

Christopher Foster, Mark Graham, Laura Mann, Timothy Waema and Nicolas Friederici

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**Christopher Foster**

Information School
University of Sheffield
Sheffield, S1 4DP
UK
christopher.foster@sheffield.ac.uk

Mark Graham

Oxford Internet Institute
University of Oxford
Oxford OX1 3JS
UK
mark.graham@oii.ox.ac.uk

Laura Mann

Department of
International
Development
London School of
Economics
London WC2A 2AE
UK l.e.mann@lse.ac.uk

Timothy Waema

School of Computing and
Informatics
University of Nairobi
Nairobi
Kenya
waema@uonbi.ac.ke

Nicolas Friederici

Oxford Internet Institute
University of Oxford
Oxford OX1 3JS
UK
nicolas.friederici@oii.ox.ac.uk

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abstract

In recent years, Internet connectivity has greatly improved across the African continent. This article examines the consequences that this shift has had for East African firms that are part of global value chains (GVCs). Prior work yielded contradictory expectations: firms might benefit from connectivity through increased efficiencies and improved access to markets, although they might also be further marginalized through increasing control of lead firms. Drawing on extensive qualitative research in Kenya and Rwanda, including 264 interviews, we examine 3 sectors (tea, tourism, and business process outsourcing) exploring overarching, cross-cutting themes. The findings support more pessimistic expectations: small African producers are only thinly digitally integrated in GVCs. Moreover, shifting modes of value chain governance, supported by lead firms and facilitated by digital information platforms and data standards are leading to new challenges for firms looking to digitally integrate. Nevertheless, we also find examples in these sectors of opportunities where small firms are able to cater to emerging niche customers, and local or regional markets. Overall, the study shows that improving connectivity does not inherently benefit African firms in GVCs without support for complementary capacity and competitive advantages.

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The last decade has seen a significant growth in Internet infrastructure in Africa. At the turn of the millennium, the continent was virtually disconnected from high-speed fiber-optic networks, with firms having to use expensive and low-speed satellite links. Since then we have seen a concerted set of initiatives to provide fiber-optic infrastructure to the continent, including the landing of eight new cables at an estimated cost of \$3.9 billion (Song 2014).

The anticipation, leading up to and following the construction of these cables has been palpable. International donor support was predicated on the belief that information and communication technology (ICT) infrastructure “strongly affects a country’s growth prospects” (World Bank 2005, 13). Given a perceived disconnect of East Africa from global economies, there has been a particular emphasis from donors, the media, and politicians on how Internet connectivity would overcome limitations of remoteness and distance (Graham and Mann 2013; Graham 2015). Donors and governments identified East African-based firms as important beneficiaries of changing connectivity, claiming that they would be able to overcome distance and better integrate with international markets and trade (Graham, Andersen, and Mann 2015).

Global value chains (GVCs) are a key medium through which export-oriented production is operationalized in a globalized world (Gereffi 2014), and GVC literature provides a base for critically exploring how East African producers and services providers integrate into global markets. Yet, there has been little systematic evidence of how Internet connectivity in lower-income countries impacts GVCs (Foster and Graham 2017). This absence is particularly pronounced in relation to small and medium-sized enterprises (SMEs), whose integration into global economies has been articulated as a key benefit of changing digital connectivity. Given the significant financial and political capital involved in supporting the expansion of connectivity and building complementary policy, it is crucial to take stock and ensure that ongoing policy and practice lead to maximum impact. Thus, we look to answer the following questions: *How is changing Internet connectivity in East Africa affecting the forms of GVCs in the region? Does Internet connectivity offer new opportunities or challenges for East African firms looking to link into GVCs?*

The article is structured as follows. In the next section, we explore literature on GVCs, describing how the literature conceptualizes interaction of East African firms with export markets. Given the relative neglect of research exploring the impact of Internet connectivity in low-income countries, we also examine empirical literature dealing with the impacts of more established forms of connectivity such as mobile phone use. This work outlines some key processes by which Internet connectivity is likely to impact firms.

Our analysis of changing connectivity draws on cross-sectoral and cross-country research conducted in Kenya and Rwanda, which is provided in the section that follows. This extensive research draws on 264 qualitative interviews and 7 focus groups in 3 sectors: business process outsourcing (BPO), tourism, and tea production. Following that is a discussion of our key empirical findings.

70 The penultimate section details a cross-sectoral analysis. Overall, our findings show that connectivity is driving a reorientation of value chains toward standardized flexible networks in East Africa. Digitization, digital platforms, and systems integration are creating new risks for export-orientated firms related to more dynamic and competitive networks. Further, the new demands around digital integration may serve to exclude smaller firms from participation in GVCs. Improved Internet connectivity has allowed smaller firms and entrepreneurs to become more networked and efficient, but has often enabled only limited *thin integration* with moderate improvements in some processes but without significantly upgrading their roles in value chains. The final section concludes.

This work thus makes an important contribution to the economic geography literature. It documents well-established trends toward fragmentation of GVCs in the Global South and highlights the role of digital technology in facilitating these processes. The article particularly highlights the growing centrality of information flows and data in new forms of standardized and monitored products and processes, and their emergence as a key source of value in flexible GVCs. However, digital components should not be seen as purely reflecting the will of large firms, for they offer the potential for more creative and innovative uses as well.

Global Value Chains and Changing Connectivity

In order to answer the research questions, we first build a clear picture of the contemporary structures of globalized production and the role that globally linked East African firms play in them. As Gereffi (2014) describes, the global economy increasingly consists “of complex and dynamic economic networks made up of inter-firm and intra-firm relationships” making the GVC concept a particularly useful perspective to investigate our questions around globally linked firms. GVC perspectives explore the increasingly fragmented nature of production by focusing on linkages, processes, and the trajectories of individual enterprises and products in a globalized economy. It does so by focusing on two elements—value and governance. The notion of *value* refers to an economic-focused analysis exploring where benefits are captured in fragmented processes of production (Kaplinsky and Morris 2001). The ability to capture value is seen as relational and linked to the *governance* of value chains—the ways that production activity is guided by *lead firm(s)*, which influence production patterns even without directly managing all value chain elements (Gereffi 1994; Gereffi, Humphrey, and Sturgeon 2005).

The Evolution of Global Value Chains in East Africa

With respect to firms involved in value chains in East Africa, the GVC literature has documented the changing nature of governance in GVCs and highlights evolving challenges. Important challenges particularly emerge from new modes of governance that simultaneously facilitate more geographically dispersed value chains, and more granular coordination and control of GVC by lead firms (Gereffi 2014).

Granular coordination and control throughout the chain is becoming increasingly embedded in requirements on products and processes, guided by lead firms in the value chain. In many GVCs, requirements come in the form of specification of standardized components (Sturgeon 2002). In addition, in sectors, such as agriculture, quality and standards imply not only tight control of *products* but also of *processes* (Ponte and Gibbon 2005; Ouma 2010). Product and process requirements are often exclusionary, since they can be complex and difficult for smaller firms to meet, limiting their GVC participation (Dolan 2010).

Lead firms have also expanded flexibility of GVCs through the move toward more agile and shifting networks. The terminology of *turn-key* networks was first used in the electronics sector to describe new divisions of labor in GVCs—between retail-oriented firms who innovate and interact with customers; firms whose job it is to assemble products according to strict specifications; and the range of smaller firms producing standardized components (Sturgeon 2002). Similar flexible networks have been observed in a wider set of sectors, and indicate trends in GVCs toward customer-facing actors disengaging from the complexities of value chains and rapidly changing networks of producers driven by standardized outputs or services (Fold 2001; Neilson and Pritchard 2011; Lee, Gereffi, and Beauvais 2012). For smaller producers of standardized products, which are likely to be firms in lower-income countries, these shifting relationships present new risks. Inconsistent demand linked to just-in-time production and the ability for lead firms to rapidly reconfigure networks when conditions become unfavorable threaten to destabilize smaller firms (Neilson and Pritchard 2011).

Although customers and markets can be distant to producers in East Africa, GVC governance and subsequent patterns of value capture are still impacted by changing consumer preferences and orientations. Innovation and demand at the retail end of value chains may entail new standards or induce new conditionalities on production. For example, new value-added products, such as food products that require cold chain storage and goods with ethical marks, have led to integrated strategies and new processes in GVCs (Ponte 2002; Fold and Gough 2008). Lead firms with financial and organizational power tend to take the lead in coordinating such changes, often working with a limited set of well-connected firms in the GVC. Thus, as well as standards and quality, new customer requirements can introduce new constraints and require new investments, thereby marginalizing smaller firms that cannot comply (Fold and Gough 2008).

In sum, the literature on GVCs articulates new opportunities and challenges for firms in East Africa. Dispersed GVCs appear to offer opportunities for East African firms to participate in value chains, but trends in standards and specification, flexible GVCs, and shifting customer demands all pose risks and high demands for firms that are part of them.

Digital Connectivity and Firms

Where the Internet has been brought into models of globalized production in economic geography or development studies, it is often discussed in a very general sense, describing how ICTs and connectivity are important factors in supporting the

fragmentation of production but without much detail (Castells 2000; Henderson et al. 2002; Malecki and Moriset 2007; Dicken 2011). Where Internet connectivity has been discussed more explicitly, it has generally been analyzed for its impacts closer to the consumer. For example, Gereffi (2001), in his exploration of the effect of the Internet on GVCs, tracks the rise of retail-facing intermediaries and services, and their potential to become influential lead firms in orienting value chains. He also outlines how customer facing firms drive customization of goods and services through online platforms and thus demonstrates how changing customer demands imply shifts in value chain governance.

72 However, with respect to actors in low-income countries, there has only been limited literature that has explored the role that Internet connectivity has played in production (e.g., Graham 2015; Murphy and Carmody 2015). This lack of attention is not surprising given that Internet access has up until recently been quite costly and only accessible to a few, meaning that extensive use of connectivity has tended to occur only in parts of the value chain closer to the customer (Humphrey et al. 2003; Moodley 2003). Given the relatively recent expansion of Internet connectivity into East Africa, literature is limited, and thus we draw on studies examining other forms of digital connectivity (particularly mobile phone connectivity) to supplement our review. This older literature helps to identify a number of potential benefits and challenges of connectivity and to consider the possible role that the Internet may play in value chains.

Firm Benefits of Digital Connectivity. In low-income countries, economists and geographers have observed that small and microfirms tend to have low levels of productivity (Liedholm and Mead 1999). However, existing research has documented how ICTs can play an important role in improving their efficiency (Aker 2010). At its simplest, efficiency gains arise due to the reduced need for physical journeys to clients or customers. ICT-enabled information flows also allow firms the ability to better monitor and manage key assets and workers (Donner 2004; Esselaar et al. 2007).

Beyond such internal efficiency improvements, improved access to knowledge resources and information can be significant. Examples include improved awareness of government support, or access to new types of information, tools, and customer knowledge to support market activity in specific sectors (Eggleston, Jensen, and Zeckhauser 2002). Smaller firms may struggle to find relevant online knowledge or struggle to interpret it correctly. Thus, knowledge and information are often transmitted through direct communications such as through private mobile and e-mail messages, which complement and strengthen existing face-to-face interactions (Donner and Escobari 2010). As these information flows become richer and as firms build stronger networks among themselves, ICTs can enable new creative and innovative activities among clusters of firms (Foster and Heeks 2013).

Another important strand of literature relates to how digital connectivity alters the interaction of small firms with markets, potentially improving access, efficiency, and coordination. For instance, mobile phone use has provided small firms with greater access to markets and market information, enhancing their ability to select new markets, find customers online, and integrate their businesses onto online platforms (Sarkar, Butler, and Steinfield 1995; Dangi and Singh 2010). Thus, digital platforms and marketplaces might potentially disintermediate previous market gatekeepers, and enable new types of business model and innovation at scale online (World Bank 2016a).

While such research provides insight, its weakness lies in the fact that it is often focused on decontextualized firm-to-firm or firm-to-customer interactions and typically

uses transaction cost models. This approach can neglect the overall structure of the value chain, and particularly the role that power relations play in governance, and therefore paint an incomplete picture of the impact of connectivity.

Exclusionary Aspects of Digital Connectivity. Due to improving connectivity and lowering costs, small firms are willing to invest in ICTs and Internet access (Esselaar et al. 2007). However, as highlighted in the digital divide literature, marginal individuals and firms may still use the Internet only in quite limited ways (James 2013). Limitations emerge from a range of factors, including lack of human or financial resources, poor digital skills, and costs to full online engagement (Jung, Qiu, and Kim 2001); social inequalities that amplify online inequality (Warschauer 2003); and the fact that applications and platforms do not fit the needs of marginal groups (Van Dijk 2005). In recent studies on smaller firms in lower-income countries, these additional aspects of the digital divide that move beyond access have been seen as crucial (Graham 2014; Kumar 2014).

Implicit in a number of these more critical studies on the digital divide is the idea that the impact of digital connectivity may not benefit all, but rather ICTs can become a source of power and control between different types of firms (Foster, Graham, and Waema forthcoming). More powerful firms may restrict digital access to smaller firms, or digital systems may be created in a way that they are only useful for certain actors or processes (Carmody 2012; Murphy and Carmody 2015). While connectivity enables links between firms, weaker firms can also be pulled into subservient relationships in such networks and be subject to economic downgrading and de-skilling rather than to digital empowerment (Molla and Heeks 2007; Murphy, Carmody, and Surborg 2014).

In sum, critical literature on digital connectivity in lower-income countries suggests that connectivity does not necessarily solve digital exclusions. Moreover, more connectivity might empower stronger firms in relation to weaker ones and might therefore be exclusionary (Foster and Graham 2017).

Summary

The literature review has highlighted that lead firms in GVCs are moving toward stricter requirements and flexible networks. Thus, a key focus will be to explore the role that digital information flows play in these processes. We have identified trends that are potentially leading to more exclusionary conditions for small producers in lower-income countries. Improved Internet connectivity might potentially accelerate exclusions, but it might also provide a means to overcome some of the barriers traditionally associated with exclusion. The goal is to make a cross-sectoral analysis of Internet connectivity that will move beyond previous sporadic studies of Internet impact within firms to provide more generalized insights for practice and policy.

Approach

As shown in the literature review, impacts of connectivity are likely to be shaped by the characteristics of the specific sectoral value chain in which firms participate. We thus take the GVC as the scope of the study, comparing and contrasting across different sectors. However, critiques suggest GVC studies often underplay the richness that backward linkages, policy, and local conditions play in value chain activity (Coe, Dicken, and Hess 2008). Intuitively, such considerations are likely to be especially important with regard to small enterprises and producers, where the intersection of firm activity, Internet connectivity, and value chain participation is more complex (Fold

2014). Thus, this article particularly emphasizes the local institutional and policy contexts and their alignment with GVCs. This approach complements others that draw on notions such as *regional coupling*, *embeddedness*, *disarticulations*, and *social upgrading*, which have been used to more richly explore the activities of marginal actors and firms in studies of GVCs (Bair and Werner 2011; Barrientos, Gereffi, and Rossi 2011; Fold 2014; Murphy and Carmody 2015).

We draw on extensive research undertaken in East Africa over the period 2010–2014 in two countries: Kenya and Rwanda. The duration of the research coincided with the period following the landing of the first three submarine fiber-optic cables in the region, and consequently there was a significant change in the availability, cost, and quality of digital connectivity (Sprague et al. 2014). In Kenya, Internet access¹ rose from 10 percent in 2009 to 43.4 percent in 2014 (World Bank 2016b). In Rwanda, official figures of growth have been more modest moving from 7.7 percent in 2009 to 10.6 percent in 2014 (World Bank 2016b), but access may be significantly higher in reality.² In addition to their similar experiences with changed connectivity, Kenya and Rwanda are both countries where Internet connectivity was explicitly part of core government economic transformation strategies (Government of Kenya 2007; Government of Rwanda 2009).

In these countries, we selected three economic sectors to explore. We focused on export-orientated sectors that make (or are predicted to make) significant contributions to national economies to ensure that we were researching sectors relevant to the country's economies. Sector selection additionally aimed to explore sectors with contrasting value chains in order to support more generalized conclusions.

We chose to include two established sectors: tea production, the biggest commodity source of export income in both countries with a well-established GVC; and tourism, a service sector that is a significant source of jobs and income, and seen as a growth area for the future. As can be seen in Table 1, both sectors make a large contribution to exports in East Africa and are thus considered key sectors in the two countries.

Table 1

Share of National and Global Exports

	Kenya		Rwanda	
	Sectoral Share of National Exports (%)	Sectoral Share of Global Market (%)	Sectoral Share of National Exports (%)	Sectoral Share of Global market (%)
Tea sector (by \$ sales)	23	16.1	17	0.8
Tourism sector (by receipts)	19	2.4	28	0.8
BPO/ITES sector	Not collected	< 0.1%	Not collected	< 0.1%

Source: Based on Federal Agriculture Organization (2013); UN Comtrade (2017); World Travel and Tourism Council (2013).³

¹ Access data includes those who have access to the Internet directly and indirectly (i.e., through family members and cybercafés), based on national household surveys (World Bank 2016b).

² Discussions with Rwandan policy makers reveals that access data has not been officially collected since 2010, and thus new growth has not been factored in, as highlighted by a recent estimate of Internet users by one Rwanda mobile operator at 19 percent (National Institute of Statistics Rwanda 2014).

³ Figures based on 2013 reporting. Tourism exports denote tourism receipts that are classed as an export in world trade statistics. BPO/ITES data is not collected as yet in these countries, but as an emerging industry is likely to be a small contribution at present.

Moreover, given the comparative low global share in these sectors, small changes in global share could have significant impacts. In addition to tea and tourism, we also chose to examine a new sector: the business process outsourcing and information technology (IT) enabled services sector (BPO/ITES), a sector that has been actively promoted by both governments related to the expansion of regional connectivity.

In each sector, we mapped actors in each network and selected a sample of interviewees that would allow us to understand the perspective of different actors in each value chain and thus help us to build a substantive picture of activities and interconnectedness (see Figures 1–3 in our analysis). As detailed above, we weighted our interview samples toward SMEs and entrepreneurs in Kenya and Rwanda (such as tea farming groups and *factories*, local tour operators, and local BPO firms) in order to more clearly understand those smaller and emerging indigenous firms. We also included local sectoral support, policy makers, and key institutions in our sample. This sample was supported with an analysis of the intermediaries, buyers, or retailers in consuming countries in GVCs that could be traced back to East Africa.

The research was based on 264 qualitative semistructured interviews which are broken down by sector and country in Table 2. Interviews were in depth and looked to

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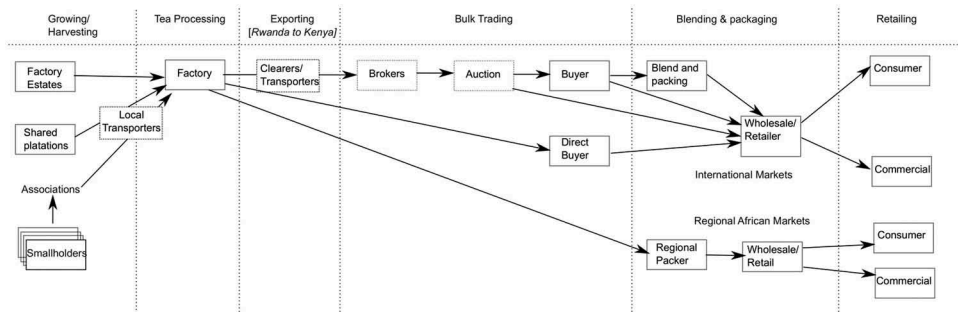


Figure 1. Processes and actors in the value chain for tea.⁴

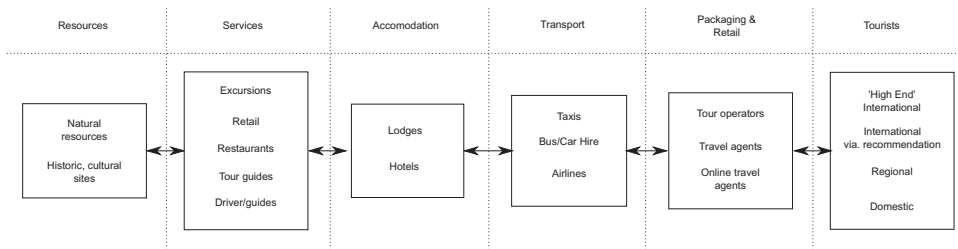


Figure 2. Processes and actors in the value chain for tourism.

⁴ There are some differences between the Kenyan and Rwandan cases, particularly around relationships between growing/harvesting and tea processing actors. This figure integrates some typical scenarios.

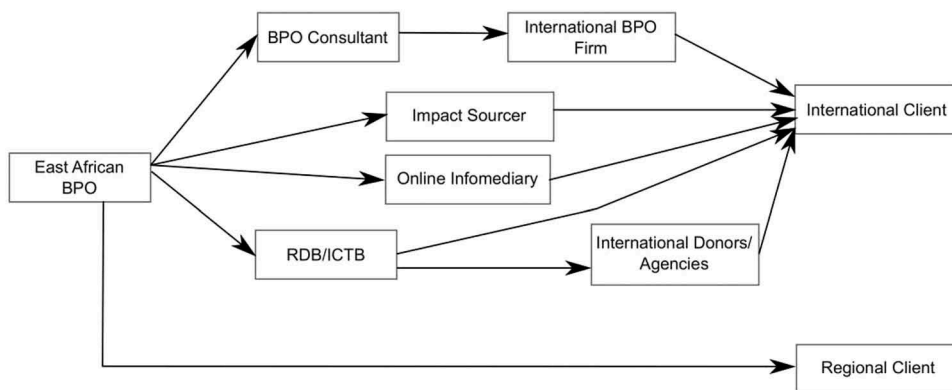


Figure 3. Value chain relationship in the BPO/ITES sector.⁵

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Table 2

Interviews (And Focus Groups in Parentheses), Broken Down by Sector, Country, and Role in Value Chain

Sector	Kenya	Rwanda	Total	Breakdown (see Sectoral GVC Diagrams for Details*)
Tea	38 (2)	37 (2)	75	Coops (17), Processors (25), Private Factory Owners (4), Brokers (5), Warehouses (5), Buyers (6), Sectoral actors (13)
Tourism	38 (2)	49 (2)	87	Sights & attractions (7), Local services (8), Hotels (11), Tour operator (inbound) (27), Travel agent (14), Tour operator (outbound) (12), Sectoral actors (8)
BPO/ITES**	49 (2)	53 (1)	102	Policy (7), Local firms (61), Firm Outsourcers (9), Consultants (6), Sectoral support & infrastructure (19)
Total	125	139	264	

Notes: *Some actors can play multiple roles in the value chain. Here we classify them by their principal role. ** As is outlined in more detail in “Analyzing Changing Connectivity,” we found the BPO sectors to be small, particularly in Rwanda where only a few firms existed. We thus also interviewed those providing ITES in the countries (such as local bill payment and application providers). Many of these firms had previously been involved (or have seriously considering entering) into the BPO space and thus this additional data provided insights into the failures of the sector to have significant impact.

qualitatively understand the sometimes subtle nature of power and control in GVCs. Interviews focused on core themes⁶ but were open-ended to allow flexibility. We also undertook eleven focus groups at two stages (midproject and end of the project) to verify our findings with interviewees and sectoral experts. Consequently, through intensive, cross-sectoral research, our research provides a substantive qualitative description of the changes in each sector, where the selection and sampling approach supports generalizability.

⁵ RDB is the Rwandan Development Board and ICTB is the Kenyan ICT Board. Both have attracted international clients for BPO firms.

⁶ In line with the research questions, our themes looked to explore how digital connectivity had changed firms, if improved connectivity had changed how firms engaged in production internationally, and how firms interacted with other firms.

The empirical material was analyzed using Nvivo 9 qualitative software for code-based searching and reporting (Gahan and Hannibal 1998; Van Hoven and Poelman 2003). A predefined set of themes was coded to explicitly explore some of the issues discussed in the literature review. Additionally, new themes also emerged during the coding process, which allowed more grounded influence of empirical research on findings. Emerging themes were subsequently examined in more detail, with some integrated into the core analysis, and others deemed outside the core scope of research.⁷ Coding thus followed well-established techniques of content analysis, which allow interpretations of relations between categories and emergent themes (Lutz and Collins 1993; Slater 1998; Krippendorff 2012).

Elsewhere we have gone into richer detail around the specific outcomes in the three sectors and their sectoral policy implications (Graham and Mann 2013; Waema and Katua 2014; Mann, Graham, and Friederici 2015; Foster and Graham 2015a, 2015b; Mann and Graham 2016). Here we present summaries of these sectors in order to answer our broader research question about the cross-sectoral impacts of connectivity on GVCs. “Analyzing Changing Connectivity” outlines key findings in each sector, with “The Uneven Impact of Changing Connectivity” subsequently highlighting cross-cutting findings that link back to the literature.

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Analyzing Changing Connectivity

Tea Sector

While the adoption of the Internet was rare among marginal actors in the East African tea sector (with, for example, very low Internet use among tea growers), we found that key local firms involved in processing and trade were adopting higher-speed Internet connections and were consequently adding to flows of digital data in the value chain. New flows included data around tea processing (sharing tea quality, weights, batches), tea trading (sharing auction lots, prices, market information) and tea logistics (sharing location data). However, while ICTs were increasingly recording and transmitting tea production activities, the benefits tended to accrue to the larger tea firms that coordinate the value chain.

Figure 1 outlines the value chain of tea in the region; lead firms in the chain are the large tea retailers as shown on the right of the diagram. Tea value chains are rapidly evolving in the region, and control over digital data is increasingly crucial to these changes. First, the tea sector has recently been privatized in Kenya and Rwanda, where private firms are often owned by subsidiaries of multinational tea firms. With the private-sector focus, there is demand for data for improved planning and management. Internet connectivity thus enables tea firms to more efficiently organize logistics and share data about the availability of processed tea to buyers at the retail end of the value chain (as shown on the right in Figure 1).

Second, there is growing demand in the tea retail market for differentiated products—environmental, fair trade, or quality teas (Ponte 2002). Crucial to the value add of these products is the *traceability* of tea—the ability to guarantee that tea batches have satisfied conditions around location, food safety, chemical use, fair labor. Data is thus in demand because it is integral to these value-added products.

Therefore, digital data flows have been particularly harnessed by multinationals to allow integrated analysis of tea production across multiple locations, by digitizing tea

⁷ For instance, emergent coding of discussions around firms in the tea sector highlighted *data access* as a crucial element of inclusion and exclusion that are discussed in more detail in the next section.

data from smaller and local tea processing sites to the Internet (on the left of Figure 1) and integrating factory data with auction, shipping, and logistics data through firm information systems (the intermediary firms in Figure 1). For instance, the manager of a firm in Kigali, Rwanda, whose firm owned four tea factories, highlighted how reliable Internet has facilitated new data flows and improved monitoring of tea.

[W]e have been able to achieve a lot of efficiencies, like we have integrated our ERP [Enterprise Resource Planning System]⁸ ... so once the factory dispatches ... they are able to see it when it reaches Mombasa [port] ... I think that kind of integration has brought efficiencies.

78 Such digital integration has supported the trend of improved control of value chains by lead firms. Digital flows also support the movement of innovation away from the fields and processing facilities in rural Rwanda and Kenya toward head offices in Mombasa, India, and the United States. For example, value-added teas, although embedded in the processes and data produced in East Africa, come into being during the blending process. It is here that standardized components are combined and configured by retail firms, supported by full chain traceability data.

Smallholder farmers and their associations⁹ were demanding more data in the tea sector. Tea privatization policies and a move to market orientation were leading to demand for information such as tea auction prices and tea growing knowledge. This information could allow them to increase prices and yields. Smallholder associations now have mobile Internet access, and thus they might serve as a conduit for information for farmers. However, many still struggled to access data: some complained that they did not know where to look (but were aware that useful information was available online), others complained that other value chain actors upchain were not sharing access to key information systems with them, and some found it difficult to search for information in English.

In sum, more reliable and cheaper Internet access has facilitated increased flows of digital data. But new digitalization is typically allowing GVCs to be more flexible and strengthening the management of the value chains. Where data flows integrate smaller firms in the region, without wider attempts, investments in upgrading (such as improved cooperatives and control of processing) gains from digital integration are captured elsewhere.

Tourism Sector

In tourism, improved Internet connectivity makes it possible for East African firms to better integrate with international tourism sites and services. We found that connectivity was enabling a number of firms to integrate with online services (e.g., online travel booking, online payments), to transmit tourism management data (e.g., booking availability, service information), and to use online resources to improve their visibility to customers (e.g., social media, websites). Through such resources, East African firms could better reach international customers and build stronger links up the value chain to international tour operators. However, there were technical barriers, particularly for small firms in the region. Many local firms had some form of Internet connection, but improvements were mainly restricted to small-scale efficiency gains in everyday

⁸ ERP is a type of information technology system that allows operational management and planning based on production data.

⁹ Typically cooperatives that serve to facilitate and support smallholder activities.

communication (e.g., e-mail communication, sending of photos) and gathering information online (e.g., flights, hotel costs).

In tourism in the region, the service value chain is composed of multiple local tourism services and sights that are packaged together, often by international tour operators. As shown in Figure 2 lead firms (on the right), particularly international tour operators (but potentially also domestic tour operators and travel agents) do the work of *packaging* a bundle of services together such as hotels, transport, and tours (Doerry 2008; Christian 2012). In recent years, value chains are changing in that customers or international tour operators are increasingly seeking to more dynamically package tours according to needs of specific customers.

A key driver of this more dynamic packaging is online data flows, which allows customers or upchain firms to quickly view availability, prices, and facilities, and make bookings and payments for a range of sights, services, and accommodation. There has been growing discussion around how smaller service providers and firms might be integrated into tourism value chains to support stronger development impacts (Mitchell 2012). One potential way of supporting this is through integration of East African firms into online tourist websites and services, which might allow more local service providers (often small firms) the ability to better attract international customers. Yet, such integration was found mainly in more-established firms and mainly in Kenya.

For domestic firms previously heavily involved in local tourism logistics, the presence of online integration was pushing them out of GVCs rather than integrating them. With digitization, international firms can now organize, schedule, or book online from afar, as described by one UK-based tour operator:

[previously to organize a tour] for each one of the places, then someone gets on the phone and books those places. Now obviously with technology that's changing a bit. Sometimes where there is a lot of fiddly stuff for us, a ground handler and DMC [domestic tour firm] works ... but that's relatively unusual for us.

For smaller service providers in the tourism sector, digital integration was limited by the technical skills and managerial requirements of system integration. Although online travel agents (OTA) (i.e., online booking such as Expedia, Kiyak, Hotels.com) are growing in popularity in the region, they require firms to adopt internal booking systems and coherent booking management. Even medium-sized hotels with higher-speed Internet might not have appropriate systems in place to integrate (for example, booking in such hotels may still be based on a paper diary or custom Excel spreadsheets). Even in cases when small hotels are able to link with OTAs, they struggle with inconsistent bookings and the demands of being part of the OTA.

More optimistic findings emerged from cases where local firms focused on niche markets or embraced new markets of tourism (e.g., regional tourism, emerging market tourists). For niche firms, even building basic online resources could provide an important avenue for discovery by customers when their strategies were novel. For instance, we found small but successful tour operators offering sports, community tourism, niche wildlife, and eco-tourism that were reporting significant proportions of new customers and contacts through their online presence. Typically customers would gather information about niche activities from web searches and social media recommendations. Information gathering could result in e-mail or telephone conversations, which in turn could lead to customers making further arrangements, reservations, and/or payments for activities.

In sum, and aligning with another study of ICT and tourism in East Africa (Murphy and Carmody 2015), all firms felt that Internet connectivity had provided efficiency gains and access to more information. However, the expected integration into online platforms was beyond the ability of many firms. Unlike the tea sector, barriers to entry and upgrading are lower in tourism, and there is room for innovative tourism entrepreneurs to use online resources to reach international customers, albeit at a relatively modest scale.

BPO/ITES Sector

BPO/ITES has been identified as a potential growth area for the region. In both countries, ITES firms had good Internet connectivity, particularly when located in urban zones with dedicated fiber links designed to support the communication needs of BPO and IT firms.

80 However, despite substantial national investment, strong government support, and reams of positive media publicity, we found a small and shrinking number of locally owned, export-oriented firms in Kenya and virtually no dedicated BPO firms in Rwanda. Many Kenyan firms were engaged in low-value work, and some were struggling for financial survival. In Rwanda, only a handful of firms were carrying out export-oriented service provision but in very niche sectors like computer-aided design engineering or accountancy. Where firms have survived, they have struggled to build direct relationships with international clients and have instead relied on a wide range of different intermediaries to access clients as highlighted in the emerging value chain in Figure 3.

Historically, BPO work has been facilitated through direct relationships between an international client and an outsourcing firm. This relationship is, however, evolving, as large BPO firms, consultants, and online platforms become lead actors in more extended value chains, facilitating further outsourcing work to smaller suppliers. Some Kenyan firms have been recipients of such outsourcing, particularly in the case of online platforms used by small firms to access digital work—such as guru.com, eLance, and oDesk. Although firms could gain access to direct inflows of international work from such platforms, the nature of work was short term and low value.

Higher-value contracts requiring more interaction with clients tended to occur through direct relationships. In Kenya, the main limitation was a lack of management capacity to undertake high-quality outsourcing work, particularly in terms of quality control and sufficient scaling. For example, an interviewee from Kenya who was considering bankruptcy described his problem in achieving scale:

[W]e approached a few people from [established BPO firms] and they told us that [they] have 100 people at daytime and 100 people at night. Here we are trying eight people in daytime and four at night ... We don't have the scale.

In light of the difficulties of accessing high-value, international work, some BPO firms have looked toward the local market. In Kenya, most of the interviewed firms were now mainly dependent on domestic clients. Local work opportunities were particularly attractive because Kenyan firms had direct interaction with clients and were thus less dependent on intermediaries. Local relationships with Kenyan firms also made domestic BPO firms more competitive in relation to foreign incumbents (Mann and Graham 2016).

In sum, on the surface BPO seemed to offer prospects for East African firms. The digital nature of work and lower labor costs of the region offer the possibility that with fiber connectivity the East African BPO sector would rapidly emerge, and engage in international BPO activities. However, in practice, policy makers and firms were struggling to build a strong position for themselves in GVCs, particularly in Rwanda. Kenya was somewhat successful in integrating into emerging value chains by sourcing low-value work from platforms and intermediaries. Yet in the sporadic cases where BPO sector firms have been able to be more successful, opportunity has come through developing a niche focus such as local markets and/or software.

The Uneven Impact of Changing Connectivity

Connectivity and Changing Value Chains

Changing connectivity has led to three key trends in value chains. First, digital data is becoming a crucial aspect in facilitating more discrete, standardized value chains in East Africa. Second, more dynamic GVCs are particularly supported by online systems and platforms. Third, customer needs and orientations have had an impact on how value chain products and processes are constituted, and these are often data led. These trends are detailed below.

Where East Africa firms are part of value chains, GVCs are marked by a move toward discrete production into standardized *chunks*. Digitization of value chains strengthens these trends, since legible data allows improved management and monitoring of GVCs (i.e., tea batches and standards, discrete outsourcing tasks). In East Africa, tighter specification of goods and processes has occurred alongside shifts from previous intensive regional coordination (i.e., tea boards in tea or inbound tourism firms) to standardized components or goods. Digital platforms and information systems were enabling more arm's-length interaction in value chains, reducing the need for regional coordination.

In hand with digitization, the growing digital information flows have affected the nature of value chain governance. In all three sectors, digital integration through online platforms and information systems is contributing to greater flexibility for lead firms in the suppliers of goods and services. In more advanced examples, such as online BPO platforms and online tourism, this supports lead firms and clients in the ability to rapidly switch across equivalent goods or services in different locations aided by digital systems.

New consumer innovations in these sectors, such as customized tourism or ethical teas, have had impacts on GVCs in East Africa. These innovations often depend on digital data flows. However, innovation and subsequent value capture tend to accrue to lead firms who were able to use digital data to support them in building and marketing products far away from the producers.

In sum, changing Internet connectivity has played an important role in changing the nature of GVCs in East Africa, moving toward flexible networks. Indeed, our evidence suggests that while ideas of flexible or *turn-key* networks have been discussed in the literature, these are only emerging in East Africa as a consequence of connectivity in the region. As flexible networks become more established, digital integration will no longer be optional and will rather become a core aspect of value chain integration.

Challenges for Smaller Firms in East Africa

East African firms seeking out international markets and trade have turned to the Internet to aid them. Our research found that connectivity has supported efficiency

gains and enhanced communication in and among firms. Previously marginal firms have begun to use simple tools, such as e-mail and Excel spreadsheets, and in all sectors, firms were increasingly using web searching for information to build knowledge and facilitate online support among employees. Such activities highlight a rich set of often creative activities that allow these firms to better integrate into networks of knowledge and improve their practices over time (Grant 2015). However, in general, though, we argue that findings align with the concept of *thin integration* discussed in Murphy and Carmody's (2015) key work on ICTs in Africa. Firms in the region do integrate, and make some small gains in terms of improved communication and productivity, but overall these forms of integration do not significantly challenge the status quo nor allow for substantive economic transformation. Digital integration is likely to only be beneficial to firms where it compliments broader investments and upgrading initiatives.

82 Indeed, trends toward more standardized products and flexible GVCs were often exclusionary for small firms. For instance, not all tea producers or BPO producers are able to meet export standards and requirements, and hence participation in GVCs may not be possible for them. Our work provides additional insights that digital integration can become an additional exclusionary barrier to GVC entry. Exclusionary digital barriers were akin to those from the digital divide literature. Internet access is now viable for small firms, but a wider set of capacities (i.e., skills, finance, systems) digitally excludes them from playing a more substantial role in GVCs (Warschauer 2003; Van Dijk 2005).

Even when firms were able to digitally integrate, more flexible GVCs, driven in part by the emergence of platforms and information systems, entailed reduced profits among East African actors, since their goods and services are more easily replaced. In more flexible GVCs lead firms might move to alternative suppliers when unfavorable conditions emerged.

As outlined previously, in flexible GVCs, innovation often results from the ways in which lead firms combine goods or services. In some cases, such as the tourism sector, lead firms cannot cater to all types of customers and customer needs. Here there was an opportunity for smaller firms. In niche areas (such as niche tourism or local BPO work), domestic firms could innovate in products and create new informal linkages built on digital resources. Such innovative activity could allow smaller firms to establish themselves with relatively novel products or new consumers, where competitive pressures from conventional GVCs were weaker.

Conclusion

This article has set out to explore the role that changing Internet connectivity has had on GVCs in East Africa, drawing on work in three sectors of production. Digitalization, online information systems, and/or platform integration are key drivers of standardized goods and services, and can enhance the ability for lead firms to implement more flexible turn-key GVCs involving actors in lower-income countries with management and control from afar.

For East African firms, standardized and flexible GVCs lead to potentially increasing marginalization and new risks. For those able to connect, online intermediaries—systems integration and online platform—are accelerating the granular management and dynamic switching of value chains. In sectors like tourism, this changing form of value chain governance has led to significant risks for firms in terms of less stable business and higher competition in broader markets. For smaller firms, barriers to GVC participation described in the literature, such as standards and product quality, are heightened by digital integration requirements, beyond the skills and capabilities of such firms.

Thus, the expected core benefits of Internet connectivity—global access to markets and knowledge—have not greatly benefited firms in East Africa. Improving connectivity has generally resulted in thin integration, through which small firms tend to make small communication and productivity improvements without more substantial upgrading. Exceptions to this pattern are firms who have been able to develop niches and build novel markets that conventional GVCs struggle to serve. Such a finding suggests that improved connectivity works as a complement to creativity and local knowledge (Adelman 1984).

These findings have implications for how the regions' policy makers consider opportunities for firms. The impact of connectivity will not come from solely *plugging* the region into better connectivity. Connectivity is only one step in achieving economic benefits. The focus must shift away from seeing connectivity as an end in itself and move toward to a better understanding about the role that new digital resources plays in reorientating the value chains that are central to export-oriented activities in East Africa. Barriers for East African firms come not only in the lack of digital access but also in the digital skills and resources they have. Moreover, value capture and governance are increasingly entwined with the digital. It is, therefore, important to also explore who exerts control over the digital and how governance might change. Thus, researchers must endeavor to give closer consideration to prevalent forms of codification, digitization, and access to digital resources, in order to better understand the limitations of digital integration and how firms operating on the margins of the global economy might use digital technologies to capture more value.

Examples of more favorable conditions have also emerged in instances where firms have been able to access and use the Internet for establishing new competitive advantages and niches. Thus, rather than looking at digital connectivity as the means of competing in already established GVCs, East African firms may want to identify their competitive advantages and consequently rethink how connectivity might enhance these advantages.

For economic geography, this work poses a challenge to better explore changing relations of economic production in low-income countries. Our work attempts to concentrate scholarly attention on who exerts control over the digital in core economic geography debates around governance, upgrading, and value in GVC analysis. As ever more people and firms connect to the Internet, these questions will become more and more important in the years to come.

References

- Adelman, I. 1984. Beyond export-led growth. *World Development* 12 (9): 937–49. DOI:10.1016/0305-750X(84)90050-0.
- Aker, J. C. 2010. Information from markets near and far: Mobile phones and agricultural markets in Niger. *American Economic Journal: Applied Economics* 2 (3): 46–59.
- Bair, J., and Werner, M. 2011. The place of disarticulations: Global commodity production in La Laguna, Mexico. *Environment and Planning A* 43 (5): 988–97. DOI:10.1068/a43505.
- Barrientos, S., Gereffi, G., and Rossi, A. 2011. Economic and social upgrading in global production networks: A new paradigm for a changing world. *International Labour Review* 150 (3–4): 319–40. DOI:10.1111/j.1564-913X.2011.00119.x.
- Carmody, P. 2012. The informationalization of poverty in Africa? Mobile phones and economic structure. *Information Technologies and International Development* 8 (3): 1–17.
- Castells, M. 2000. *The rise of the network society*. Oxford: Blackwell.

- Christian, M. 2012. *Economic and social up (down)grading in tourism global production networks: Findings from Kenya and Uganda*. Capturing the Gains Working Paper 11. Manchester, UK: University of Manchester.
- Coe, N. M., Dicken, P., and Hess, M. 2008. Introduction: Global production networks—Debates and challenges. *Journal of Economic Geography* 8 (3): 267–69. DOI:10.1093/jeg/lbn006.
- Dangi, N., and Singh, H. 2010. E-choupal: Hope or hype? *American Journal of Economics and Business Administration* 2 (2): 179–84. DOI:10.3844/ajebasp.2010.179.184.
- Dicken, P. 2011. *Global shift: Transforming the world economy*. 6th ed. London: Guildford Press.
- Doerry, S. 2008. Business relations in the design of package tours in a changing environment: The case of tourism from Germany to Jordan. In *Tourism and mobilities: Local-global connections*, ed. P. Burns and M. Novelli, 204–18. Oxfordshire, UK: CAB International.
- Dolan, C. S. 2010. Virtual moralities: The mainstreaming of fairtrade in Kenyan tea fields. *Geoforum* 41 (1): 33–43. DOI:10.1016/j.geoforum.2009.01.002.
- Donner, J. 2004. Microentrepreneurs and mobiles: An exploration of the uses of mobile phones by small business owners in Rwanda. *Information Technologies and International Development* 2 (1): 1–21. DOI:10.1162/itid.2004.2.issue-1.
- Donner, J., and Escobari, M. 2010. A review of evidence on mobile use by micro and small enterprises in developing countries. *Journal of International Development* 22 (5): 641–58. DOI:10.1002/jid.v22.5.
- Eggleston, K., Jensen, R., and Zeckhauser, R. 2002. Information and communication technologies, markets, and economic development. In *The global information technology report 2001*, ed. G. Kirkman, P. K. Cornelius, and J. D. Sachs, 62–74. Oxford: Oxford University Press.
- Esselaar, S., Stork, C., Ndiwalana, A., and Deen-Swarray, M. 2007. ICT usage and its impact on profitability of SMEs in 13 African countries. *Information Technologies and International Development* 4 (1): 87–100. DOI:10.1162/itid.2007.4.issue-1.
- Fold, N. 2001. Restructuring of the European chocolate industry and its impact on cocoa production in West Africa. *Journal of Economic Geography* 1 (4): 405–20. DOI:10.1093/jeg/1.4.405.
- . 2014. Value chain dynamics, settlement trajectories and regional development. *Regional Studies* 48 (5): 778–90. DOI:10.1080/00343404.2014.901498.
- Fold, N., and Gough, K. V. 2008. From smallholders to transnationals: The impact of changing consumer preferences in the EU on Ghana's pineapple sector. *Geoforum* 39 (5): 1687–97. DOI:10.1016/j.geoforum.2008.06.004.
- Food and Agriculture Organization. 2013. *FAOStat database*. Rome: Food and Agricultural Organization. <http://faostat.fao.org/>
- Foster, C., and Graham, M. 2015a. *The Internet and tourism in Rwanda: Value chains and networks of connectivity-based enterprises in Rwanda*. Oxford: Oxford Internet Institute. https://www.oii.ox.ac.uk/archive/downloads/publications/The_Internet_and_Tourism_in_Rwanda.pdf.
- . 2015b. Connectivity and the tea sector in Rwanda. *The Internet and tourism in Rwanda. Project Report*. Oxford: Oxford Internet Institute. <http://cii.oii.ox.ac.uk/tea-report/>.
- . 2017. Reconsidering the role of the digital in global production networks. *Global Networks* 17 (1): 66–88. DOI:10.1111/glob.12142.
- Foster, C., Graham, M., and Waema, T. Forthcoming. Making sense of digital disintermediation and development: The case of the Mombasa tea auction. In *Digital economies at global margins*, ed. M. Graham and N. Friederici. Cambridge, MA: MIT Press.
- Foster, C. G., and Heeks, R. B. 2013. Conceptualising inclusive innovation: Modifying systems of innovation frameworks to understand diffusion of new technology to low-income consumers. *European Journal of Development Research* 25 (3): 333–55. DOI:10.1057/ejdr.2013.7.
- Gahan, C., and Hannibal, M. 1998. *Doing qualitative research using QSR NUD* IST*. London: Sage.
- Gereffi, G. 1994. The organization of buyer-driven global commodity chains: How U.S. retailers shape overseas production networks. In *Commodity chains and global capitalism*, ed. G. Gereffi, and M. Korzeniewicz. 95–122. Westport, CT: Praeger.

- . 2001. Shifting governance structures in global commodity chains, with special reference to the Internet. *American Behavioral Scientist* 44 (10): 1616–37. DOI:[10.1177/00027640121958087](https://doi.org/10.1177/00027640121958087).
- . 2014. Global value chains in a post-Washington Consensus world. *Review of International Political Economy* 21 (1): 9–37. DOI:[10.1080/09692290.2012.756414](https://doi.org/10.1080/09692290.2012.756414).
- Gereffi, G., Humphrey, J., and Sturgeon, T. 2005. The governance of global value chains. *Review of International Political Economy* 12 (1): 78–104. DOI:[10.1080/09692290500049805](https://doi.org/10.1080/09692290500049805).
- Government of Kenya. 2007. *Kenya vision 2030: A popular version*. Nairobi: Government of Kenya.
- Government of Rwanda. 2009. *Rwanda vision 2020*. Kigali: Government of Rwanda.
- Graham, M. 2014. A critical perspective on the potential of the Internet at the margins of the global economy. In *Society and the Internet: How networks of information and communication are changing our lives*, ed. M. Graham and W. Dutton, 301–18. Oxford: Oxford University Press.
- . 2015. Contradictory connectivity: Spatial imaginaries and technomediated positionalities in Kenya's outsourcing sector. *Environment and Planning A* 47 (4): 867–83. DOI:[10.1068/a140275p](https://doi.org/10.1068/a140275p).
- Graham, M., Andersen, C., and Mann, L. 2015. Geographical imagination and technological connectivity in East Africa. *Transactions of the Institute of British Geographers* 40 (3): 334–49. DOI:[10.1111/tran.12076](https://doi.org/10.1111/tran.12076).
- Graham, M., and Mann, L. 2013. Imagining a silicon savannah? Technological and conceptual connectivity in Kenya's BPO and software development sectors. *Electronic Journal of Information Systems in Developing Countries* 56 (2): 1–19.
- Grant, R. 2015. *Africa: Geographies of change*. Oxford: Oxford University Press.
- Henderson, J., Dicken, P., Hess, M., Coe, N., and Yeung, H. W.-C. 2002. Global production networks and the analysis of economic development. *Review of International Political Economy* 9 (3): 436–64. DOI:[10.1080/09692290210150842](https://doi.org/10.1080/09692290210150842).
- Humphrey, J., Mansell, R., Paré, D., and Schmitz, H. 2003. *Reality of e-commerce with developing countries*. London: LSE.
- James, J. 2013. *Digital interactions in developing countries: An economic perspective*. Abingdon, UK: Routledge.
- Jung, J. Y., Qiu, J. L., and Kim, Y.-C. 2001. Internet connectedness and inequality beyond the “divide.” *Communication Research* 28 (4): 507–35. DOI:[10.1177/009365001028004006](https://doi.org/10.1177/009365001028004006).
- Kaplinsky, R., and Morris, M. 2001. *A handbook for value chain research*. Ottawa, Canada: IDRC.
- Krippendorff, K. 2012. *Content analysis: An introduction to its methodology*. London: Sage.
- Kumar, R. 2014. Elusive empowerment: Price information and disintermediation in soybean markets in Malwa, India. *Development and Change* 45 (6): 1332–60. DOI:[10.1111/dech.2014.45.issue-6](https://doi.org/10.1111/dech.2014.45.issue-6).
- Lee, J., Gereffi, G., and Beauvais, J. 2012. Global value chains and agrifood standards: Challenges and possibilities for smallholders in developing countries. *Proceedings of the National Academy of Sciences* 109 (31): 12326–31. DOI:[10.1073/pnas.0913714108](https://doi.org/10.1073/pnas.0913714108).
- Liedholm, C., and Mead, D. C. 1999. *Small enterprises and economic development: The dynamics of micro and small enterprises*. London: Routledge.
- Lutz, C. A., and Collins, J. L. 1993. *Reading national geographic*. Chicago: University of Chicago Press.
- Malecki, E. J., and Moriset, B. 2007. *The digital economy: Business organization, production processes and regional developments*. London: Routledge.
- Mann, L., and Graham, M. 2016. The domestic turn: Business process outsourcing and the growing automation of Kenyan organisations. *Journal of Development Studies* 52 (4): 530–48. DOI:[10.1080/09669582.2012.663378](https://doi.org/10.1080/09669582.2012.663378).
- Mann, L., Graham, M., and Friederici, N. 2015. The Internet and business process outsourcing in East Africa: Value chains and networks of connectivity-based enterprises in Kenya and Rwanda. Oxford: Oxford Internet Institute. https://www.oii.ox.ac.uk/archive/downloads/publications/The_Internet_and_Business_Process_Outsourcing_in_East_Africa.pdf.

- Mitchell, J. 2012. Value chain approaches to assessing the impact of tourism on low-income households in developing countries. *Journal of Sustainable Tourism* 20 (3): 457–75. DOI:10.1080/09669582.2012.663378.
- Molla, A., and Heeks, R. 2007. Exploring e-commerce benefits for businesses in a developing country. *Information Society* 23 (2): 95–108. DOI:10.1080/01972240701224028.
- Moodley, S. 2003. The promise of e-business for less developed countries. *International Journal of Electronic Business* 1 (1): 53–68. DOI:10.1504/IJEB.2003.002165.
- Murphy, J. T., Carmody, P., and Surborg, B. 2014. Industrial transformation or business as usual? Information and communication technologies and Africa's place in the global information economy. *Review of African Political Economy* 41 (140): 264–83. DOI:10.1080/03056244.2013.873024.
- Murphy, J. T., and Carmody, P. R. 2015. *Africa's information revolution: Technical regimes and production networks in South Africa and Tanzania*. Chichester, UK: Wiley.
- National Institute of Statistics Rwanda. 2014. *Statistical yearbook 2014*. Kigali: National Institute of Statistics Rwanda.
- Neilson, J., and Pritchard, B. 2011. *Value chain struggles: Institutions and governance in the plantation districts of south India*. Hoboken, NJ: Wiley.
- Ouma, S. 2010. Global standards, local realities: Private agrifood governance and the restructuring of the Kenyan horticulture industry. *Economic Geography* 86 (2): 197–222. DOI:10.1111/ecge.2010.86.issue-2.
- Ponte, S. 2002. The 'latte revolution'? Regulation, markets and consumption in the global coffee chain. *World Development* 30 (7): 1099–122. DOI:10.1016/S0305-750X(02)00032-3.
- Ponte, S., and Gibbon, P. 2005. Quality standards, conventions and the governance of global value chains. *Economy and Society* 34 (1): 1–31. DOI:10.1080/0308514042000329315.
- Sarkar, M. B., Butler, B., and Steinfield, C. 1995. Intermediaries and cybermediaries. *Journal of Computer-Mediated Communication* 1 (3): 1–14.
- Slater, D. 1998. Analysing cultural objects: Content analysis and semiotics. In *Researching society and culture*, ed. C. Searle, 233–44. London: Sage.
- Song, S. 2014. Hilary: note that all of a sudden they put a period after the doi number. African undersea cables. <https://manypossibilities.net/african-undersea-cables/>.
- Sprague, K., Griepink, F., Manyika, J., Moodley, L., Chappuis, B., Pattabiraman, K., and Bughin, J. 2014. *Offline and falling behind: Barriers to Internet adoption*. Washington, DC: McKinsey.
- Sturgeon, T. J. 2002. Modular production networks: A new American model of industrial organization. *Industrial and Corporate Change* 11 (3): 451–96. DOI:10.1093/icc/11.3.451.
- UN Comtrade. 2017. United Nations commodity trade statistics database. <https://comtrade.un.org>.
- Van Dijk, J. A. 2005. *The deepening divide: Inequality in the information society*. Thousand Oaks, CA: Sage.
- Van Hoven, B., and Poelman, A. 2003. Using computers for qualitative data analysis: An example using NUD. IST. *Journal of Geography in Higher Education* 27 (1): 113–20. DOI:10.1080/03098260120084403522.
- Waema, T., and Katua, C. 2014. The promises of fibre-optic broadband in tourism and tea sectors: A pipeline for economic development in East Africa. Project report. Nairobi: University of Nairobi.
- Warschauer, M. 2003. Dissecting the "digital divide": A case study in Egypt. *Information Society* 19 (4): 297–304. DOI:10.1080/01972240309490.
- World Bank. 2005. *E-development: From excitement to effectiveness*. Washington, DC: World Bank.
- . 2016a. *World development report 2016: Digital dividends*. Washington, DC: World Bank.
- . 2016b. *World bank national database*. Washington, DC: World Bank. <http://data.worldbank.org/>.
- World Travel and Tourism Council. 2013. *Travel and tourism economic impact 2013*. London: World Travel and Tourism Council. <http://www.wttc.org/research/economic-impact-research/> (no longer available).