. Regional infrastructure can be important in transmitting the effects.

Infrastructure is usually considered as a potential important determinant in the analysis investigating the capacity of one region or country to attract FDIs, whether at the macro level on aggregated country-level data or at the micro level based on firm-level evidence. However, quantitative evidence for African countries is scarce. Asiedu (2002) finds that infrastructure is not a significant determinant of FDI in sub-Saharan Africa, and that the impact of openness is less important compared with other developing regions. Conversely, for Kinda (2008), the availability of physical infrastructure significantly attracts FDI to the region with an effect even greater than for other developing regions. At the micro level, Kinda (2010) confirms that constraints on hard infrastructure negatively and significantly affect FDI in sub-Saharan African countries.

Other analyses provide evidence of the relevance of the process of regional integration associated with investment in trade facilitation infrastructure for FDI. Ngowi (2001) underlines the role of regional integration in providing infrastructure to attract and keep FDI in Africa. Mbekeani (2010) also argues that improving connectivity through regional infrastructure would trigger FDI. Brenton and Isik (2012) view regional integration as a way for smaller Southern Africa to attract FDI. Despite failing to identify robust growth effects of regional integration, te Velde (2011) emphasises its beneficial impact through increased FDI.

Richaud et al. (1999) found that improving infrastructure in Africa raises the profitability of investment not only in the country where the investment is made but also in its neighbouring countries: better RITF allows for an improvement in the reach and profitability of a wider market and improves opportunities for exports.

In theory, regional integration can be an important tool for development by fostering growth and poverty reduction. However, the positive impacts of integration at the regional level can be hindered by economic divergence, both between and within countries, whereby some parts or countries gain much more in relative terms.

5.3 Infrastructure and firm-level productivity

Exposure to regional markets (either through import completion or through access to regional markets) can increase productivity spillovers and raise the incentives for firms to innovate and build firm capabilities. Constraints to the growth of the private sector, and in particular SMEs in developing countries, can be summarised into five main categories:

- 1. Input constraints: access to finance, limited access to markets, limited access to capital and skilled labour or limited access to production inputs such as raw materials.
- 2. Output constraints: limited experience with national or international markets, inefficient distribution channels or market control by a few large firms.
- 3. Regulatory constraints: complicated taxation regimes, barriers to export, high start-up costs and complicated legal and regulatory frameworks.
- 4. Management constraints: scarcity of management skills and outflow of skilled managers to larger companies.

5. Institutional constraints: low level of collaboration between SMEs, weak collective voice and political risks such as the risk of expropriation, government interference or discriminatory taxes.

A decrease in trade costs can result in an increase in a firm's productivity through various channels. The first is the decreased cost in movement of production factors. The literature suggests that under certain circumstances, better transport infrastructure allows for more movement of the skilled and unskilled workforce. The increase in market scale potential also supports more investments by the private sector, assisted by economies of scale and agglomeration. Finally, reductions in trade costs increase access to cheaper and better-quality inputs as well as technologies.

RITF can be a way to alleviate constraints to private sector growth and productivity. For example:

- It becomes possible to take advantage of economies of scale or agglomeration.
- Migration can increase access to skills.
- Better market connection can facilitate access to more productive inputs and technologies (raw material, tools and machinery).
- More transparent customs and regional regulations reduce uncertainties relating to volatile tax laws and regulations such as production standards that firms have to meet in order to sell or export their goods.

The impact of regional infrastructure on firm-level productivity and the spillovers to the rest of the economy (small and large firms) is one of the most important sustained effects. Small firms depend on reliable trade environment more than larger firms and are disproportionately affected by high trade costs (Brenton and Isik, 2012). Being more organised, large firms are more able to circumvent the lack of hard infrastructure by finding private solutions and to deal with soft constraints.

However, if firms are unprepared, they can also lose out as a result of the reduction in trade costs and the increase in import competition with larger and betterconnected firms. Lall (1999) analyses technological response to trade liberalisation in Kenya, Tanzania and Zimbabwe. He shows that the industrial sector responded by contracting rather than upgrading. This can be explained by the lack of preparation for increased competition due to trade liberalisation, an issue which affected SMEs in particular. Parker et al. (1995) confirm that among micro and small enterprises in five African countries, those ill-prepared for competition lost from import liberalisation. Jonsson and Subramanian (2001) find that firm-level productivity significantly increased in South Africa as reductions in trade barriers allowed increased import competition.

Firms can also learn new techniques from being engaged in regional trade. There is a growing literature on the relationship between firm productivity and exporting. For example, te Velde (2011) undertakes a number of regressions using World Bank enterprise data for Benin, Malawi and South Africa. The study indicates that exporting firms have higher productivity. However, because of a lack of access to panel data, the analysis does not allow to identify whether good firms export or exporting firms become good firms. The study also distinguishes whether the main exports of the firm go to the region (WAEMU for Benin and Eastern and/or Southern Africa for Malawi and South Africa) or elsewhere. The regression results show exporters to the region and exporters to other countries outside the region are statistically associated with the same productivity levels – but they might be slightly lower for regional exporters in Benin and higher for regional exporters in Malawi. In the case of South Africa, regional exporters are statistically more productive than worldwide exporters.

The existing evidence linking trade-related infrastructure to productivity by improved access to lower prices of imported and domestic inputs relates mainly to the agricultural trade literature and is summarised in Jouanjean (2013). Fan et al. (2000) relate country- or regional-level public expenditure data to changes in agricultural productivity. They create a cost-benefit ratio comparing investments in infrastructure with other forms of public spending. They find that in India public investment in rural roads had the largest positive impact on agricultural productivity growth. However, Dercon et al. (2009) highlight that these approaches do not tell which component of infrastructure spending generates the benefits. Chamberlin et al. (2007) in Ethiopia and Stifel and Minten (2008) in Madagascar both show that isolation causes lower agricultural productivity. The second study also finds that isolation decreases the use of fertiliser in rice production, as well as vields of the three major staples (rice, maize and cassava), thus highlighting the impact of connectivity on the availability of inputs. Ulimwengu et al. (2009) and Dorosh et al. (2010) examine the link between road connectivity and agricultural production in the Democratic Republic of Congo and sub-Saharan Africa. Both papers highlight significant impacts on agricultural productivity of reducing travel time to markets.

5.4 Conclusions

Regional infrastructure and regional integration can raise growth and productivity through increased trade and investment, and hence increase competition and channels for productivity spillovers. There are some clear findings, but also some clear research gaps. First, regional integration and infrastructure attract more trade and investment, but there are no studies examining the impact of *regional infrastructure* on FDI and convergence. Second, infrastructure and exporting is strongly correlated with both growth and firm-level productivity, but again there is very little on *regional* infrastructure and *regional* exporting on productivity.

6 Pathways of impact, strength of evidence and policy suggestions

6.1 Pathways of impact

Figure 1 was used as a heuristic to guide the sections in this literature review. It includes a number of pathways of impact. A companion report has refined this further and has suggested a theory of change, drawing from this literature review, from economic theory and from further discussions. This is presented briefly in Annex 2.⁶ It identifies the effects on three main types of actors: households, firms and governments. A fourth category of affected people can be defined separately as the actors at the border whose livelihoods and income-generating activities are directly dependent on lack of or deficiencies in regional infrastructure. This theory of change builds on the review in previous sections, and its robustness can be confirmed by comparing to the existing literature.

The table below summarises the different pathways of impact that regional infrastructure for trade is expected to have on poverty, both directly and indirectly. It includes four pathways. The first three pathways (prices, firms, tax/revenues) are adapted from McCulloch et al. (2001). The final pathway focuses on other issues specific to regional integration through the provision of trade-related infrastructure.⁷

⁶ For further details the companion report is available on demand from the authors.

⁷ The authors define three pathways – price transmissions, enterprises, and taxes and spending – and add four elements to their analysis – economic growth, costs of adjustments, risk and uncertainty, and supply response.

Table 1: The direct and indirect effects of trade-relatedinfrastructure

Channel of	Direct effects		Indirect effects	
Impact	Positive	Negative	Positive	Negative
Prices	Benefiting consumers of affected products and services	Displacing competing production	 Lower input prices raise productivity Smoothing local production price volatility 	 Increased exposure to international price fluctuations
Jobs, investment and output effects	 Direct output in expanded trade sectors Increase in domestic and foreign investments and better- quality jobs 	 Losses in import competing sectors and potential losses of jobs (SMEs) because of the reorganisation of value chain stakeholders 	 Dynamic efficiency and productivity effects through competition Better access to international market and economies of scale (development of economic activities and job creation) 	Potential negative effect with divergence between countries and migration
Tax revenues	Higher volume of formal trade leads to more revenues	Lower tariffs lead to fewer tax revenues	 Increased tax revenues through greater output effects and greater tax base 	• Potential losses of tax revenues with the delocalisation of economic activities in case of divergence between economies
Other	 Fewer health risks associated with reduction in time to cross border Jobs in construction of project 	 Health risks associated with corridors Displacing activities that resulted from opportunities owing to existence of border delays 		

6.2 Strength of evidence and missing evidence

We can compare the evidence discussed in the previous sections with the expected impacts of regional infrastructure on growth and poverty, as they are categorised in the theory of change. This will allow us to assess the strength of the pathway from regional trade-related infrastructure to poverty effects and identify gaps in the literature.

The body of evidence surveyed in this document concludes that improvements in regional infrastructure designed to increase cross-border trade in sub-Saharan Africa are very likely to result in poverty reduction through both direct and indirect

routes. However, there may be specific negative effects, which are expected to be more than offset by the other more positive channels (the first objective as stated in the introduction). Obviously, the balance of the effects will depend on the specific contexts. The quality of the evidence surveyed is often high, using regressions at macro or firm level for infrastructure generally. However, looking at each type of impact inside the segmentation between direct and indirect effects, the size of the evidence remains quite small.

According to the evidence surveyed, the main potential risks to the poor (second objective) created by increased trade from better regional infrastructure is that such initiatives do not spread sufficiently to the poorest and most vulnerable stakeholders or, even worse, will displace their activities without allowing them to seize the new opportunities opened up by regional integration.

However, the evidence consistently points to the importance of complementary measures (third objective) to increase benefits for the poor and mitigate potential harm. In particular, RITF has to be complemented by measures supporting private sector investment in trade services (transport, information) as well as supporting increases in productivity (e.g. through extension services), making it possible to connect the poor to market opportunities.

An overall gap in the evidence concerns the analysis of precisely defined RITF projects. Usually, proxies of availability of such infrastructure are used, but very few studies focus on the impact of specific *regional* infrastructure projects or *regional* exporting.

Regarding the specificities of the pathways, the 'jobs, investments and output effects' literature often does not take into account indirect effects of investments in infrastructure for trade facilitation on firm productivity. The potential of regional integration to develop better connectivity with international value chains and trade opportunities is also not deeply analysed, despite its expected importance in sub-Saharan Africa (OECD, 2014). Reorganisation of value chain stakeholders, in impacts particular the on smallholders and SMEs' activities (creation/displacements), is also weakly (if at all) investigated, even though this concentrates high levels of jobs in Africa.

The evidence on the effects on government tax revenues is the most weakly developed among the different channels surveyed. Cantens et al. (2011) show that customs reforms based on contracts with performance indicators for frontline customs inspectors in Cameroon led to increased duties and taxes. In Ethiopia, following trade facilitation reforms based on soft infrastructure initiatives aiming to reducing custom and border procedures, exports and imports increased by 200% and tax revenues by more than 51% (OECD, 2014).

An additional lacking piece of evidence concerns the impact of regional trade infrastructure on actors dependent on activities at the border. In particular, deepening regional integration through the provision of trade-facilitating infrastructure, both hard and soft, can result in displacing some specific activities taking place at the border as a response to delays and long truck queues (small shops but also prostitution). Therefore, trade facilitation initiatives are likely to disrupt livelihood strategies at the border.

6.3 Policy suggestions

Two broad policy suggestions follow from this literature review.

The first is the importance of the complementarity of various types of infrastructure in ensuring the maximum contribution of (regional) hard infrastructure projects in fostering growth and poverty reduction.

The literature examining the pathways to growth and poverty reduction – through prices, jobs, investment and output – emphasises the importance of complementary policies. Complementary policies enable the pass through of lower trade costs to lower prices in the entire economy. Such transmission is key in ensuring that even the most vulnerable and isolated people and regions benefit from regional trade integration and increased food security. It requires the participation of isolated stakeholders in commercial markets.

As jobs and activities are created and displaced, and trade facilitation presents new opportunities to workers and producers, complementary measures are needed to allow a supply response. Such complementary policy could be for instance to make migration easier, to enable labour mobility across space.

Therefore, to optimise the contribution of regional hard infrastructure investment on inclusive growth, this literature review points to the following complementary policies and initiatives:

- Coordination of large investments through regional agencies to avoid suboptimal level of investments and
 - allowing for multimodal corridors linking landlocked countries to gateway countries' ports
 - taking into account the complementarity among several types of infrastructure, for instance undertaking both transport and communication infrastructure development jointly. The same applies to customs and corridors.
- Policies supporting investment and competition in trade-related services including the logistics services sector. This can for instance include
 - regulatory reform that addresses the governance and political economy of freight logistics
 - facilitating and stabilising policy and regulatory processes. There
 needs to be more transparency and stable implementation of trade
 agreements and trade rules to prevent policy volatility. This would
 allow for more market predictability necessary to unlock private
 sector investment.
- Improved intermediary hard infrastructure such as rural feeder transport networks and access to storage facilities.
- Increased transparency of markets and access to information to allow better price-transmission mechanisms so that consumers, traders and producers gain.
- Support of market access for the smallest producers, through the provision of various support services, including financial but also technical assistance

and access to inputs. Increased flexibility and mobility of workers to allow them to benefit from new opportunities in the region.

• Scaled-back levels of ambition regarding integration planning, particularly on regulation and standards harmonisation. This can be done through targeted initiatives after the identification of specific regulatory bottlenecks, or through mutual recognition processes.

The second broad policy suggestion aims to provide support to the countries, population and activities that are the most vulnerable to being harmed by the effects of increased regional integration and reduction in trade costs:

- Support for regions needs to go beyond a simple sequential model; e.g. moving from goods to services to capital and labour mobility that may not be the most efficient. Planning and implementation of regional infrastructure should be carried out in consultation with institutions such as business associations to
 - \circ better identify barriers to regional integration and identify relevant bottlenecks to be addressed
 - better inform the private sector about new opportunities created by the increased regional integration that results from the development of regional infrastructure
 - better prepare the private sector for potential increased competition.
- Identifying whether regional institutions are the most relevant level of aggregation in order to solve various trade-related issues: Regions should apply the principle of subsidiarity, according to which the responsibility of a public policy should be addressed by the smallest body able to address it. This would include regional infrastructure design and investment decisions.
- Creating compensation or support mechanisms to be built under a deep integration process, to allow countries with less attractive business environments (natural resources, infrastructure or skills) to make the necessary investments to become more attractive and spur convergence in the region rather than divergence.
- Facilitating dialogue and partnerships among groups affected by reforms at the value chain, sector and national level, particularly as they might entail political economy and governance issues.

7 Conclusions

The objective of this literature review was to answer the following three questions on the impacts of RITF in Africa:

- 1. What is the evidence that improvements in regional infrastructure designed to increase cross-border trade in sub-Saharan Africa (through reducing the costs of trade, including costs caused by delays principally transport) result in poverty reduction (a) indirectly as a result of economic growth; (b) directly?
- 2. What potential risks to the poor are created by trade growth resulting from improvements in regional infrastructure?
- 3. What policy interventions have the capacity to increase benefits for the poor and mitigate potential harm to the poor?

The body of evidence surveyed in this document concludes that improvements in regional infrastructure designed to increase cross-border trade in sub-Saharan Africa are very likely to result in poverty reduction through both direct and indirect routes, although there may be specific negative effects on certain groups; these effects are expected to be more than offset by the other channels. The quality of the evidence surveyed is often high, depending on regressions at macro or firm level. However, looking at each types of impact inside the segmentation between direct and indirect effects, the size of the evidence remains quite small. Moreover, there is a lack of evidence on *regional* infrastructure.

According to the evidence surveyed, the main potential risk that increased trade from better regional infrastructure creates for the poor is that such initiatives will not spread sufficiently to the poorest and most vulnerable stakeholders or, even worse, will displace their activities without allowing them to seize the new opportunities opened up by regional integration.

The evidence further points to the importance of complementary measures to increase benefits for the poor and mitigate the potential harm. In particular, RITF has to be complemented by measures that enable connecting the poor to market opportunities.

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Annex 1: Evaluating the impact of infrastructure investments

Despite a general consensus on the importance of hard infrastructure for growth, and in particular roads (Gannon and Liu, 1997), there has been very little empirical analysis evaluating the importance of the contribution in value to growth and poverty reduction.

This is simply because of the inherent difficulties in estimating the magnitude of the effects attributable to infrastructure, due to methodological and measurement challenges. Any attempt to evaluate impacts of infrastructure projects faces the problem of identifying a true causal impact. Indeed, infrastructure investments are all but random. The decision to build infrastructure is often targeted subject to various considerations, making it difficult to isolate causal impacts from placement effects. These can be the geographical and topographic conditions, but infrastructure may also be constructed in a given region because the area is characterised by some economic potential that in turn shapes the economic situation of stakeholders (households, firms) residing there. It seems logical to think that simply because of cost benefit analysis and the need to maximise returns to investments, infrastructure will be built in areas of known potential dynamism. Infrastructure investments may also be the consequence of political incentives to favour a specific region or influence group or to ensure the popularity of governments with visible investments. Also, it is often difficult to accurately capture the impacts on a diffuse beneficiary group and account for substantial differences in road quality.

It is therefore difficult to disentangle and identify the specific effect of the infrastructure investment on growth. Such endogeneity issues characterising the relationship between infrastructure and economic development are particularly difficult to address and circumvent at both the micro and macro levels.

One other issue potentially biasing the estimation of the impact of infrastructure is the fact that households and economic agents do not randomly settle in space and will have a tendency to move closer to areas with good and new infrastructure provision. In particular, the locational choices are driven by specific individual characteristics that can also determine the level of development. In the same vein, a reverse causality issue may also be at work, as the economic status of a household or a firm can determine its locational choices alongside infrastructure.

Many authors have nevertheless suggested methodologies to go around those caveats.⁸ All these methodologies require panel data that are difficult to obtain.

⁸ Regarding the impact evaluation of rural road projects, van de Walle (2009) recommends the use of appropriate estimation methods, such as difference-in-difference, propensity score matching and instrumentation. Other authors have developed the use of the general method of moments to deal with unobservable characteristics.

Hence, the usual drawbacks in the literature analysing the impact of infrastructure include inadequate comparison groups and insufficient data and evaluation time span to describe the entire process of how infrastructure may influence growth and poverty.

Finally, general equilibrium modelling is another way to deal with this endogeneity issue. Fan et al. (2005), and Fan and Zhang (2008) provide a series of papers based on general equilibrium models to assess the impacts of different types of public expenditures – including on rural roads – on growth and poverty reduction in developing countries. For Uganda (Fan and Zhang, 2008) and Tanzania (Fan et al., 2005), they find that better road access helps decrease poverty.

Many analyses have explored the impact of infrastructure provision, roads in particular, on specific outcomes at both the macro and micro levels. At the macro level, analyses looked at the effect on growth (gross domestic product) and trade flows. At the micro level, they investigated the effect on productivity and incomes, usually for rural and/or smallholders' households. However, the transmission mechanisms leading to such outcomes are not always clear. For instance, if the road allows for the creation of new market and economic activity opportunities, is there an effect on prices, investments etc. Studies on the impact of infrastructure usually focus on the effect at the micro level and look at the impact on income, whether from on- or off-farm new income opportunities.

(Dercon et al., 2009). Robust estimates on cross-section data require the use of instrumental variables that can also be difficult to define appropriately (Castaing Gachassin et al., forthcoming).

Annex 2: Theory of change

This section presents the causal chain and transmission channels for direct and indirect, positive and negative impacts of regional trade facilitation infrastructure on poverty reduction and growth. This theory of change draws both from the literature review and from economic theory and a review of other documents, such as the documents from the Department for International Development (DFID) and TradeMark East Africa (TMEA) on the effects of trade programmes for the poor. It is a preliminary outcome of the inception phase report. The proposed theory of changes includes a number of building blocks. These include the following:

- The policy measure that is being assessed. The overall measure is a regional infrastructure measure, and this can consist of hard (e.g. roads) and soft (e.g. harmonisation of rules) infrastructure.
- The effects on three main types of actors: households, firms and governments. A fourth category of affected people is defined as the actors at the border whose livelihoods and income-generating activities are directly dependent on lack of or deficiencies in regional infrastructure. This category can encompass a large range of small-scale activities, likely to be informal (e.g. truck repair shops, hotels, restaurants, currency exchange, customs facilitators etc.), as well as informal traders. The effects on such actors are interdependent and they overlap. For example, rural households might be both consumers and producers. We present potential broad effects by type of actor, as the appropriate complementary policies that apply to them are likely to vary by type of actor.
- Distinguishing between direct and indirect impacts. Some groups are affected directly by the policy measure (e.g. firms that can trade more). In other cases, the effects are indirect and take time to work through the impact (e.g. productivity and agglomeration⁹ effects). Identifying direct and indirect transmission mechanisms of impact of investments in RITF on households, firms, government and informal sectors at the border makes it possible to identify entry points for policy interventions to both increase the benefit and mitigate the potential harm to the poor. We distinguish positive (+) and negative (-) impacts.
- Explicit growth and poverty effects. The overall impact on poverty is through the combined effect on the three main channels (households, firms and governments). But some channels have a more direct poverty link; the effect for others is more indirect, via growth. For example, the impact on

⁹ The term economies of agglomeration describes the benefits to firms of locating near each other ('agglomerating'). The benefits often derive from economies of scale and network effects. For example, competing firms in the same cluster benefit from each other as the cluster attracts more suppliers, better quality labour, and more customers than a single firm could achieve alone.

poverty is envisaged through the impact on consumption and welfare, job creation or destruction, assets and resilience. The impact on growth is envisaged through the increase in the scale of firms and productivity. Finally, we consider that the increase in government revenues affects both poverty reduction and growth, as increased revenues can help to provide more and better public services.

It is important to highlight that while we are aiming to present accurately the main potential causal chains and transmission mechanisms for the impact of investment in RITF on poverty, the current framework does not consider a number of further spillovers on most of the relationships and channels. For instance, the increase in trade resulting from trade cost reduction is likely to occur only if the relevant traderelated logistics services exist. However, increasing trade flows is also likely to increase incentives for the private sector to invest in such services, thereby further decreasing trade costs. Or, as another example, a beneficial impact on firm activity will also lead to greater tax revenues and better employment opportunities that can increase the resilience of households.

The following figure illustrates the broad potential impacts on poverty.





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