



Radboud University



DFID Research Project:
*'Enabling Innovation and Productivity Growth in Low
Income Countries (EIP-LIC)'*

Country Report Ethiopia



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<http://www.tilburguniversity.edu/dfid-innovation-and-growth/>

Acknowledgments

In 2013, the Department for International Development (DFID) awarded a grant to Tilburg University and Radboud University Nijmegen for a 5-years research project ‘Coordinated Case Studies – Innovation for Productivity Growth in Low Income Countries’ (PO 5639)¹. The sizeable research project, implemented in cooperation with academic institutions in African and Asian countries, resulted in an extensive series of scientific papers and reports, databases and more practical policy oriented documents.

This report presents the findings of the research activities in Ethiopia. We hope that it is informative for policy makers within governmental agencies, donors and NGOs involved in the promotion of innovation in manufacturing SMEs in Ethiopia and the region. It is also targeted at SME owners and SME branch organisations who could use the report as reference material for reflecting on and formulating the management and business strategies. For the academic community with similar research interests, it may provide useful insights to providing ideas or supporting them to identify and/or validate research questions and hypotheses.

On behalf of Tilburg University and Radboud University Nijmegen we would like to thank the British people and DFID, in particular the Growth Research Team, for the support in this project. The qualitative research field work in Ethiopia was the result of a fruitful cooperation with the Ethiopian consultant Mr. Beyene Gizaw. We are grateful for organising and participating in the interviews and sharing his valuable observations and thoughts.

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¹ The research project was later renamed into Enabling Innovation and Productivity Growth in Low Income Countries’ (EIP-LIC).

Basic data of the project

Project title	‘Enabling Innovation and Productivity Growth in Low Income Countries’ (EIP-LIC). Formerly: ‘Coordinated Case Studies – Innovation for Productivity Growth in Low Income Countries’.
DFID RP reference number	PO 5639
Project objective	To fill research gaps in the understanding of factors, institutions and policies that can increase innovation and productivity in low-income countries in Africa and Asia.
Project period	1 May 2013 – 30 September 2018
Lead partner	Tilburg University Project Director: Prof. Lex Meijdam (e-mail: a.c.meijdam@tilburguniversity.edu) Coordinator: Jaap Voeten (e-mail: j.voeten@tilburguniversity.edu)
Partner	Radboud University Nijmegen Prof. Patrick Vermeulen (e-mail: p.vermeulen@fm.ru.nl)
Countries of study	Kenya, Tanzania, Vietnam, Ethiopia, Uganda, Ghana, South Africa, India, Indonesia, Bangladesh
Project website	www.tilburguniversity.edu/dfid-innovation-and-growth

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Executive summary

From 2013 to 2018, the British Department for International Development (DFID) funded a research project on innovation and productivity growth with special reference to low income countries (LICs), implemented by Tilburg University and Radboud University Nijmegen. The project focused on understanding the factors, institutions, and policies that can increase business innovation and productivity growth, particularly in manufacturing small and medium sized enterprises (SMEs). The research was organised within two thematic areas: ‘Innovation Systems’ and ‘Finance for Productivity Growth’. Research teams conducted the field work in ten countries in Africa and Asia, including Kenya, Tanzania, Vietnam, Ethiopia, Uganda, Ghana, South Africa, India, Indonesia and Bangladesh. Various academic institutions and World Bank offices in these countries were actively engaged as partners in the research.

A key feature of the project is the combined quantitative and qualitative research approaches involving enterprise surveys, randomised control trials (RCTs) and case studies. The collection of original data resulted in a series of scientific papers, reports, policy briefs and open-access databases. The research output is targeted at academics in development research as well as at innovation policy makers within governments, businesses and development agencies, with a view to valorising research outcomes and promoting evidence-based policy making.

The research was structured around the following set of research questions, initially formulated by DFID to frame the research:

- What firm-level and regional-level factors hinder or foster the engagement of firms in innovative activities and commercialise the outcomes of their innovative activities?
- What is the impact of in-house innovation activities versus collaborative innovative activities or technology acquisition activities on the innovative performance of firms in developing countries?
- What is the role of economic spillovers within clusters of firms in fostering economic growth and innovation?
- What are the most critical barriers to the process of innovation and the diffusion of technology?
- What types of links between the public/private sectors, universities, governments, NGOs and the private sector are most conducive to innovation activity?
- What is the role of demand side versus supply side policies?

In the course of the project implementation, new research questions emerged. Both original and emerged research questions were addressed in the various scientific outputs.

This ‘Ethiopia Country Report’ presents an overview of the scientific output and policy implications. The scientific output comprises a qualitative research report identifying research and policy issues in Ethiopia, three papers within the ‘Finance and Productivity Growth’ theme and three papers within the ‘Innovation Systems’ theme. Not all papers analyse data from Ethiopia, yet the findings of papers on neighbouring countries are relevant as well in the context of this report. In Annex 1 a comprehensive list of all research working papers written in the framework of EIP-LIC is presented. The key DFID/World Bank survey findings for Ethiopia are presented in Annex 2 and the research addressing the original DFID questions with regard to Ethiopia is presented in Annex 3.

Qualitative research

The qualitative report is based on data collected through open semi-structured interviews with owners and managers of SMEs in Addis Ababa and the surrounding area in June 2017. The qualitative report provides context to validate, compare and complement existing theory in literature and research design and hypothesis development with contemporary bottom-up realities on the ground in Ethiopia, as perceived by manufacturing SME owners and managers. Specifically, the case descriptions illustrate the different ways in which companies in Ethiopia introduce new products, processes, technology, or machinery.

The interviewed companies in Ethiopia all introduce small incremental changes to raise productivity and competitiveness. Although the new products and processes in the innovative companies are not radical and not 'new to the world', they are new for the companies or Ethiopian market. In all cases, it is the owner who initiates, coordinates and manages the new ideas, including preparations for the innovation, technical details, and the product launch. The interviewed owners and managers perceive a positive business environment in terms of opportunities, in particular with regard to import substitution; they see that there are many imported goods on the local market that could be produced in a more cost-efficient way. The formal institutional context is ambiguous however. On the one hand, most of the companies, in one way or another, benefitted from governmental development and support programmes for small business. On the other hand, institutional stability and transparency is not improving, according to many interviewed SME owners and managers. Regarding policies to promote innovation, there is no clear regulatory or policy framework for manufacturing SMEs.

Finance for productivity growth

The first scientific paper within the 'Finance for Productivity Growth' theme investigates the relationship between bank credit and trade credit in Ethiopia: whether usage of trade credit decreases with access to bank credit, or whether the use of trade credit and bank credit are positively associated. The findings suggest that bank finance and trade credit are substitutes in Ethiopia. In locations with lesser access to formal bank finance, the use of trade credit is higher. The extension of trade credit by suppliers generates a credible signal to banks with regard to the customers' creditworthiness, which can make trade credit and bank credit complementary on the individual firm-level. For informal retailers, bank credit acts as a counterpart to trade credit in the sense that higher bank loan exposure is associated with greater access to trade credit. For formal firms, however, the research reveals that having more bank loans is not a significant explanatory factor of the use of trade credit. Financial inclusion has been a key topic in development policy debates in many underdeveloped countries, but most policy initiatives address the direct effect of bank credit constraints. This research stresses the importance of the role of informality in understanding the association between trade credit and bank credit. Facilitating trade credit and bank credit could mutually strengthen each other, for instance, in combined policy and development programmes integrating the two. Policies to expand financial inclusion by increasing operational transparency might alleviate the agency problems of informal enterprises vis-à-vis suppliers and enable them to obtain not only formal finance from banks but also informal finance in the form of trade credit.

The second scientific paper within the 'Finance for Productivity Growth' theme investigates the determinants of - and the barriers to - the adoption of a profitable financial technology by SMEs in Kenya. The research is relevant for Ethiopia since the adoption of new technologies is comparable in the Ethiopian economic context. Specifically, the study involves a field experiment focusing on the adoption of mobile-money as a payment technology by restaurants and pharmacies in Nairobi. The field experiment studied the factors that foster adoption of mobile money technologies by SMEs, and the barriers to its adoption. The research team offered a randomly selected sample of restaurants and pharmacies the opportunity to sign up for mobile-money technology which allows efficient mobile-money based transactions between a business and a customer. The study found

that over 60% of restaurant owners/managers signed up for the new technology, whereas adoption rates were about 20% among pharmacies. The research suggests that policies and programmes to promote new technology adoption could be best designed by addressing (situational) barriers, particularly bureaucratic barriers and lack of information. A government programme providing free mobile technology, a relatively low-cost intervention, would bring substantial commercial benefits for SMEs. Moreover, such an intervention would repay itself in terms of increased taxation revenues. Providing free technology might also result in a ‘tipping point’ being reached, when non-adopting SMEs switch to the mobile technology because it has become common practice. This would also moderate the effect of the status quo bias.

The third scientific paper within the ‘Finance for Productivity Growth’ theme analysis interactions between access to finance and employment creation for educated workers in Uganda. This country is comparable to Ethiopia in terms such financial constraints and skilled labour issues. The research shows that the extent to which micro and small businesses expand skilled employment, as their sales and profits increase, depends significantly on access to external funding. Firms with positive performance and a bank loan will hire more trained and experienced employees. Thus, growing and profitable small businesses create more jobs for trained and experienced workers - which is interpreted as demand for skill - if they have access to external finance. Regarding policy, the research findings underline the importance of well-developed financial systems for policies focusing on job creation. Firms with greater financial flexibility are more likely to hire skilled labour once their performance improves. For policy makers focusing on the challenge of creating formal and permanent jobs in a developing society, devising a complementary financial sector policy is equally important. The policy should go beyond helping firms directly to strengthening efficient financial systems and credit programmes as well. Better access to external funding can thus be an accelerator of human capital investment demand and growth. Policy makers must also acknowledge that firms which are financially constrained save a greater proportion of their additional profits (or pay other expenses associated with financial constraints) and therefore cannot invest further in greater levels of employment.

Innovation systems

The first scientific paper within the ‘Innovation Systems’ theme assesses the effect of different forms of labour flexibility on innovation during downsizing across nine developing countries in Africa and South Asia. The nine countries compare well with Ethiopia in terms of economic structure and growth, policy and political context and business dynamics. The results of the study described on the paper suggest that downsizing a firm’s workforce negatively impacts process innovation in SMEs in emerging nations. However, the study indicates that labour flexibility can be a way for firms to overcome the innovation challenges associated with downsizing. The researchers find that both numerical flexibility, namely the use of temporary employment, as well as functional flexibility such as employee training, can alleviate the negative impact of downsizing on innovation. Regarding policy implications, the research suggests that managers of SMEs take functional flexibility into account in their business strategies, because an increasing percentage of employees having received training will positively moderate the relationship between downsizing and innovation. Focusing on the psychological impact downsizing has on the remaining employees, employability as a human resources management strategy could be a substitute for employment security during downsizing to protect their psychological contract with the firm. Managers could thus consider functional flexibility as a means to mitigate downsizing’s negative effect on innovation. In particular, firms might consider training a core group of staff to distribute existing knowledge among the remaining firm members, to create new knowledge as well as to increase employees’ employability.

The second paper analyses the relationship between gender diversity and innovation output of firms in a series of low income countries in Africa and Asia, comparable to Ethiopia. The research shows that gender diversity at all levels in the organisation has a positive effect on innovation. Furthermore, the research illustrates that a

country's level of economic opportunity for women plays an important role in the relationship between gender diversity and innovation. Policy makers must acknowledge the value of gender diversity for innovation and create awareness among managers and employees that innovation emerges and blossoms from gender diversity at the firm level. Government agencies could develop special policies and programmes which encourage and support firms to hire a more gender-balanced workforce, secure more female top managers, and develop a gender diverse ownership structure. This could take the form of awareness raising programmes explaining the particular benefit of gender diversity for a firm's likelihood to innovate. Furthermore, the introduction of tax advantages, subsidies or other incentives targeted at increased gender diversity at all hierarchical levels within a firm could be a driver for increased gender balance. An additional avenue for policy makers is to encourage a social perception of women as being equally valuable members of society, with the same rights and obligations as men.

The third scientific paper investigated the bi-directional relationship between innovation and exporting in four countries in Sub-Saharan Africa. The research finds that the relation between innovation and subsequent exporting is positive and significant. The other way around, there is a positive but non-significant relation between exporting and subsequent innovation. The research further indicates that market creation mediates the innovation-exporting relationship because the innovation process entails the introduction of new products and services to the marketplace. Moreover, customer feedback mediates the relation between exporting and innovation to a large extent. Innovation policies aimed at fostering product innovation by providing incentives may be crucial for exporting. Customer feedback mediates the exporting-innovation relation to a very large extent. Therefore, policies focusing on information and communications technology infrastructure investment are vital in enabling faster response to market needs. Additionally, export promotion policies encompassing instruments such as export subsidies are likely to play a key role in stimulating innovation.

Highlights of DFID/World Bank EIP-LIC survey Ethiopia

Annex 2 and 3 present the highlights of the World Bank/EIP-LIC survey. In fact, two waves of data from the 2015 World Bank Enterprise Survey (WBES) and the 2016 Innovation Capabilities Survey (ICS) were used. The WBES includes 848 firms in Ethiopia. The ICS is a follow-up and complementary to the WBES. The ICS comprises 204 randomly selected manufacturing firms in the WBES sample making its sample a subset of the WBES sample. The ICS focuses on innovative activities and innovative capabilities of manufacturing firms, and is a collaboration between the World Bank and EIP-LIC. The raw dataset used in this report was created by merging the two waves of data collected from the WBES and the ICS by means of the unique firm identifiers for firms in six regions.

Amongst others, annex 2 and 3 highlight several important descriptive statistics capturing variables such as turnover, number of fulltime employees, labour productivity, and gender diversity of firms in six regions in Ethiopia. It is observed that the sampled firms report relatively large proportions of direct exports. This suggests that the customs and business regulatory environment facilitate direct exporting in Ethiopia. This report also highlights the topic of innovation where reported measures of innovation, innovation activities, sources of information for innovation, and barriers to innovation are discussed extensively. It is observed that R&D activities are regarded as less important innovation activities relative to new equipment and formal training. This indicates that firms are more likely to invest in physical assets including equipment, machinery, or software and formal training for developing human capital as opposed to internal and external R&D. Customer feedback and the internet are the most important sources of information for innovation. Dynamic capabilities including commercialization of new products and services and knowledge acquisition are apparent in manufacturing firms in Ethiopia. Furthermore, on average, firms in Ethiopia trust their business partners much more than they trust government institutions. The role of gender diversity is critical in fostering innovation performance. Female workforce participation is positively associated with innovation performance in Ethiopia. This indicates that the

role of women in driving the innovation process should be emphasized especially in the manufacturing industry which is likely to be male-dominated.

Research and policy dissemination

Based on the research outcomes, EIP-LIC produced series of policy briefs on promoting innovation in manufacturing SMEs in LICs, targeted at a broad audience of policy makers. Innovation policy makers are usually understood to be government officials and staff within various ministries (S&T, industrialization, higher education and economic planning). However, innovation policies and strategies are equally designed and implemented by managers, business owners and branch organizations in the private sector. Likewise, development agencies, donors and NGOs also consider and integrate (inclusive) innovation policies in their programs and projects. All these actors mutually interact and could be enrolled in networks that promote and enable innovation in manufacturing SMEs in LICs. It is envisaged that all these various stakeholders will make use of the EIP-LIC policy output.

The research output is accessible at the project website www.tilburguniversity.edu/dfid-innovation-and-growth. The output includes the academic reports and papers, the open access databases, a series of policy briefs and videos illustrating some key research findings and policy messages.

1 Introduction

The promotion of innovation in Low Income Countries (LICs) and emerging economies has recently appeared on the agenda of policy-makers and international development agencies. Many agree that innovation is crucial in these countries, because it is fundamental for growth in order to catch up with middle and high income economies (Chaminade et al., 2010). Current research, theory development and policy formulation to promote innovation, however, have mainly focused on innovation in the more advanced economies, whilst investigation of these issues in low income countries to date has been limited.

The 5-year research project '*Enabling Productivity and Innovation in Low Income Countries (EIP-LIC)*,' funded by the British Department for International Development (DFID) and commissioned to Tilburg University and Radboud University, aims to fill research gaps on innovation in LICs from an economic perspective. EIP-LIC aims to deliver robust high quality evidence from Africa and Asia on how to increase innovation and raise productivity in manufacturing SMEs, through a coordinated set of thematic and country case studies providing internationally comparable data. The research has been organized within two thematic areas: 'Innovation System' and 'Finance for Productivity Growth'. The countries of study include Kenya, Tanzania, South Africa, Ghana, Ethiopia, Uganda, Vietnam, Indonesia, India and Bangladesh.

EIP-LIC focuses on manufacturing Small and Medium-sized Enterprises (SMEs) in LICs. Promoting innovation in these enterprises has a particularly positive impact on development (Szirmai et al., 2011): SMEs are usually operating on the boundary of the formal and informal sector and have low levels of productivity and competitiveness. Compared to the agriculture and services sectors, manufacturing in LICs is typically characterised by a limited share of the total GDP. Innovation within SMEs in manufacturing enables these enterprises to raise productivity and grow, resulting in a better-balanced economic structure while generating employment opportunities for poorer groups and contributing to poverty reduction. Moreover, promoting innovation in domestic manufacturing is a way towards import substitution and increases the competitive (export) position of firms on the world market.

The project collected primary data via enterprise surveys in collaboration with the World Bank, conducted randomized control trials (RCTs) and carried out qualitative case studies in all countries of study leading to a series of research papers and articles published in top journals and policy briefs. All written output is available at the project website: www.tilburguniversity.edu/dfid-innovation-and-growth

This 'Ethiopia Country Report' presents a summary of the key findings of EIP-LIC research of Ethiopia and the associated policy implications. Chapter 2 sets out the overall project approach of EIP-LIC. In chapter 3, the report introduces the SME manufacturing sector by providing some key findings and context of the qualitative study. Chapter 4 present presents summaries of three research papers and policy implications developed within the 'Finance for Productivity Growth' theme. Chapter 5 presents summaries of three research papers and policy implications developed within the 'Innovation Systems' theme. The policy implications in chapter 3, 4 and 5 are intended for government agencies, donors, NGOs, branch organization or others to could take into consideration in their efforts to promote innovation in manufacturing SMEs in Ethiopia. Annex 2 and 3 present the key survey findings as well as the data addressing the research question articulated by DFID in the original project proposal.

2 Project approach and methodology

In 2012, DFID identified the need for research in this field, and set the terms of reference for project proposals. Tilburg University's successful proposal focused on an overall goal to contribute to innovation and growth and raise productivity in low income countries (LICs), leading to job creation and poverty reduction. The project aims to strengthen evidence-based policy making on innovation and productivity issues in developing countries. At the direct operational and output level, its framework comprises three areas of activity:

1. Research: open-access datasets and written research output (working papers, submitted articles and reports) on productivity and innovation applicable to developing countries.
2. Policy and research uptake materials and dissemination.
3. Capacity development, to train and engage researchers in developing countries in policy relevant innovation research. The project includes a capacity building component including PhD seminars on research methods applied in the DFID project.

The approaches and methodologies involved in 'Research' and 'Policy and Research Uptake' are further described in paragraphs 2.1 and 2.2 respectively. The capacity development component was of lesser importance in the project and is not discussed in this report.

Project organisation

In terms of organisation and implementation, Tilburg University is the lead partner of the project, with Radboud University Nijmegen (RUN) the main Dutch project partner. Within these universities, teams of researchers were formed to prepare and manage the data collection and develop the academic output. In every country of study, the research teams concluded cooperation agreements with academic partners for joint implementation of fieldwork, data analysis, and paper and report writing. This cooperation also incorporated research uptake and policy activities, involving interactions and stakeholder meetings with policy makers within government, donors, NGOs and SME owners/managers. With regard to capacity development, the Dutch project partners organised research methodology seminars for local academic staff and students, in collaboration with their partners in the countries of study.

Partnerships were formed with the University of Nairobi (Kenya), University of Pretoria (South Africa), University of Dar es Salaam (Tanzania), University of Ghana, National Economics University Hanoi (Vietnam), University Indonesia, Ahmedabad University (India), Chittagong Independent University (Bangladesh), and Makerere University (Uganda). A cooperation agreement was concluded with the World Bank for quantitative data collection in the 10 countries of study. For randomised control trials within the 'Finance for Productivity Growth' research theme, a collaborative agreement was concluded with The Abdul Latif Jameel Poverty Action Lab (J-PAL) in Jakarta, Innovation for Poverty Action (IPA) in Accra and the National Board for Small Scale Industries (NBSSI) in Ghana, amongst others.

2.1 Research

The first output area of EIP-LIC focuses on the development of high quality research output, data and academic papers, examining ways to increase innovation in manufacturing SMEs in LICs. In particular, the research teams addressed internal capabilities and external institutional factors, institutions and policies that support or hinder the diffusion and adoption of innovation and finance raising productivity. The research implementation was organised within two thematic areas: 'Innovation Systems' and 'Finance for Productivity Growth'.

The written output of the research is systematically organised in a repository accessible via the ‘Publications and Reports’ menu on the project website. The repository is integrated into the overall Tilburg University repository, established and maintained by its library. In addition, three types of open access datasets are produced: (i) qualitative datasets, (ii) quantitative datasets under the ‘Innovation Systems’ theme, and (iii) randomised control trial (RCT) quantitative datasets under the ‘Finance for Productivity Growth’ theme. These are also accessible via the project website.

Research methodology challenges: combined qualitative – quantitative approach

Overall, the project involved a combined qualitative-quantitative research methodology, including *qualitative* explorations in each country of study into policy and research issues, and *quantitative* data collected through large scale surveys and RCTs. In the quantitative component, the project took an ‘economics’ perspective on innovation, and involved econometric analysis of a set of variables concerning barriers at firm, regional and national levels and their causalities with the innovative behaviour/capability of entrepreneurs and subsequently innovation and productivity. This constitutes a reductionist and deductive approach in defining variables for analysis, in which the impact of individual factors on innovation is assessed by applying quantitative econometric methods. The quantitative analysis served as a basis for identifying relationships between internal capabilities, external institutional factors and finance on the one hand and innovativeness and productivity growth on the other.

Applying quantitative methods in development research brought some limitations and challenges. In EIP-LIC, conceptual issues emerged, in terms of the definition and measurement of innovation and productivity in LICs. These may seem straightforward variables at first glance, but their measurement can be more complicated in the LIC context. Innovation may be manifested differently, not via high profile technological and radical breakthroughs, usually measured by R&D expenditures or patents (OECD, 2005), but by more incremental adoption and adaptation or new combinations of existing technologies (Szirmai et al., 2011). These forms of innovation are equally important for raising the productivity and competitiveness of SMEs in LICs.

Moreover, innovation research and theory development in recent decades have typically involved empirical material from advanced economies, such as the innovation systems literature of Lundvall (1992) and Freeman (1987), where innovation takes place within a relatively stable institutional and Science, Technology and Innovation (STI) policy context, ‘controlled’ and supported by established innovation system actors and innovation policies. In LICs, however, the contemporary institutional realities and formal/informal dual economic contexts are different and may involve other less visible or less commonly known factors and policies around SMEs affecting their innovativeness and how innovation manifests itself.

Therefore, the theory and associated policies of how innovation evolves within an innovation system in the institutional contexts in LICs may be different, which is increasingly acknowledged in recent innovation systems literature (Lundvall, 2009; World Bank, 2010). For instance, entrepreneurs are innovating by Doing, Using and Interacting (DUI) in fast-changing contexts, enabled by informal institutions and informal (social) learning. Applying the research variables on innovation and productivity in LICs from existing literature and theory (deduction) based on advanced economies, therefore, might not take all relevant variables into account. A more precise identification of variables might be obtained by complementing the selection with a broader understanding of contemporary realities and context on the ground in LICs.

Qualitative studies

In an effort to manage these challenges, EIP-LIC included a complementary qualitative research component, involving an exploration and description of contemporary realities of innovation in manufacturing SMEs in LICs

and emerging economies. This sought to inductively identify actual and relevant research and policy issues as input for the EIP-LIC research themes as well as for additional explanatory evidence supporting research outputs. This material could help researchers to validate, compare and complement existing theory in literature and research design and hypothesis development with contemporary bottom-up realities on the ground, as perceived by manufacturing SME owners and managers.

In operational terms, Tilburg University and partners conducted a series of case studies of manufacturing SMEs in each of the 10 countries of study in the project. The holistic case study approach and method involved interviews capturing original insights, views and perceptions of SME owners and managers. A similar report format and comparable data was used for all countries of study in EIP-LIC, enabling cross-country comparison to identify overall trends and patterns in innovation and productivity policy and research issues in manufacturing SMEs in LICs.

In each of the 10 countries of study, 15-20 semi structured interviews were held with owners and managers of SMEs in manufacturing, textiles, metal processing, food processing etc. The interviews discussed types of innovation, the firm's history, its innovation processes, internal capabilities, and the external business and institutional context. The owners and managers also shared their stories outside this framework and advanced issues that are relevant and interesting for current scientific work. 170 interviews in total were recorded, transcribed and stored in a qualitative research database. The concluding qualitative reports of all 10 African and Asian countries of study are downloadable from the project website. Chapter 3 provides some key insights from the qualitative study in Ethiopia.

In line with DFID's policy, the original intention was to publish the qualitative database as an open access resource via the project website. However, in contrast to the numerical data, the qualitative data contained some confidential information that owners and managers might not wish to have in the public domain. This ethical consideration means that the interviews and transcripts are not freely available on open access, but may still be used subject to a strict confidentiality agreement, in consultation with Tilburg University.

Innovation systems research

The 'Innovation Systems' theme focused on understanding innovation in the manufacturing sector in LICs, its processes and critical factors hindering or stimulating its diffusion, including innovation policies and governmental institutions. The research involves the quantitative analysis of a set of variables concerning barriers at firm, regional and national levels and their causalities with the innovation capacity of firms. SMEs in manufacturing find it harder to survive than large firms, which are typically more productive and more likely to innovate in the long term, securing employment and economic growth. Regional conditions and infrastructures differentially affect levels of innovation and technological and industrial development in developing countries.

The 'Innovation Systems' team obtained data in close cooperation with The World Bank, particularly focusing on the World Bank Enterprise Survey (ES) and the Innovation Capabilities Survey (ICS). The ES is an ongoing project covering over 155,000 firms in 148 countries, collecting data based on firms' experiences and enterprises' perception of the business environment and investment climate. The whole population of the ES data is the non-agricultural economy, comprising firms from the manufacturing, construction, services, transport, storage, and communication sectors.

The ICS is a follow-up and complementary to the ES, comprising a randomly selected subset of respondents from the ES sample. It focuses on the innovative activities and capabilities of manufacturing firms, and is a collaboration between the World Bank, Tilburg University and Radboud University Nijmegen, funded by DFID through EIP-LIC.

The primary and secondary data enabled the ‘Innovation Systems’ researchers to produce a series of working papers downloadable from the project website. The titles and full details of the papers are listed in Annex 1. The data are available on open access for other researchers at the project website. All working papers have been submitted to high quality journals, with some published and some still under review at the time of writing this report. The primary and secondary data also enabled the team to address the original DFID research questions underlying EIP-LIC, which are presented in chapters 4 and 5.

Finance for productivity growth

The ‘Finance for Productivity Growth’ theme focuses on understanding the effects of access to finance in determining the productivity of SMEs and how constraints to investment finance influence growth. The team identified interactions between firm-level characteristics, such as entrepreneurial traits, country-level factors (such as industrial structure, institutional framework etc.) and access to finance.

Contrary to the research approach within the ‘Innovation Systems’ theme, the finance team conducted four extensive RCTs in Vietnam, Ghana, Indonesia and Kenya. The interventions and associated baseline and endline data collection were implemented with local partners including the Abdul Latif Jameel Poverty Action Lab (J-PAL) in Jakarta and Innovation for Poverty Action (IPA) in Accra as well as the National Board for Small Scale Industries (NBSSI) in Ghana. A series of academic papers has been developed from this, listed in Annex 1. The dataset for each country, combining the listing, baseline and endline data, will become available on the project website for future research and follow-up RCTS or endlines.

2.2 Policy and research uptake

In following up on the research of EIP-LIC, the dissemination and uptake of the research evidence is essential to justify the value for money of the project. The underlying principle of the project’s engagement with potential users is to ensure that the research insights in the published output are useful, accessible, actively disseminated and communicated in a way that enables potential users to engage and make use of the research information in their own work (research valorisation). There are four target groups of potential users of the EIP-LIC research outcomes:

- Local policy makers of governmental agencies, international donors and development agencies and NGOs, who may gain new insights into promoting innovation and productivity growth in the manufacturing sector.
- SMEs owners and SME branch organisations, who may learn from the management implications of the research.
- Researchers within the academic development research community, for whom the research outcomes serve as a source of ideas and reference to develop their own research questions and methods.
- The general public worldwide interested in development and poverty alleviation issues. The dissemination will inform the public about DFID’s innovation and growth approach to alleviating poverty.

Policy and research uptake strategies

The project includes several strategies to interact with potential users. At the project start, the partners organised a series of innovation policy stakeholder meetings in Kenya, Tanzania, South Africa, Vietnam, Ghana, Indonesia, India and Uganda. Policy makers from government agencies, donors, NGOs and SME owners and managers discussed the relevance of innovation and identified policy and research issues. These issues were then followed up in the qualitative research component of the project.

A further dissemination mechanism has been the production of a series of EIP-LIC policy briefs in which the findings and implications for policy of the academic papers are discussed. Each policy brief is typically a 2-page presentation of key findings, practical suggestions and implications, accessible via the project website.

The final collection of all research outputs is concluded in a series of country reports, which draw together all the research findings for each country and are an important vehicle to disseminate the policy messages. The last chapter of the report includes and elaborates on the country-specific policy recommendations.

Lastly, three short videos were produced, focusing on key research findings and policy messages, using high quality footage filmed in Accra, Nairobi and Kampala. The videos present a policy theme illustrated by interviews with several SME owners and managers, tell the entrepreneurs' story, provide an idea of the realities they face on the ground, and show the resilience of the SME owners. They provide policy makers with a sense of the difficulties of the local context, and suggest policy solutions from the DFID research findings.

3 Qualitative study in Ethiopia

3.1 Case study method

The objective of the qualitative study of EIP-LIC is to identify relevant policy and research issues concerning innovation in manufacturing SMEs within contemporary realities in Ethiopia. Applying a case study approach is particularly useful in this respect, since this method is an approach for inductively exploring and identifying concepts, noticeable similarities, trends and patterns of socio-economic phenomena (Yin, 2003).

The case study research in Ethiopia involved a series of 15 interviews with managers and/or owners of manufacturing SME in Addis Ababa and around. The qualitative data collection through interviews took place from 17 to 28 June 2017. The number of interviews may seem a limited number to justify research validity. However, the approach usually involves in-depth rich and detailed descriptions and a multidimensional analysis of the complexities and linkages of a few cases to gain an understanding of the (socio-economic) mechanisms and processes of the case subject. In the case descriptions, innovation as an economic phenomenon is the case 'subject', whereas the unit of analysis is a manufacturing SME. The case description holistically explores the type and basic features of innovation within the SME, and reviews the impact on productivity and competitiveness over the past 2 to 5 years.

The data for the case descriptions are obtained via 'semi-structured' interviews with SME owners and managers. Of particular interest is what innovation means in the manufacturing SMEs in their context, and the less known favourable and unfavourable institutional conditions and barriers enabling or preventing it.

The selection criteria are defined in such a way that the selected cases represent the EIP-LIC target group: manufacturing SMEs understood as a company with 10-100 employees. Moreover, the criteria assure a certain homogeneity within the selected cases, which will enable comparison of cases while supporting a certain validity of the identified trends or patterns. At the same time, allowing some heterogeneity, by including deviant cases, provides more contrast, and thus enables the research team to better construct and highlight divisions in the innovation process, linkages, system or mechanisms.

An essential element of the selection is the notion that types of SME innovation in LICs are not confined to technological (radical) inventions resulting from particular R&D investments and efforts. Innovation in manufacturing SMEs in LICs more often encompasses incremental adoption and adaptation or new combinations of existing technologies, products, marketing, management or business practices. Moreover, innovation often does not concern one type only. More often, an initial innovation enables and/or triggers other types of innovation within a firm; a new technology allows the introduction of new products, for instance.

From the eight cases in the comprehensive qualitative report of Ethiopia, accessible via the project website, we present three cases below to provide some insight on the daily realities of SMEs in manufacturing.

3.2 Selected cases

Case 1: Textiles – uniforms and working clothes (45 employees)

This textile company produces uniforms and other garments. It is located in an area of Addis Ababa dominated by textile production, wholesale and retail firms. The company was set up by a group of 10 individuals 10 years ago. The interview is held with one of the owners, who acts as the managing director. He explains that it is easier

to start with a group in Ethiopia, in particular to get the financial resources together. It is an increasingly frequent phenomenon and the government is promoting business groups.

All 10 owners previously worked in larger international textile companies. They individually invested 2,500 Bir (65 USD) and jointly borrowed another 50,000 Bir (1,800 USD) from a micro-finance bank. To do so, they prepared a business plan. After securing the initial investment capital of 75,000 Bir (2,700 USD), they bought six second hand sewing machines, rented a production hall and started production in 2007. The hall is rented with a subsidy from the government and costs only 1,000 Bir per month (40 USD) – “This is support from the government.” The basic requirement to qualify for such a subsidy is that the individuals have to organise themselves formally, develop a business plan and register the business. Today, the company has 35 workers and 30 sewing machines. There are production workers, designers, marketing and management staff – “We have enjoyed steady growth.”

The company mostly supplies uniforms and working clothes on order to large companies, which constitutes 90% of their turnover. The remaining 10% of turnover is clothes for the regular local market.

The client usually suggests the design, including the company’s logo. The company produces a small sample for approval before they go into full production.



Internal capabilities

The group of 10 owners decided upon a division of tasks. The Managing Director, who is 45 years old, was chosen for the position because of his earlier experience as an export and quality control manager in a large international textile factory. He holds two diplomas, one in general mechanics and another in management. He considers himself a multi-skilled person: he designs new products, works on the machines and manages the business. He is able to manage the enterprise and “make sure that things work.” His appointment was approved in writing by the group.

The company also creates its own designs. Instead of using the internet, the dedicated employer goes to the market and buys clothes from competitors, which he tries to improve in terms of quality and pricing.

The company only employs skilled workers, to produce high quality products. It is difficult to find such workers, so the company trains them according to their own standards. The owner provides several benefits to retain workers by providing a good salary and paying overtime. The salary is a combination of fixed, piece rate and overtime, “which provides a good package.” The company is a popular place to work because of its good reputation for high quality work. There is a certain prestige to work there.



The company has fixed working hours of 8 hours per day. Employees are sometimes asked by the Managing Director to work overtime. Conditions in the workshop are in line with Ethiopian national labour standards in terms of light, clean air and noise. These standards “are basically a copy of the international labour standards.”

In the framework of AGOA², a feasibility study was carried out into opportunities to market Ethiopian textiles in the US. Based on the detailed figures in the study, the group of owners decided to develop plans to expand and export to Europe and the US. They developed a proposal for new machines and agreed with the government to relocate their business to an industrial zone –“We have the first approval. We need additional funding and have established contacts with private bankers.” If the new investment materialises, they will grow into an export-based company – “We plan to export 70% of our production and keep 30% local.” The expanded business is forecast to require 400 permanent workers. The owners felt confident to take this step to invest as a result of the government marketing study.

External business and institutional environment

The company has many competitors but survives well because of its focus on quality and the long-term client relationships it has built. Its technology is more advanced than that of other textile companies in the neighbourhood. There exists even better export quality technology, but the company cannot currently afford it. State-owned textile companies mainly produce the fabric only and do not do the tailoring.

“Getting access to finance is very difficult in our country.” The government has held back from financing the textile industry. The Development Bank of Ethiopia was previously financing textile development activities, but this has stopped, so the company is turning to private banks –“However, limited access to finance is still the key problem.” The private banks charge an interest rate of 14% per year. The Development Bank of Ethiopia offers an interest rate of 7% for export oriented projects, but they have strict and complicated application procedures. The Managing Director would like the government to simplify the credit application procedures. Although open to working with private financiers, they lack experience. They would prefer a bank loan, supported by the government, but “if a private investor comes along, then we will use that opportunity.”

Textiles is a priority sector for the government. The Managing Director mentions that Ethiopia is gaining market share and importance in garments and textiles – “It has not yet reach the level of Bangladesh in terms of export volume but export from Ethiopia is growing steadily. I am more than confident that I can produce better quality than other countries.”

The Managing Director tries to avoid corruption practices by keeping accurate and transparent records, so they know what to pay and the government can levy tax without difficulty– “As a result, we do not encounter many corruption problems.” The administration is linked to the official tax revenue machine connected to the server of the tax authority.

The company is a member of the Ethiopian Employers’ Confederation, but there is no direct benefit in this for the firm. When they encounter technical problems, they just try to find a solution themselves – “We are basically on our own.” There are no technical, research or education institutions in Addis Ababa to help the company to solve technical or design issues. The only contact the company has is with technical vocational training centres – “These TVTs do not have the skills required for international quality.” In fact, the support works the other way around: the owner receives requests from the TVTs for their teachers to do apprenticeships in the company.

² Africa Growth and Opportunity Act, an opportunity to import to the US on favourable terms offered by the US government.

Case 2: Leather processing – leather bags and handicrafts (18-100 employees)

This leather products company is located in Addis Ababa and produces a range of bags, cases, tourist items, corporate gifts and other handicrafts. In 2009, the business was set up by four brothers and two sisters of one family. The interview is held with one of the brothers, who is the designer/production manager. The initial working capital was 20,000 Bir (750 USD) borrowed from their father, “which was very little money to start a business.” They also borrowed two leather sewing machines from their father, who also worked in leather handicrafts, “a family tradition.” Production started in a small shed with a work surface of 4m by 4m. “Since then, we have worked very hard to produce high quality leather products.” By saving and living very frugally, they invested in high quality raw materials, equipment and machines. In fact, it was not so difficult, according to designer/production manager. The family never took out a bank loan, “which is too difficult”, because of the high interest rate and collateral requirements.

The products are mostly shipped to the US, Germany and China, with only a small proportion sold in Ethiopia. The company usually develops one sample for Ethiopian middlemen and exporters first before moving to production and fulfilment of the order. The company does not export directly. There is little awareness of handicrafts and leather products in Ethiopia, according to the designer/production manager. The company distributes samples to potential customers in Ethiopia such as large companies, hotels and souvenir shops – “Sometimes, they come back with orders. This is how we try to create demand.”



After completing an order, the company keeps one sample for display and to show to new clients. The designer/production manager observes an increasing demand abroad for leather items.

Internal capabilities and innovation

The company has 18 permanent workers and often many more temporary staff, up to 100 depending on the volume of orders. The business is going well, according to the designer/production manager – “The work is also good for creativity.”

The designer/production manager went to art school in Addis Ababa. He designs leather backpacks and laptop bags himself – “You can do a lot of design with leather. I really like the design work.” The school also taught him how to select good quality leather input, which is very useful for the company.

All the brothers and sisters are still in the business today. They agreed to fill the different positions to run the business, dividing the tasks among themselves and “my father is still giving ideas on how to run the business.” A younger brother manages the workers and salaries. The oldest brother is the marketing manager, sourcing new orders and clients – “This setup works well. We work together and try to improve our business every day.” The father is very much in the background, as an advisor, but he has also travelled abroad to research high quality affordable technology.

The company has three machines, two from China and one from Germany, bought second hand when other factories closed. The designer/production manager complains about the Chinese machines because “these require

maintenance every day.” He undertakes the maintenance himself, having familiarised himself with the technology – “I always check the internet and I read a lot of books.”

There is a rehabilitation centre for disadvantaged girls nearby – “My father teaches leather handicraft skills in the centre.” In fact, many of the company’s workers learned the trade in the centre and “these girls became very skilled.” Other newly recruited workers are less skilled “and we have to train them.” In the course of the 3-6 month training, the company pays the new recruits monthly a little extra, depending on their ability. There is no formal handicraft schooling available in Ethiopia. Sometimes, the workers leave after their training and look for better jobs, but only a very few do this.



The workers earn a regular salary and additionally earn on a piecework basis if there is a large order. Every month, there is a staff meeting with the 18 permanent workers – “We discuss problems, solutions and new ideas for the work and many other things.” The workers are very open, according to the designer/production manager – “I am not the boss, it is better to become like brothers and sisters.”

The company has a spacious workshop, which they acquired five years ago through a government programme, launched in in 2010, to support small businesses by providing land on long-term leases. As a result, the process of getting new land was not difficult. Recently, they leased an additional 1,500m² from the government to build another new workshop.

External business and institutional context

The business environment has not been easy but has provided many opportunities. The company faces increasing competition – “The competitors buy design items here and copy them.” The designer/production manager does not like to copy from competitors; he prefers original designs, although he gets inspiration from existing designs he finds on the internet.

To address the copying problem, he is considering patenting his designs – “Sometimes I regret I did not do this earlier.” At the same time, he tries not to bother too much – “My business is mine, and the competitors have their businesses with their own problems.” He also thinks that it is probably better to keep away from the tiresome paperwork and possible corruption of patenting. He has a big market, so there is actually little problem with competitors.

The input material is bought in Ethiopia, mostly leather from young goats. The goat meat is exported abroad but the leather remains in Ethiopia for leather product manufacturing, and other uses. The designer invests a lot of time in searching for the best leather. The quality improves if chemicals are used, but at the moment, the dollar rate is high, so fewer imported chemicals are available – “Then the companies stop using chemicals and the quality drops.”

The company imports the accessories directly, which is problematic due to limited access to foreign currency. Moreover, the government regulates imports and tells companies where to buy their input materials. For instance, the company has to buy zippers from China, which is based on a political agenda “but the quality is not good.” The designer/production manager believes that companies should have total freedom to choose their input suppliers.

The business environment is not only hindered by governmental regulations. There is also a shortage of finance, which the designer/production manager regrets. However, there is increased awareness among entrepreneurs of business opportunities in the country and abroad.

The government runs good programmes for small business development and encourages young Ethiopian entrepreneurs. However, many of the initiatives are not sustainable once the support stops. The government provides land but fails to adequately maintain vital infrastructure, such as roads, water and electricity.

The production volume, turnover and profit are still growing every year –“The past year was good, this year is even better. Every year it is about 5% more.” The designer/production manager thinks this is because of good product quality. “We have good machines for cutting, which work faster and better.



Our brother who is doing the marketing has gained good knowledge and established a good network of clients.” The designer/production manager is confident about the future. He says he learned to be positive in the church – “The church gives a positive energy to grow.”

Case 3: Food processing – snacks, cookies and bread (70 employees)

The company produces several types of local snacks and foods, including cookies, biscuits, sweet bread and snacks for travellers –“Most of my products are rolled from barley and wheat flour, cut in pieces and fried in oil.” The interview is held with the owner, who started the company in 2010.

Before starting his business, the owner did a number of other jobs. For a short time, he had a shop near a market place in central Addis Ababa. He was educated in marketing and shortly after his graduation, he started as a marketing agent, representing several factories in Addis Ababa. Many entrepreneurs in Ethiopia do produce good quality products but lack management skills, according to the owner – “I noticed that companies do not know how to sell their products.” At that time, he offered his marketing services to companies and acted as their agent. Unfortunately, this did not work out because of conflicts with these business partners.

Having the ambition to become a large business owner at that time, he was thinking of developing a “big thing and producing something for myself.” He developed a business plan with friends for exporting locally manufactured goods. However, they lacked investment money – “We discussed ideas for collecting investment capital. We put money together to buy a garment business.” Again, there was conflict because of different expectations and the group split up – “I lost all my money.” The owner believes he is like many Ethiopians – “I never lose hope.” He learned a lot and decided to continue with something more modest – “I learned one big lesson: in order to build a high building, you need to dig very low to develop a good foundation.”

He decided to produce something well-known, easily marketable and made from locally available raw materials. He chose fried bread snacks and traditional cookies. Although many of these foods are already widely produced in Ethiopia, he still saw several problems in terms of “poor food quality and hygiene and unreliable supply.” Another advantage of doing food processing is that buying barley and wheat involves no government intervention or bureaucracy.

He managed to borrow 30,000 Bir (1,100 USD) through a government credit scheme to start his food processing business. In addition, he secured an attractive lease contract for the premises from the government. At that time, the government had many support programmes for small business development, including preferential leasing contracts of working space (sheds) and land. Nevertheless, it took a further year before all the electricity connections and infrastructure were ready – “Government decision making is very slow in developing infrastructure.”



Once this was done in 2010, he borrowed another 30,000 Bir from relatives as working capital and engaged 30 women to start production. The initial equipment included a standard cutting machine, and some basic home cooking and kitchen materials. He started step by step with small amounts of local raw materials, distributing and selling the product himself through retail shops. From the profit, he bought more raw materials – “For a long time I worked for about 18 hours per day. I had little sleep, but the business developed steadily.”

Internal capabilities and innovation

Today, the company employs 70 people – “I believe in God, he blessed my hands that developed my business.” There are 7 staff in administration and sales – “I monitor them closely.”

In his marketing study, he learned how to promote the product – “It is all about communication.” He explains to potential clients about the product and gives them a sample to taste. He supplies supermarkets, grocery shops and wholesalers in the central market place. According to the owner, running a business is about satisfying customers first, and the profit will follow – “First think about serving people, then think about earning money. My first salary is customers’ satisfaction.”



Recently, the company has been re-categorised to a higher size classification. According to the official government’s system, the company is now a ‘Medium-Sized Company’. The criteria include the number of employees, production volume, management systems and production processes.

Initially, the owner benefitted from government subsidised rent on the land and working shed – “However, once you develop and graduate, the government does provide follow up policies and programmes enabling further expansion.” He wants to develop his enterprise but there are no other available premises or land nearby. As one way forward, he agreed a deal with another local company, which went bankrupt and cannot pay back its bank loan. This company now produces part of his food production volume – “I give them raw materials and they produce and give it back to me. It is like a subcontract arrangement.” The owner gives management advice to the company.

The owner gained his technical knowledge about recipes and ingredients by reading, browsing the internet and talking to people. He started to experiment at home with his family, systematically writing down a detailed log of his experiments. He has developed some products that sell well and keeps the formulas secret – “Like a Coca-Cola secret.” There are some companies that try to copy but they have not succeeded so far. He mixes the input

at home by himself and then brings the mixed ingredients to the company for preparation. In the company, the employees mix it with flour and then fry it – “They do not know what ingredients are in there, so the secret is kept.”

He also acknowledges the importance of keeping employees satisfied because staff turnover is high: many work for a short time and then go. Hiring good workers is difficult in Ethiopia, explains the owner – “There are many people in the street but they are not interested in working. They want to go high right away, without digging a foundation first.” He tried a bonus to retain workers, but this was not effective. Often employees get training and then go elsewhere for a better salary or to open their own business.

He aims to expand further and has applied for new land in a planned industrial zone in Addis Ababa, which will probably take one year. He is now calculating the cost of purchasing of a new biscuit machine and a peanut butter machine – “All our peanut butter is now coming from America, imported at very high cost.” The owner sees the advantage in terms of saving foreign currency if these products are produced locally.

External business and institutional context

The company has many competitors, but that is not a problem. The owner feels that his business is doing well because of his higher product quality and marketing skills.

In general, he is happy with the level of government support. However, many people in the ministries he deals with have no idea about the realities of business on the ground. For instance, he believes the government’s food hygiene policies are good, but the civil servant who checks and monitors compliance does not understand the issue. He gets regular visits from the food and health department, which is necessary to renew his business licence.

He is a member of the Addis Ababa food processing and pharma manufacturers’ board, created by the government to address problems in manufacturing and problems with stakeholders – “We provide policy advice. I tell them all our problems. We tell them to change the policy.”

There are no contacts with universities, although he would like to work with them. He searches the internet and conducts experiments, but lacks expertise in chemistry, on topics such as shelf life and taste characteristics. His machine supplier also provided some recipes, which he has improved.

The owner is really concerned about the Ethiopian work force and the work mentality of its people. He thinks that this is a media problem – “Ethiopians see on TV and the internet that everything is possible without any effort and they want it.” As one example, the media indirectly promotes visits to Arab countries – “Many uneducated people want to travel and go there as a visitor or for unskilled jobs such as cleaners.”



The owner emphasises that there are many industries in Ethiopia but not sufficient workers willing to stay in the country and work. The owner wants to see many people in his company and help them with jobs. He can contribute to the prosperity of his country by creating simple jobs, “but people should be happy with it.”

The owner is not happy with “economic refugees” abroad, and strongly believes that they should stay in Ethiopia. The owner thinks that the government should be strict and adopt penalty policies – “if Ethiopians go abroad illegally they should lose their citizenship rights, for instance.”

The owner believes that Ethiopians themselves have to save and develop their country – “I want to live in my country and I want to die in my country.”

3.3 Research and policy issues

Most interviewed owners and managers in the Ethiopian companies described in chapter 3, in different ways, introduced new products, processes and technology in order to improve and expand their business operations. Some would clearly qualify as innovation, while others would not, depending on how innovation is defined and assessed. In advanced economies, innovation is typically measured by R&D expenditures and number of patents of new products or processes, as proposed in the *Oslo Manual*³ (OECD, 2005). From a radical technology perspective, much of the ‘newness’ introduced in the Ethiopian cases would not qualify as innovation. Such an assessment would in any case have been impossible because the owners do not systematically record R&D expenditures and have not registered patents.

Taking a broader and economic perspective on innovation, viewing it in terms of incremental adoption and adaptation or of new combinations of existing technologies creating value (Szirmai et al., 2011), it is evident that the new elements introduced in the interviewed companies resulted in improved and expanded business operations. As described in emerging innovation theories on LICs, much innovation depends on an aggregation of small insights and advances through ‘learning by doing’ rather than on major technological inventions (Carayannis et al., 2003).

Despite increasing interest in the literature, the exact definition of innovation in LICs remains an issue in theory (Çapoğlu, 2009) and for its application by the researchers in EIP-LIC. The broadest possible definition of innovation, from an economic perspective, referred to in the qualitative research section, is everything new that the company does to raise productivity and/or to stay ahead of its competitors. Or as Fagerberg et al. (2010) put it: ‘Innovation is often seen as carried out by highly educated labour in R&D intensive companies with strong ties to leading centers of excellence in the scientific world. Seen from this angle innovation is a typical “first world” activity. There is, however, another way to look at innovation that goes significantly beyond this high-tech picture. In this, broader perspective, innovation – the attempt to try out new or improved products, processes or ways to do things – is an aspect of most if not all economic activities. In this sense, innovation may be as relevant in the developing part of the world as elsewhere.’

Assuming the broader perspective on innovation in EIP-LIC, in box 1 several definition elements are proposed to assess innovation in an LIC context for the analysis of the cases in this report.

Box 1: Innovation newness, process and value creation

A cross analysis of definitions in innovation theory from recent decades (Voeten et al., 2011) shows that innovation is repeatedly typified by three key elements: newness, process and value creation.

Addressing the first element, Kotabe and Swan (1995) argue that innovation can be investigated in terms of both **newness** to the company and newness to the market or world.

Regarding the second element, the innovation **process**, all owners and managers themselves initiated, managed and owned the innovation process within the unit of analysis, their company. They developed the idea, sometimes inspired by others, started to run small experiments and trials and eventually implemented the new product or production technique on a

³ <https://www.oecd.org/sti/inno/2367580.pdf>

commercial scale. As is often the case in incremental innovation in developing countries, this was not a planned and formalised process involving a pre-defined innovation strategy and an R&D department.

The third element, **value creation** of innovation, is evidenced either through lower input costs or higher sales revenues (Porter, 1985). Higher profit through new premium products of better quality, or appealing to a certain fashion, increases competitiveness.

Regarding the dimensions of innovation, Kaplinsky and Morris (2001) identify five types of innovation: (i) process innovation, aiming at improving the efficiency of transforming inputs into outputs; (ii) product innovation, leading to better quality, lower price and/or more differentiated products; (iii) business practice innovation, implying new ways to organise and manage the business and attract new clients; (iv) functional innovations, assuming responsibility for new activities in the value chain, such as design, marketing and logistics; and (v) inter-chain innovations, moving to new and profitable chains. These types of innovation are taken into account in the analysis in this report.

In many innovation definition and measurement documents, such as the *Oslo Manual* (OECD, 2005), an explicit distinction between product, process and other types of innovation is made. However, distinguishing the types of innovation in the manufacturing SME cases interviewed in the EIP-LIC countries of study was not such a clear and simple matter. It is more common to see an integrated combination of several types of innovation, where one type of innovation triggers or enables another, such as the introduction of a new process (technology) that results in the launch of new products requiring the reorganisation of the workshop and staffing. Analysing the Ethiopian cases for newness, process and value creation, as suggested in box 1, is one possible way to assess whether the observed new phenomena within the three companies qualify as innovation or not.

1. The textile company is producing existing products – uniforms and clothes – but it has a solid and advanced organisational structure. The way of organising the business in terms of production and human resources management, which enabled it to raise productivity, could be considered as business practice innovation. The high quality of products and organisation gives the company a certain prestige.
2. The designer and production manager of the leather handicraft company is a creative person who develops his own designs of leather bags and items (product innovation). Competitors buy his handicrafts and copy them. The company is using standard machinery and equipment. The company tried to change its marketing strategy, by directly exporting the product, but did not succeed, and therefore still deals with middlemen.
3. The food processing company is producing existing products with existing equipment. The owner experiments with new recipes and ingredients at home with the assistance of his family. He systematically writes down a detailed log of his experiments, recording what works and what does not. He has developed some products that sell well and keeps the recipes secret (product innovation).

Trends and patterns in the cases

Compared to the earlier qualitative explorations in other African countries and Asia, the companies in Ethiopia introduce small incremental changes to raise productivity and competitiveness. Although the new products and processes in the innovative companies are not radical and not ‘new to the world’, they are new for the companies or Ethiopian market, as units of analysis. The ideas for new products are mainly acquired from the internet and in response to market demand. Customers come with requests and suggestions, or the owners talk with clients, examples of demand-driven innovation.

In terms of these innovation manifestations, Ethiopia fits best in the classification of a factor-driven economy competing on factor endowments, unskilled labour and natural resources. One of the priority sectors of the

government is textiles, a good example of a sector using abundant labour resources. As a country becomes more competitive, productivity will increase and wages will rise with the advancing development. Countries will then move into the *efficiency-driven* stage (Porter et al., 2002). In this stage, companies begin to develop more efficient production processes and further increase product quality because wages have risen and they cannot increase prices. This is not yet the case in Ethiopia. The cases do not show innovation aimed at increasing productivity by saving on input or labour costs.

There are many imported products on the Ethiopian market. Many owners consider this a missed opportunity for local manufacturing and try to produce these products by themselves. Interestingly, in such a context, innovation would be one way to make more efficient use of resources and processes and compete with imports on the local market. An innovation focus on quality would be a logical way forward.

Internal capabilities

In all cases, it is the owner who initiates, coordinates and manages the new ideas, including preparations for the innovation, technical details, and the product launch. The companies rarely have a design or R&D department or a specialist employee with this function.

The Ethiopian workforce comprises both unskilled and skilled labourers. Most owners pay their employees a fixed salary, sometimes on a piecework basis, according to output levels. Several owners face difficulties of recruiting and retaining a skilled workforce and the high turnover rate of skilled production workers. Sometimes the employees provide innovative ideas, to a greater or lesser extent. Several owners, however, stress the limited creativity of their workers and refer to a passive attitude. Most owners and managers do train the employees on-the-job in acquiring the required skills. Getting higher educated staff is a problem, since the graduate employees have primarily theoretical knowledge and few practical skills.

The owners mention that the skills and knowledge gained through formal education do not match the company's requirements. Moreover, it is difficult to find skilled craftsmen to do the manual manufacturing work in Ethiopia today. Despite these shortcomings, few interviewed companies provide additional formal training for the workers, opting instead for on-the-job training. Some owners are reluctant to provide formal training because they are afraid that workers will move to other jobs. Some owners acknowledge the potential innovation capacity within the workforce, but this is not applied in practice.

Typically, the Ethiopian companies possess technology and machinery that they have had for a long time. The technology is still able to deliver a certain minimum product quality. Occasionally, new machinery is bought from profits and savings. The interviewed owners and managers are well-informed about technological possibilities though the internet or informal contacts. They have ideas and plans for upgrading and expanding their companies, but new (technological frontier) machines are too expensive and advanced compared to the expected short-term return on investment. With regard to the long term, the macro-economic and institutional context does not provide sufficient confidence to justify extensive investment.

External business environment and formal and informal institutions

The interviewed owners and managers perceive a positive business environment in terms of opportunities, in particular with regard to import substitution. They see that there are many imported goods on the local market that could be produced in a more cost-efficient way. The establishment of a business, recruiting skilled and motivated staff and the organisation of a constant supply of raw materials and inputs are key challenges.

The formal institutional context is ambiguous, according to the interviewed owners and managers. On the one hand, most of the companies, in one way or another, benefitted from governmental development and support

programmes for small business, in particular, in the provision of cheap working space and land. However, many of these programmes stopped after a period, or did not further facilitate business growth. The SME owners have a positive perception of government regulations, tax regimes and systems: as long as one follows the rules, there is little difficulty in compliance.

On the other hand, institutional stability and transparency is not improving, according to many interviewed SME owners and managers. Corruption is getting worse. Regarding policies to promote innovation, there is no clear regulatory or policy framework for manufacturing SMEs. Many ministries and governmental agencies have different policies and programmes. All the entrepreneurs complain about the weak infrastructure: unreliable electricity and water provision and poorly maintained roads.

Several of them hold negative perceptions about government policies regarding imports of input raw materials. The government established strict regulations on where imports may be sourced. This results in an obligation to import low quality inputs, which affects the final product quality. This business and institutional environment prevents them from innovating and growing their enterprises.

The banking system is not an attractive source of finance for SMEs in Ethiopia. High interest rates, collateral requirements and complex paperwork are critical issues. Instead, most SME entrepreneurs find investment money from savings and via informal loans from family members. They usually invest incrementally just before or after receiving large orders.

Most business owners and managers are members of a business association and have regular interactions, which sometimes help in solving technical issues or client networking. Branch associations are an important source of information and of both contacts and contracts. Interaction with formal technology institutions, as suggested in the innovation systems literature (Lundvall, 1997), does not happen. Many SMEs owners and managers indicate that they would like to cooperate with universities to undertake research at their premises, to share research insights, for instance. There is very little spill-over of technology as a result of cooperation between firms, subcontracting or other forms of collaboration within value chains, business clusters or networks.

Policy issues – insights for policy makers to consider

One question that remains is the extent to which government can reach SMEs. Various ministries within the Ethiopian government have defined and implemented policies that in one way or another promote innovation. However, these seem not to reach the SME owners that were interviewed in the qualitative research, although some are aware of R&D centres and technology development programmes for SMEs. One reason for this failure may be that the support is implemented in a technocratic top-down way. The companies are seldom consulted, in fact they prefer to stay at a distance from the formal institutions.

They are aware of the state of the art technology but cannot afford the high costs of such machines. Moreover, those that have available funds do not invest because of the uncertain future, in macroeconomic terms. In addition, the government does not provide assurance on the stability of the ‘rules of the game’, so most SMEs continue their activities but do not expand further because of challenging business conditions.

As argued in the introduction of this report, it is desirable to develop innovation within manufacturing SMEs. Some believe that technological innovation is critical for SME development and catch-up in LICs. Technological innovation has, however, been traditionally concentrated in developed countries, given the costs and risks involved in stimulating technological innovation. Foreign sources of technology account for a large part of productivity growth in most countries. Therefore, the development process in Ethiopia could be supported by tapping existing technical and product knowledge.

Moreover, the stories and experiences of the owners and managers raise the issue of whether an innovation-driven and new-to-the-world innovation approach is the way forward. Most of the required technology is already available, but elsewhere in the world. In fact, all owners in the cases are well informed about the technological possibilities of their business. Without too much difficulty, the owners and managers find the technology themselves by drawing on various sources of information (the internet, informal business contacts and trade fairs). Moreover, the companies themselves refine and adapt the existing technology once acquired. So, although setting up technology development projects and programmes may help SMEs, the availability of technology is not perceived as a barrier to innovation by the owners and managers.

It seems that the notion of growth as ‘manna from heaven’ as reflected in convergence theory, see the earlier rejected exogenous growth model of Solow and Swan (Fagerberg et al. 2010), might work after all because of the free and widespread access to knowledge and technologies via the internet. The knowledge itself is available for local companies in Ethiopia. The institutional context, providing trust, predictability, stability and access to finance is more of a problem in preventing investment in technology and innovation and thus ‘convergence’ from happening. At the same time, the ‘manna from heaven’ of technology developed elsewhere may not address local needs or issues.

Innovation climate

How then can the innovative capacity of SMEs in Ethiopia as a developing country be increased? According to the World Bank (2010), an efficient government innovation policy will address the overall innovation climate, which goes beyond traditional science and technology policy. At the same time, government action can usefully focus on a few generic functions to help SMEs to grow. It can facilitate the articulation and implementation of innovative initiatives, since innovators need basic technical, financial and other support.

The government can reduce obstacles to innovation in competition and in regulatory and legal frameworks. Government-sponsored research and development structures can respond to the needs and demands of surrounding communities. Finally, the education system can help form a receptive and creative population. Regarding actual innovation policy development, there has been a considerable amount of work in developing countries, such as the World Bank (2010) report ‘*Innovation Policy: A Guide for Developing Countries*’.

The lack of relevant education is a problem for the companies interviewed, who feel there are insufficient skilled and motivated workers and operators to work with. SME owners and managers complain that university and college graduates do not have the required technical and craftsman’s skills, exposure to modern technologies, or an entrepreneurial and creative attitude.

As mentioned earlier, several ministries and agencies are engaged in efforts to develop and promote innovation policy, usually labelled as Science, Technology and Innovation (STI) policy. Despite considerable effort in developing strategies and plans, actual implementation is challenging, due to the limited availability of public budgets and knowledgeable staff.

Nearly all SME owners and managers suggest that creating a stable and predictable institutional context would be an efficient and effective way to promote innovation in Ethiopia. All kinds of innovation policies and programmes could be developed, but the results of such policies will be undermined by the weak and unreliable wider formal institutional context.

Another policy idea emerging from the DFID project is that several owners and managers suggest not to focus on governmental policy makers only, but on direct advice to SMEs on how to improve their business. One idea is to develop non-governmental business information exchange networks and platforms, establishing contact between entrepreneurs in Africa and beyond, to facilitate discussion and deals within the various sectors. SME

owners suggest that the DFID project could establish a network of all SME owners and managers contacted during the implementation of EIP-LIC and create a website for them to stay in touch with each other.

4 Finance for Productivity Growth

The ‘Finance for Productivity Growth’ team produced three scientific papers with special reference to Ethiopia. The first paper addressing trade credit and access to finance analyses data from Ethiopian firms. The second paper, involving a field experiment, analysed the determinants of - and the barriers to - the adoption of a profitable financial technology by SMEs in Kenya. The third paper investigated the role of financial constraints in firms’ skilled labour demand in Uganda. The research findings of each paper are discussed and policy implications reviewed in the paragraphs below.

4.1 Trade credit and access to finance

The first scientific paper within the ‘Finance for Productivity Growth’ theme investigates the relationship between bank credit and trade credit in Ethiopia. The underlying idea of the paper is based on the fact that many African countries have achieved promising economic growth rates in recent years. However, credit market imperfections are still persistent, resulting in limited access to formal bank credit for many firms, especially small and micro enterprises. Trade credit, as a method of direct ‘in-kind’ business financing, can be popular as an alternative to bank credit in locations with limited financial sector development. From this perspective, trade credit and bank credit can be considered substitutes.

Specifically, the research question of the paper addressed whether usage of trade credit decreases with access to bank credit, or whether the use of trade credit and bank credit are positively associated. The research further highlights the role of formality of firms. The team analysed firm-level data from 5,500 Ethiopian retailers. The original working paper is entitled ‘Trade Credit and Access to Finance of Retailers in Ethiopia’ (2017) by Thorsten Beck, Mohammad Hoseini and Burak Uras.

Research approach and findings

The findings suggest that bank finance and trade credit are substitutes in Ethiopia. In locations with lesser access to formal bank finance, the use of trade credit is higher. The extension of trade credit by suppliers generates a credible signal to banks with regard to the customers’ creditworthiness, which can make trade credit and bank credit complementary on the individual firm-level. For informal retailers, bank credit acts as a counterpart to trade credit in the sense that higher bank loan exposure is associated with greater access to trade credit. For formal firms, however, the research reveals that having more bank loans is not a significant explanatory factor of the use of trade credit. These results could imply that receiving bank credit increases the creditworthiness of informal firms that have less transparent operations and motivates their suppliers to extend them trade credit. Formal firms, on the other hand, are more transparent and the level of obtaining trade credit is mainly restricted by the availability of such sources of external finance in the locality.

Having a relationship with a bank can also act as a signal of the creditworthiness of firms to their suppliers and reduce the agency problems associated with trade credit. An important issue for studying trade credit as a form of financing is its substitutability versus complementarity with respect to bank credit. The researchers find that trade credit usage is more prevalent in locations with lower access to finance, consistent with the substitutability theory. The research, however, also finds that bank credit acts as a complement to trade credit for informal firms who lack transparency and suffer more from agency problems with their suppliers.

Policy implications

Although the link between trade credit and bank credit has been studied in the literature, investigating this relationship in the context of a developing country with low levels of access to finance provides several original insights for policy makers. Financial inclusion has been a key topic in development policy debates in many underdeveloped countries, but most policy initiatives address the direct effect of bank credit constraints.

This research stresses the importance of the role of informality in understanding the association between trade credit and bank credit. Informal firms feature non-transparent operations and rely on cash-based transactions, partly to hide from tax authorities and partly due to the unavailability of bank accounts. Operational transparency is a major element in accessing external finance, because without transparent (formal) accounting standards, creditors cannot determine the quality of borrowers. Informal sector promotion policies could focus on the notions and necessity of transparent operations through awareness, training and education policies.

Facilitating trade credit and bank credit could mutually strengthen each other, for instance, in combined policy and development programmes integrating the two.

Policies to expand financial inclusion by increasing operational transparency might alleviate the agency problems of informal enterprises vis-à-vis suppliers and enable them to obtain not only formal finance from banks but also informal finance in the form of trade credit.

For the formal sector, however, the research suggests less expected policy impact. Although obtaining a bank loan is positively associated with receiving trade credit for informal firms, the team does not find a similar significant link for the sample of formal firms.

4.2 Technology adoption and mobile money

The second scientific paper within the ‘Finance for Productivity Growth’ theme investigated the determinants of - and the barriers to - the adoption of a profitable financial technology by SMEs in Kenya, a country comparable to Ethiopia in terms of economic structure and growth, policy and political context and business dynamics. Specifically, the study involved a field experiment focusing on the adoption of mobile-money as a payment technology by restaurants and pharmacies in Nairobi. The original working paper is entitled ‘Technology Adoption by Small and Medium Businesses: Experimental Evidence from Mobile Money in Kenya’ (2017) by Patricio Dalton, Haki Pamuk, Daan van Soest, Ravindra Ramrattan and Burak Uras.

The paper’s starting point is the ambition to understanding the constraints that firms in developing countries face to adopt productive technologies is crucial for designing appropriate development policies. Over the last decades there have been important advancements that deepened the understanding of the drivers and the barriers of technology adoption, including mobile technologies. For instance, mobile-money is an emerging phenomenon offering the option money transfers via simple cell-phone text-messages. This technology was amongst others launched in Kenya in 2007 under the name of M-PESA. Since then, it has quickly reached remarkable adoption rates among Kenyan households. As of 2016 in more than 95% of the households this technology has been adopted. The use of mobile-money among Kenyan businesses, however, is relatively low. Less than 40% of the small and medium sized enterprises (SMEs) report using M-Pesa services when transacting with their customers or with their suppliers.

Research approach and findings

The field experiment studied what factors foster adoption of mobile money technologies by SMEs, and what the barriers to adoption are. The research team offered a randomly selected sample of restaurants and pharmacies the possibility to sign up, on their behalf, for a novel mobile-money technology which allows an efficient mobile-money based transaction between a business and a customer. A key feature of M-Pesa is that it is profitable, it does not involve any risk, and it has no registration fee. In short, the intervention eliminates the transaction costs associated with the adoption of the technology.

The study found that over a 60% of the restaurants owners/managers decided to sign up for this new technology, while the adoption rates turned out to be about 20% among pharmacies. Moreover, study provides causal evidence that small bureaucratic hassles and lack of information constitute a major barrier for adopting this profitable technology. The team further found that neither risk, time preferences or trust are important factors. Small situational barriers play a decisive role in preventing people to take advantage of profitable available options.

The motivations of those business owners who decided not to adopt the technology remain somewhat unclear. One plausible explanation of the non-adoption behaviour is status quo bias. If the business took the status quo (i.e. no technology) as a reference point, then any change from the status quo, in this case adopting the novel technology, would be perceived as a loss. If the business owners were loss averse, they would be less likely to adopt.

Policy implications

The research suggests that policy and programs to promote new technology adoption could be best designed by addressing the (situational) barriers, particularly bureaucratic hassles and lack of information. A government program providing the mobile technology for free, which is a relatively low-cost intervention, would bring substantial commercial benefits for the SMEs. Moreover, such intervention will repay itself in terms of increased taxation revenues. Providing the technology for free might also result that at a certain point in time a ‘tipping point’ will be reached; the remaining SMEs switch to the mobile technology because over it has become common practice. This will also moderate the effect of the status quo bias.

Along with providing the technology for free, an additional policy recommendation involves the lowering of the bureaucracy, and likely the application procedures for the mobile banking accounts; A one-stop shop for getting the mobile technology with flexible guarantee requirements, for instance offered as a package with a trial period. The lack of information can be addressed effectively once the application bureaucracy is eased. Information campaign to reach out and assist the SME owners to apply for mobile banking accounts.

4.3 Finance and demand for skill

The third scientific paper within the ‘Finance for Productivity Growth’ theme addressed the role of financial constraints in firms’ skilled labour demand. Specifically, using a small business survey from Uganda, the research explored whether skilled job creation rises with access to external finance. Uganda is comparable to Ethiopia in terms such financial constraints and skilled labour issues. The original working paper is entitled ‘Finance and Demand for Skill: Evidence from Uganda’ (2016) by Thorsten Beck, Mikael Homanen and Burak Uras.

Sub-Saharan Africa experienced a decade of growth between 2000 and 2012, in which average annual GDP growth was over 4.5%. However, recent studies indicate that this growth has not translated into similarly high growth rates in job creation. Current growth comes largely from a small base of industry and the manufacturing sector, which will not come close to absorbing the millions of new workers entering the labour force each year. What is even more challenging is that many educated and skilled workers in Africa fail to find employment. The supply of highly skilled human capital who remain unemployed raises the question of whether there is a shortage of firm-level demand for skill in African economies.

Academic studies stress the importance of access to external funding for firm-level investment decisions, economic development and growth. What about the interactions between access to finance and employment creation for educated workers? There is little research addressing the effect of financing constraints on hiring decisions, especially of skilled workers.

Research approach and findings

The research shows that the extent to which micro and small businesses expand skilled employment, as their sales and profits increase, depends significantly on access to external funding. Firms with positive performance and a bank loan hire more trained and experienced employees. Thus, growing and profitable small businesses create more jobs for trained and experienced workers - which is interpreted as demand for skill - if they have access to external finance.

The analysis does not reveal a significant relationship in the case of hiring casual employees or family and friends in the informal context, suggesting that financing constraints are more likely to bind in the context of employment contracts associated with experienced and trained employees with high human capital intensity. The results also suggest that financially constrained firms save their excess resources instead of investing in a more sophisticated and skilled workforce.

Policy implications

The research findings underline the importance of well-developed financial systems for policies focusing on job creation. Firms with greater financial flexibility are more likely to hire skilled labour once their performance improves. For policy makers focusing on the challenge of creating formal and permanent jobs in a developing society, devising a complementary financial sector policy is equally important. The policy should go beyond helping firms directly to strengthening efficient financial systems and credit programmes as well.

Better access to external funding can thus be an accelerator of human capital investment demand and growth. Policy makers must also acknowledge that firms who are financially constrained save a greater proportion of their additional profits (or pay other expenses associated with financial constraints) and therefore cannot invest further in greater levels of employment; if access to finance is difficult, one could question the optimal effectiveness of employment creation policies.

For government, interest rates by state banks. would be a first point of attention in policy efforts to create formal employment of higher skilled labour. Against this background, policy monitoring systems for employment

creation could include the degree of access to finance. Looking at it from the other side, formal credit policies and programmes could include formal job creation, since they are linked.

Better performance and financial access do not explain the hiring rates of informal employees, which include casual and family employees. Labour creation policies should thus acknowledge the different policy instruments for creating employment for higher educated and skilled workers on the one hand, and informal employment on the other.

In many developing countries, young people are educated and governments need to find ways to employ these highly qualified workers. With better access to finance, a firm's workforce can become more permanent and potentially more stable as well. As firms grow and become profitable, employment opportunities will increase for those who are formally trained, educated and more experienced. The policy relevance of such stable employment for higher educated staff centres on greater commitment of staff in firms. This will particularly positively affect firms' survival and innovation efforts, and is thus a vital issue for policy makers in many nations, and especially in developing countries.

5 Innovation systems

Within the Innovation Systems theme, data from Ethiopia are analysed and presented in annex 2 and 3 of this report. Moreover, the ‘Innovation System’ team produced three scientific papers involving data from neighboring countries that have special relevance to Ethiopia in terms of labour flexibility, gender and export effects on innovation. The research findings of these papers are discussed and policy implications are reviewed in the paragraphs below. The associated policy briefs and many others are listed in the project website.

5.1 Innovation, downsizing and labour flexibility

The first scientific paper within the ‘Innovation Systems’ theme with relevance to Ethiopia focuses innovation and labour flexibility. Firms increasingly engage in downsizing their labour force with a view to increase their efficiency and to cut costs. However, recent research in developed countries found that downsizing firms do not always enjoy the desired increase but rather frequently experience a decrease in organizational performance, efficiency and profitability: Downsizing is frequently associated with increased feelings of job insecurity among the remaining employees, resulting in lower levels of motivation and commitment and ultimately a decrease in innovative behaviours and performance. Given the frequent use of downsizing, the importance of innovation for firm competitiveness and the negative impact of the former on the latter, researchers and practitioners alike are intrigued by the question how firms can remain innovative despite undergoing downsizing.

Taking the special importance of innovation for developing countries into account, the researchers assess the effect of different forms of labour flexibility on innovation during downsizing in a quantitative study across nine developing countries in South Asia and Africa. As such, the research team broadened the focus from the thus far primarily European and American context to emerging economies. In answering the question whether labour flexibility can be a means to lessen the negative effect of downsizing on innovation, the researchers focus on process innovation. Downsizing poses a special challenge for process innovation given its particular dependence on knowledge exchange and collaboration across firm networks and technology institutions, which suffer immensely during downsizing. Similarly, the focus on the predominant organizational form of small and medium enterprises (SMEs) in developing countries offers an interesting research setting: For reasons associated with proximity, interpersonal links in SMEs are much stronger than in large companies, which can be expected to additionally amplify the negative effect of downsizing on innovation. The original working paper is entitled ‘Success belongs to the Flexible Firm: How Labour Flexibility Can Retain Firm Innovativeness in Times of Downsizing’ (2017) by Daniela Ritter-Hayashi, Joris Knoben and Patrick Vermeulen.

Research findings

The study focuses on process rather than product innovation because downsizing poses particular challenges for the latter given its dependence on knowledge exchange and collaboration across firm networks and technology institutions. The results of the study suggest that downsizing a firm’s workforce negatively impacts process innovation in SMEs in emerging nations. However, the study indicates that labour flexibility can be a way for firms to overcome the innovation challenges associated with downsizing. The researchers find that both numerical flexibility, namely the use of temporary employment, as well as functional flexibility such as employee training, can alleviate the negative impact of downsizing on innovation. Moreover, independent of whether or not a firm is downsizing its workforce, wage and reward flexibility in terms of performance bonuses for managers and employees positively impact innovation regardless of other factors.

Policy implications

Casual work is a common practice in emerging nations, and was regularly observed in the qualitative studies of EIP-LIC, in particular in SMEs with irregular order portfolios. Casual employment in these SMEs involves low-skilled labour as part of the periphery workforce. The fact that casual workers frequently rotate allows them to transport best practices and tacit knowledge from one firm to another. The casual workers usually lack specialised expert knowledge, so the benefit of numerical flexibility does not concern higher level knowledge supporting innovation. SME owners and managers could take both considerations into account in their staffing strategy. Despite the overall lower education and thus knowledge levels in firms, the loss of firm-specific and tacit knowledge associated with downsizing confronts firms with considerable innovation challenges.

Following the research findings, managers of SMEs in developing countries might wish to take functional flexibility into account in their business strategies, because an increasing percentage of employees having received training will positively moderate the relationship between downsizing and innovation. Focusing on the psychological impact downsizing has on the remaining employees, employability as a human resources management strategy could be a substitute for employment security during downsizing to protect their psychological contract with the firm.

Managers could thus consider functional flexibility as a means to mitigate downsizing's negative effect on innovation. In particular, firms might consider training a core group of staff to distribute existing knowledge among the remaining firm members, to create new knowledge as well as to increase employees' employability.

A final policy or management strategy implication for managers concerns providing performance bonuses. This management practice is highly efficient in the emergent country context. Bonuses also moderate the effects of a high rate of staff turnover, which is considerably higher in emerging compared to developed countries. Wage and reward flexibility can, if designed accordingly, be a means for motivating employees to remain with the firm given the prospect of monetary incentives.

5.2 Gender diversity and innovation

The second paper within the 'Innovation Systems' theme analyses the relationship between gender diversity in the ownership, management and workforce structure at the firm level and women's economic opportunity at the country level to improve innovation outputs. In present theory, there is an implicit assumption that higher levels of women's economic opportunity at a country level enable firms to better render the benefits gender diversity can bring for innovation. The original working paper is entitled 'Gender Diversity and Innovation: The Role of Women's Economic Opportunity in Developing Countries' by Daniela Ritter-Hayashi, Patrick Vermeulen and Joris Knobens.

Research Findings

The research shows that gender diversity at all levels in the organization has a positive effect on innovation in the firms surveyed in low and lower-middle income countries in South Asia, Africa and the Middle East - despite their below-average performance on a world-wide scale of measuring women's economic opportunity. Furthermore, the research illustrates that a country's level of women's economic opportunity plays an important role in the relationship between gender diversity and innovation.

On the one hand, the results put forward that the positive effect of gender diversity on firms' innovation likelihood is amplified with increasingly equal opportunities for women. On the other hand, both gender diversity in the ownership structure and in the overall workforce can have a negative effect on a firm's likelihood to innovate if the firm is operating in a country with very little economic opportunity for women.

It needs to be however pointed out that, extrapolated from this study, gender diversity only has a potential negative effect on innovation in a handful of countries worldwide, ranging at the bottom of the women's economic opportunity ranking (lowest 5 countries for gender diversity in the workforce and lowest 15 countries for gender diversity in the ownership structure).

Policy Implications

Based on the research results, it is essential to acknowledge the value of gender diversity for innovation and to create awareness among managers and employees that innovation emerges and blossoms from gender diversity at the firm level. Government agencies could develop special policies and programs which encourage and support firms in hiring a more gender-balanced workforce, having more female top managers and supporting firms with a gender diverse ownership structure. This could take the form of awareness raising programs explaining the particular benefit of gender diversity for a firm's likelihood to innovate.

Furthermore, the introduction of tax advantages, subsidies or other incentives targeted at increased gender diversity at all hierarchical levels within a firm could be a driver for increased gender balance. Once awareness is raised at the top ranks of firms, it is pivotal that managers initiate a change of attitude and organizational culture top-down, encouraging women to voice their opinion, urging men to value women's viewpoints and knowledge in the innovation process, and reassuring management on the importance of promoting both men and women based on their performance rather than their gender.

It is crucial to encourage increased levels of women's economic opportunity at a country level as a prerequisite for gender diversity to benefit innovation. Potential avenues are increased access of women to education to decrease the gap in knowledge between men and women. Governments could initiate country-legislation enabling women to better balance family and work demands such as improved childcare as well as maternity and paternity leave. An additional avenue for policy makers is to encourage a social perception of women as being equally valuable members of society like men, with the same rights and obligations.

On a practical level, supporting networking activities through women entrepreneurship associations seems an effective instrument to strengthen women's determination to pursue ambitions. Moreover, establishing programs in which women entrepreneurs lend support to girls on their way of obtaining education can be of advantage. This can take the form of financial support and motivational reinforcement for the girls themselves. Similarly, successful women entrepreneurs can serve as a role model to girls' families, which may be hesitant to invest in their daughters schooling based on traditional gender norms and expectations. Moreover, to change the overall public perception of women entrepreneurs while aiming at a ripple down effect to their immediate surrounding and support system, campaigns celebrating the success of women starting a business can be a further avenue to strengthen their societal position.

5.3 Innovation and export

The third scientific paper within the ‘Innovation Systems’ theme assesses whether innovation directly influences exporting behavior, because firms apply innovation as a strategy for gaining an international market share. A firm’s ability to successfully compete on the international market is influenced by its capacity of introducing and marketing both new and improved products.

Actually, the link between innovation and exporting has received considerable attention. One strand of research investigates complementarity between exporting and innovation while the other examines the direction of causality. Nevertheless, few studies take into account the possibility of both causalities occurring simultaneously. Furthermore, a majority of these studies have been conducted in developed countries. For instance, previous studies find evidence of learning by exporting in Sub-Saharan Africa (SSA) implying that participation on international markets facilitates knowledge flows from customers and competitors. Yet, it remains unclear how this mechanism affects the exporting-innovation relation.

In the paper, a team of researchers from University of Nairobi and Radboud University investigated bi-directional relationship between innovation and exporting in four countries in Sub-Saharan Africa. Specifically, the research addressed the question whether there is a positive relationship between innovation and subsequent exporting and that this relationship is mediated by market creation and with customer feedback mediating this relation. The original working paper is entitled ‘Export and Innovation in Sub-Saharan Africa’ (2017) by Laura Barasa, Bethuel Kinyanjui, Joris Knobens, Peter Kimuyu and Patrick Vermeulen. The study sample consists of firms located in SSA including Ghana, Kenya, Tanzania, and Uganda.

Research findings

The research finds that the relation between innovation and subsequent exporting is positive and significant. However, we find a positive but non-significant relation between exporting and subsequent innovation. These relations broadly nuance a relationship between innovation and exporting.

The teams also find evidence that market creation mediates the innovation-exporting relationship since the innovation process entails the introduction of new products and services on the marketplace. The market creation significantly mediates about 32.5% of the effect of innovation on subsequent exporting. In agreement with this, our results suggest that the technology-push mechanism accounts for the relationship between innovation and subsequent exporting in the context of SSA.

Similarly but to a much larger extent, customer feedback is found to significantly mediate about 67.4% of the effect of exporting on subsequent innovation. Furthermore, we find evidence that customer feedback mediates the relation between exporting and innovation to a large extent (67.4%) suggesting that the demand-pull mechanism is very critical in explaining this relationship. Taking into cognizance that the demand-pull mechanism has received scant attention over the past years this finding gives rise to an important theoretical implication arising from the empirical evidence of the demand-pull mechanism in SSA. We argue that the recognition of market needs arising from customers on the export market constitutes a major driving force of innovation in SSA.

Apart from contributing to the debate on the innovation-exporting relationship in the context of SSA, the paper goes a step further to shift focus on disentangling the mechanisms underlying this interrelationship. This is an area of study that has received scant attention particularly in the African context.

Policy implications

The findings reveal that whilst the main effect for the innovation-exporting relationship is significant, the reverse relation remains unclear. Notwithstanding, the positive albeit non-significant relation between exporting and innovation provides some nuanced support for the existence of a bi-directional relationship. Furthermore, the technology-push mechanism underlies the innovation-exporting relation to a medium extent. Hence, innovation policies aimed at fostering product innovation by providing incentives may be crucial for exporting. Such policies may be useful in fostering the development of innovations with a high degree of novelty and are likely to promote exporting through the creation of new market space.

Moreover, the study provides evidence that the demand-pull mechanism underlies the exporting-innovation relationship. Customer feedback mediates the exporting-innovation relation to a very large extent. Therefore, state capital expenditure focusing on information and communications technology infrastructure investment is vital in enabling faster response to market needs. Additionally, export promotion policies encompassing instruments such as export subsidies are likely to play a key role in stimulating innovation in SSA.

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Annexes

Annex 1: Series of EIP-LIC working papers

Innovation systems

1. Bos, M. J. D., B. V. G. Goderis and G. C. L. Vannoorenberghe. 2014. Inter-industry Total Factor Productivity Spillovers in India. DFID Working Paper. Tilburg: Tilburg University.
2. Barasa, L., P. Kimuyu, P.A.M. Vermeulen, J. Knoben and B. Kinyanjui. 2014. Institutions, Resources and Innovation in Developing Countries: A Firm Level Approach. DFID Working Paper. Nijmegen: Radboud University *)
3. Osoro, O., G. Kahyarara, J. Knoben and P.A.M. Vermeulen. 2015. Effect of Knowledge Sources on Firm Level Innovation in Tanzania. DFID Working Paper (**)
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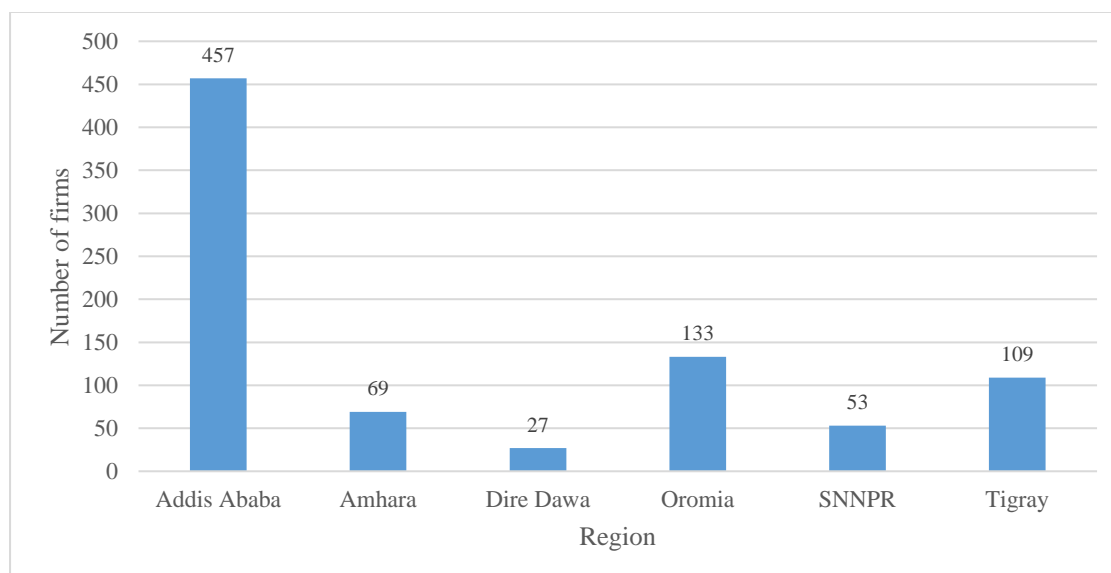
All papers are accessible at the EIP-LIC project website: <https://www.tilburguniversity.edu/dfid-innovation-and-growth/>

Annex 2: Highlights of DFID/World Bank EIP-LIC survey Ethiopia

Introduction

This annex 2 describes the salient features firms in Ethiopia to provide a detailed layout of the innovation context in Ethiopia. Two waves of data from the 2015 World Bank Enterprise Survey (WBES) and the 2016 Innovation Capabilities Survey (ICS) were used for preparing this report. The WBES collects data focusing on an economy's business environment and investment climate. The World Bank has conducted firm-level surveys since the 1990's, however, since 2005 data collection efforts have been centralized and instruments standardized for establishing comparability of data across countries. The WBES involves administering firm-level surveys to a representative sample of firms in the non-agricultural formal sector in an economy comprising firms in the manufacturing, retail and service sector. In addition, WBES are stratified according to the firm size, sector of activity, and geographical location of the firm (www.enterprisesurveys.org). The WBES includes 848 firms. The ICS is a follow-up and complementary to the WBES. The ICS comprises 204 randomly selected manufacturing firms in the WBES sample making its sample a subset of the WBES sample. Unlike the WBES, the ICS sample is stratified according to firm size and location only. The ICS focuses on innovative activities and innovative capabilities of manufacturing firms, and is a collaboration between the Enterprise Analysis Unit (DECEA) of the Development Economics Group of the World Bank, Tilburg University, and Radboud University Nijmegen within the 'Enabling Innovation and Productivity Growth in Low Income Countries' project funded by the United Kingdom's Department for International Development (DfID).⁴ The raw dataset used in this report was created by merging the two waves of data collected from the WBES and the ICS by means of the unique firm identifiers for firms in six regions. Figure 1 reports the number of firms in each region after merging the two datasets. Addis Ababa has the largest number of firms. This may be attributed to the fact that Addis Ababa is the capital city of Ethiopia.

Figure 1. Distribution of firms by region⁵



⁴ This project was undertaken to study the innovative capability of manufacturing firms in ten case countries including Ghana, Tanzania, Uganda, Kenya, South Africa, and Ethiopia from Africa, Bangladesh, and India from South Asia and, Vietnam and Indonesia from East Asia and Pacific <http://www.tilburguniversity.edu/dfid-innovation-and-growth/>.

⁵ SNNPR stands for Southern Nations, Nationalities and Peoples' Region.

General description of the sample

Distribution of firms by sector and region

Table 1 shows the sectoral distribution of firms in each region as reported in the WBES. The distribution of firms is similar for the six regions with the largest number of firms falling in the manufacturing industry. Table 1 also reveals that the food sector and the non metallic mineral products sector dominate the manufacturing industry. The precision instruments sector has the lowest number of firms in the entire sample.⁶

Table 1. Distribution of firms by sector and region

Industry	Code	Sector	Addis Ababa	Amhara	Dire Dawa	Oromia	SNNPR	Tigray	Total
Manufacturing	15	Food	26	6	10	25	13	9	89
	16	Tobacco	1	0	0	0	0	0	1
	17	Textiles	7	1	2	1	1	1	13
	18	Garments	18	1	0	5	0	11	35
	19	Leather	16	1	0	3	1	1	22
	20	Wood	5	2	0	0	1	0	8
	21	Paper	2	0	0	1	0	0	3
	22	Publishing, printing, and recorded media	21	1	0	2	2	1	27
	24	Chemicals	13	0	1	0	0	0	14
	25	Plastics & rubber	17	0	2	5	1	2	27
	26	Non metallic mineral products	23	1	0	7	7	25	63
	27	Basic metals	5	2	0	4	0	2	13
	28	Fabricated metal products	11	0	3	2	0	6	22
	29	Machinery and equipment (29 & 30)	2	2	0	0	0	1	5
	31	Electronics (31 & 32)	4	0	0	0	0	0	4
	33	Precision instruments	1	0	0	2	0	0	3
34	Transport machines (34 & 35)	2	0	0	2	0	1	5	
36	Furniture	10	4	1	6	4	4	29	
Retail	52	Retail	48	7	1	15	1	11	83
Other services	51	Wholesale	77	20	2	19	4	5	127
	72	IT	4	0	0	0	0	1	5
	55	Hotel and restaurants: section H	19	8	0	19	13	13	72
	50	Services of motor vehicles	28	4	2	4	1	2	41
	45	Construction Section F	39	2	1	2	3	6	53
60	Transport Section I: (60-64)	58	7	2	9	1	7	84	
		Total	457	69	27	133	53	109	848

Descriptive statistics

Table 2 reports the descriptive statistics on some of the variables of sampled firms using data from the WBES. A majority of the firms are small and medium sized. Table 2 shows that one half of the firms have less than 19 fulltime employees in 2015. A quarter of the firms have more than 68 fulltime employees. The largest firm reported having 7600 fulltime employees. Sales turnover in 2015 exhibits heterogeneity. The minimum sales turnover was zero Ethiopian Birr (ETB). The median firm in the sample reported a sales turnover of 8 million ETB whilst the average sales turnover in the same period

⁶ Due to missing observations, the number of firms in the subsequent sections does not always add up to 848.

was 72.985 million ETB. Table 2 also shows that one half of the firms have been in operation for less than 11 years with the average age of firms being about 15 years. Hence, most of the firms in our sample are relatively young. Labour productivity, calculated as sales turnover divided by the number of fulltime employees also exhibits heterogeneity. The minimum labour productivity is zero ETB given that one firm reported no sales turnover. The median firm reports a labour productivity of 265,690 ETB against a mean of about 1.6 million ETB. The maximum value for labour productivity is 75 million ETB. An interesting observation is that one quarter of the firms experienced a decrease in turnover growth over the period 2012-15. Lastly, 204 firms report the same number of employees over the period 2012-15.

Table 2. Descriptive statistics

Variable	min	p25	p50	p75	max	mean	N
Turnover 2015*	0.00	1200.00	8000.00	66275.43	7000000.00	72985.79	848
Employment 2015**	1.00	7.00	19.00	68.00	7600.00	94.40	848
Age	1.00	6.00	11.00	18.00	90.00	14.50	848
Labour productivity ***	0.00	99.25	265.69	909.09	75761.34	1604.54	848
Turnover growth 2012-15	-1.00	-0.03	0.25	0.50	23.39	0.48	848
Employment growth 2012-15	-0.94	0.00	0.04	0.33	89.48	0.36	848

*Turnover is reported in Ethiopian Birr and is divided by 1000

**Firms are categorized as small (1-19 employees), medium (20-99 employees), and large (100+ employees)

***Labour productivity is calculated as Turnover 2012 divided by number of fulltime employees in 2012

Sales and exports

Table 3 reports the proportion of sales that are exported directly and indirectly (i.e. by third parties). These measures give an indication of the intensity of foreign trade as reported in the WBES. Dire Dawa region reports the highest percentage of direct exports (8.5%) whilst SNNPR reports the highest percentage of indirect exports (1.9%). Notwithstanding only two regions including SNNPR and Addis Ababa engage in indirect exporting.

Table 3. Export status

Region	Direct exports	Indirect exports	N
Addis Ababa	7.2%	0.8%	457
Amhara	8.3%	0.0%	69
Dire Dawa	8.5%	0.0%	27
Oromia	3.2%	0.0%	133
SNNPR	0.0%	1.9%	53
Tigray	3.4%	0.0%	109
Total	5.1%	0.4%	848

Table 4 reports export status of manufacturing firms located in different regions in the world (www.enterprisesurveys.org). In comparison to the values reported in Table 4, we observe the proportion of total sales that are exported directly in Ethiopia (5.1%) is only surpassed by that of East Asia and Pacific, Europe & Central Asia, and Middle East & North America. It can also be observed that indirect exports (0.4%) shown in Table 3 is very low relative to the values reported in Table 4.

Table 4. Export status by region

Region	Direct exports	Indirect exports
East Asia and Pacific	6.5%	2.1%
Europe & Central Asia	5.4%	2.7%
Latin America & Caribbean	4.7%	2.5%
Middle East & North America	8.5%	2.5%
South Asia	5.0%	4.0%
Sub-Saharan Africa	4.2%	2.9%

Supplies and imports

Table 5 reports the proportion of material inputs and supplies purchased from domestic or foreign origin. These measures are also reported in the WBES. Addis Ababa and Dire Dawa report the highest percentage of imported inputs (31.1% and 29.4% respectively). Contrastingly, Tigray reports the lowest percentage of imported inputs (9.4%). Nevertheless, all the regions report that more than one half of the inputs are of domestic origin region. This may suggest that sampled firms face large number of alternative suppliers domestically. Firms may also have the alternative of purchasing their inputs from local importers.

Table 5. Origin of inputs and supplies

Region	Foreign origin	Domestic origin	N
Addis Ababa	31.1%	68.9%	186
Amhara	10.0%	90.0%	21
Dire Dawa	29.4%	70.6%	19
Oromia	16.0%	84.0%	57
SNNPR	15.5%	84.5%	31
Tigray	9.4%	90.6%	63
Total	18.6%	81.4%	377

Table 6 shows the proportion of total inputs by origin for firms located in different regions (www.enterprisesurveys.org). We observe that relative to firms in all the regions shown in Table 6, firms in Ethiopia rely on inputs of foreign origin to a much smaller extent. Notwithstanding, firms in Ethiopia rely heavily on domestic inputs in comparison to firms in other regions.

Table 6. Origin of inputs and supplies by region

Region	Foreign origin	Domestic origin
East Asia and Pacific	25.8%	74.2%
Europe & Central Asia	38.4%	61.6%
Latin America & Caribbean	35.7%	64.3%
Middle East & North America	43.1%	56.9%
South Asia	24.0%	76.0%
Sub-Saharan Africa	37.5%	62.5%

Innovation

Product and process innovation

Measures reported in this section are also from the WBES. As shown in Table 7, a majority of firms report on whether they have introduced new or significantly improved products or services, and processes. Dire Dawa region has the highest percentage for both product innovation (48.1%) and process innovation (44.4%). Oromia region had the lowest rate of product innovation (27.1%) whilst Tigray region had the lowest rate of process innovation (12.8%). The firms report lower rates of product innovation relative to process innovation. A comparison between the rates of innovation in the sample and those of the EU-28 enterprises based on the Community Innovation Survey (CIS) for the period 2012 through 2014 (ec.europa.eu) reveals that the average rate of both product and process innovation in Oromia is markedly similar to the average rate of innovation observed in EU-28. Yet, the reported rates of innovation for the remaining regions are relatively higher than the rates reported by EU-28 enterprises. Cirera and Muzi (2016) argue that such high levels of self-reported innovation in developing countries partly arise from a rather subjective definition of an innovation in the surveys especially since innovations are likely to be more incremental and less radical. Notwithstanding, the definition of innovation in both the WBES and CIS is guided by the Oslo Manual (2005) which defines innovation as the introduction of new or significantly improved products and services.

Table 7. Product and process innovation

Region	Product innovation	Process innovation	N
Addis			
Ababa	38.9%	30.4%	457
Amhara	43.5%	33.3%	69
Dire Dawa	48.1%	44.4%	27
Oromia	27.1%	18.8%	133
SNNPR	37.7%	34.0%	53
Tigray	33.9%	12.8%	109
Total	38.2%	29.0%	848
EU-28	23.9%	21.6%	

Table 8 shows the market orientation of product innovations from the ICS. A large percentage of firms indicate that both product innovations are new to the local market. A very small proportion of the firms report that innovations are new to the international market. This may indicate that innovations have a relatively low degree of novelty. Furthermore, Addis Ababa region leads in product innovation that is new to the local and international market. Dire Dawa regions does not report on innovation that is new in the local market or international market. It is also striking the rest of the regions do not report any innovation that is new to the international market.

Table 8. Product innovation market orientation

Region	Product innovation		
	Local	International	N
Addis Ababa	18.8%	5.0%	101
Amhara	15.4%	0.0%	13
Dire Dawa	0.0%	0.0%	10
Oromia	12.1%	0.0%	33
SNNPR	13.3%	0.0%	15
Tigray	12.5%	0.0%	32
Total	12.0%	0.8%	204

Objectives of innovation

Figure 2 describes the reasons for firms introducing their main innovative products and services from the ICS. The main objective for product innovation is extending the range of products or services. Opening up new markets or increasing market share which exhibits very little variation between the regions is also an important objective for innovation. Competition also ranks as an important objective for innovation. Few firms report compliance with regulations and standards, and replacing a product or service already offered by the firm as a reason for product innovation.

Figure 2. Objectives of product innovation

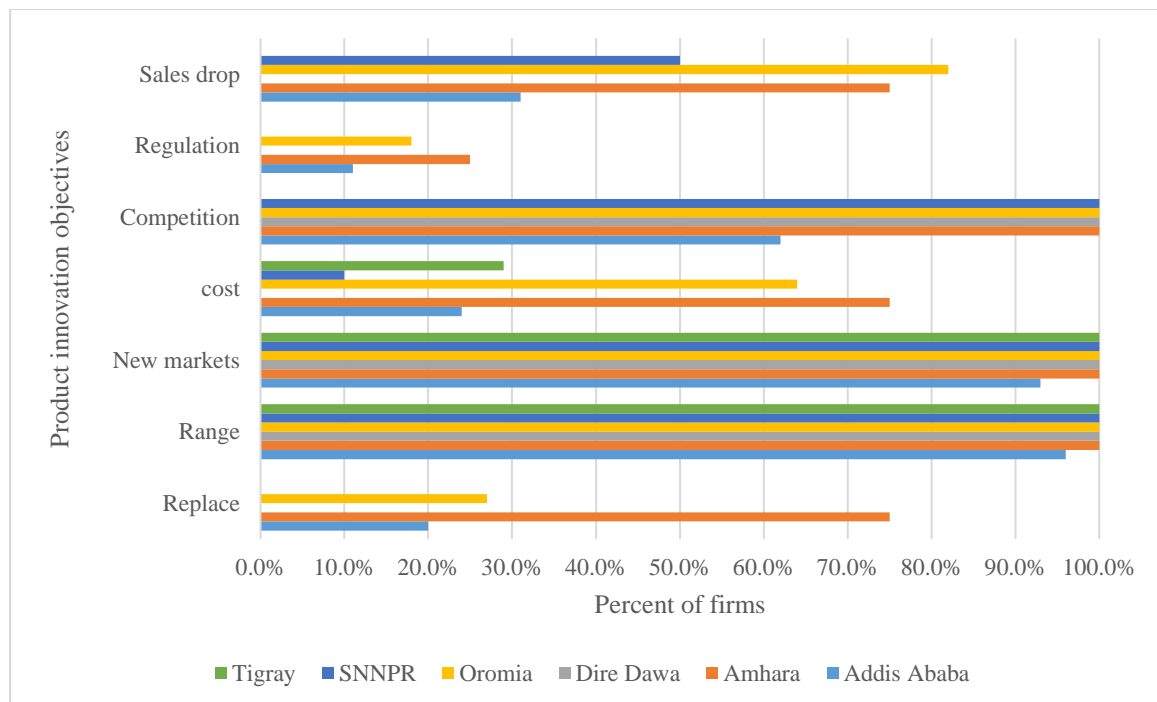
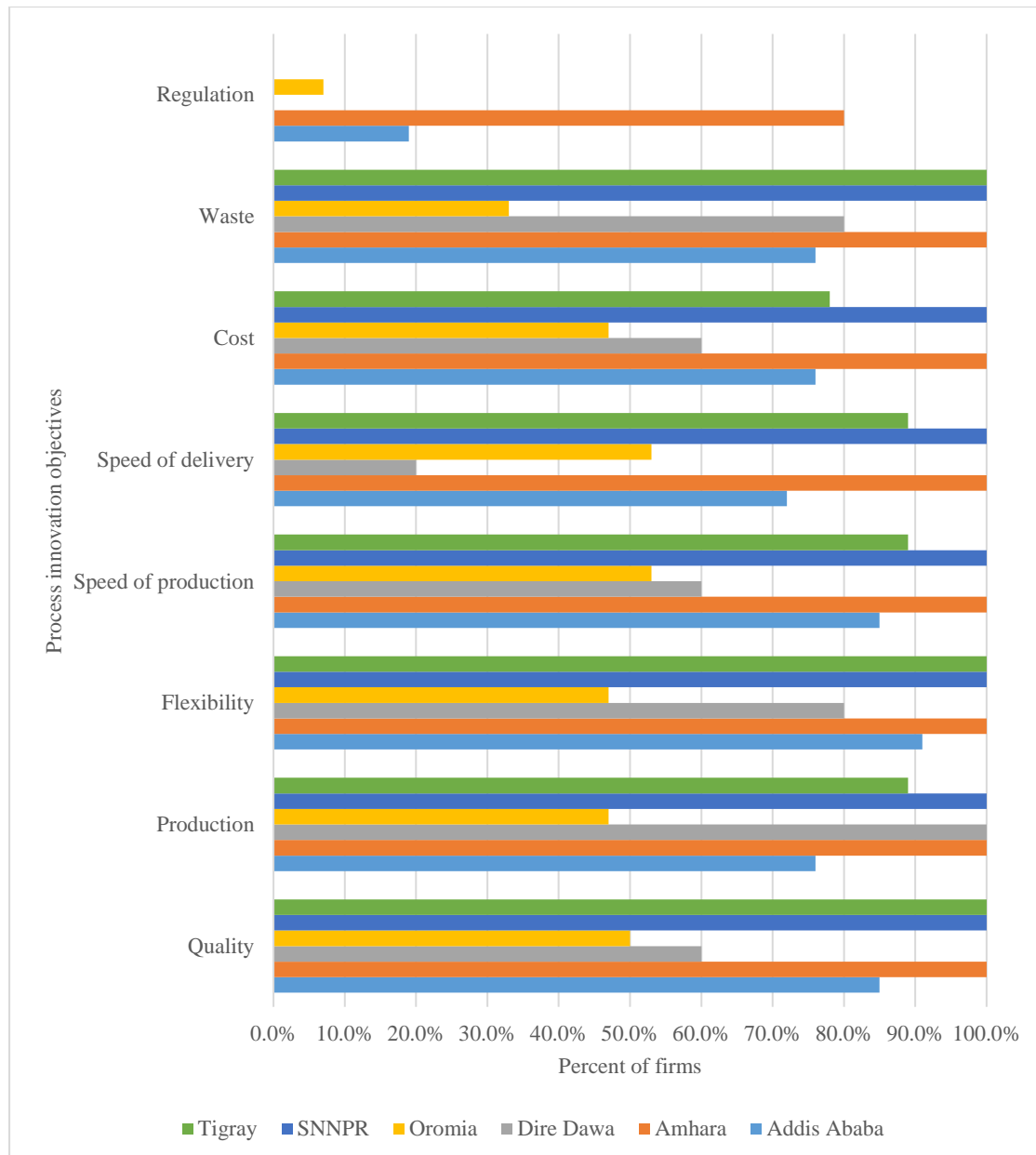


Figure 3 reports the main reasons for introducing process innovation in the firm from the ICS. A high percentage of the firms report that the main reason was to increase flexibility of production and offering services, followed by increasing productivity of goods and services and to increase the quality of goods and services. There are no marked differences between the regions in these three objectives. A much

smaller percentage of firms report compliance with regulations and standards as a reason for process innovation.

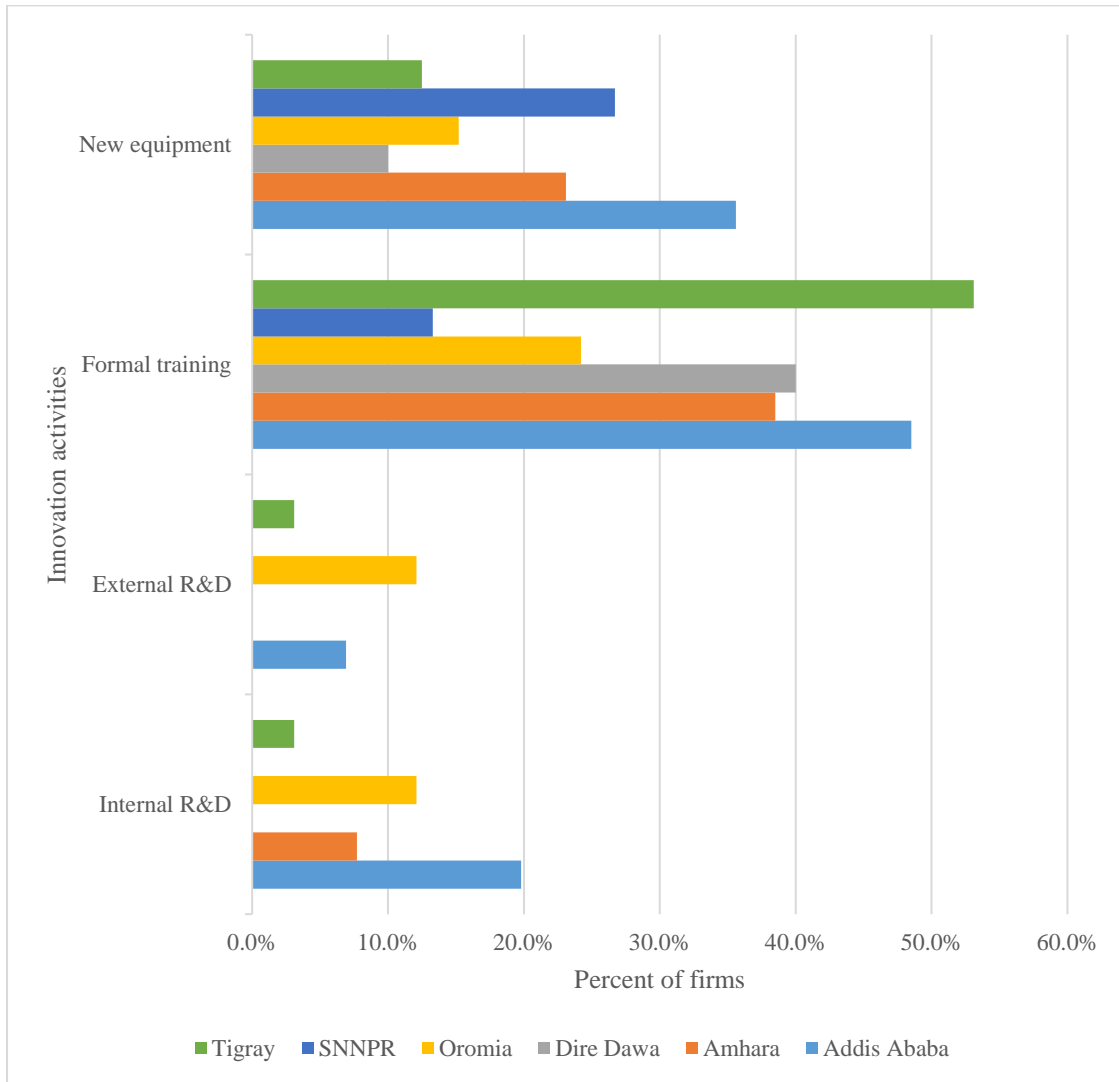
Figure 3. Objectives of process innovation



Innovation activities

Figure 4 reports on the activities associated with the development or production of product/service or process innovations reported in the ICS. The regions exhibit relatively small differences in the reported measures. The most important innovation activity is formal training, followed by the purchase of new equipment, machinery or software. Internal R&D, and external R&D are less important innovation activities in Ethiopia. External R&D relating to creative work undertaken by other public or private enterprises that are paid for the development of innovations seems to be of very low importance in all the regions. It is likely that the costs associated with external R&D are high.

Figure 4. Innovation Activities



Sources of information for innovation

The most important sources of information or ideas for innovation activity by region as reported in the ICS are shown in Figure 5. A majority of firms rely on customer feedback for innovation. The second most important source of information is the internet. The least important sources of information or ideas for innovation include knowledge from the parent, and universities and research institutes. This may imply weak linkages between parent firms and their establishments, and firms and universities/research institutes, and government ministries.

Figure 5. Sources of information for innovation by region

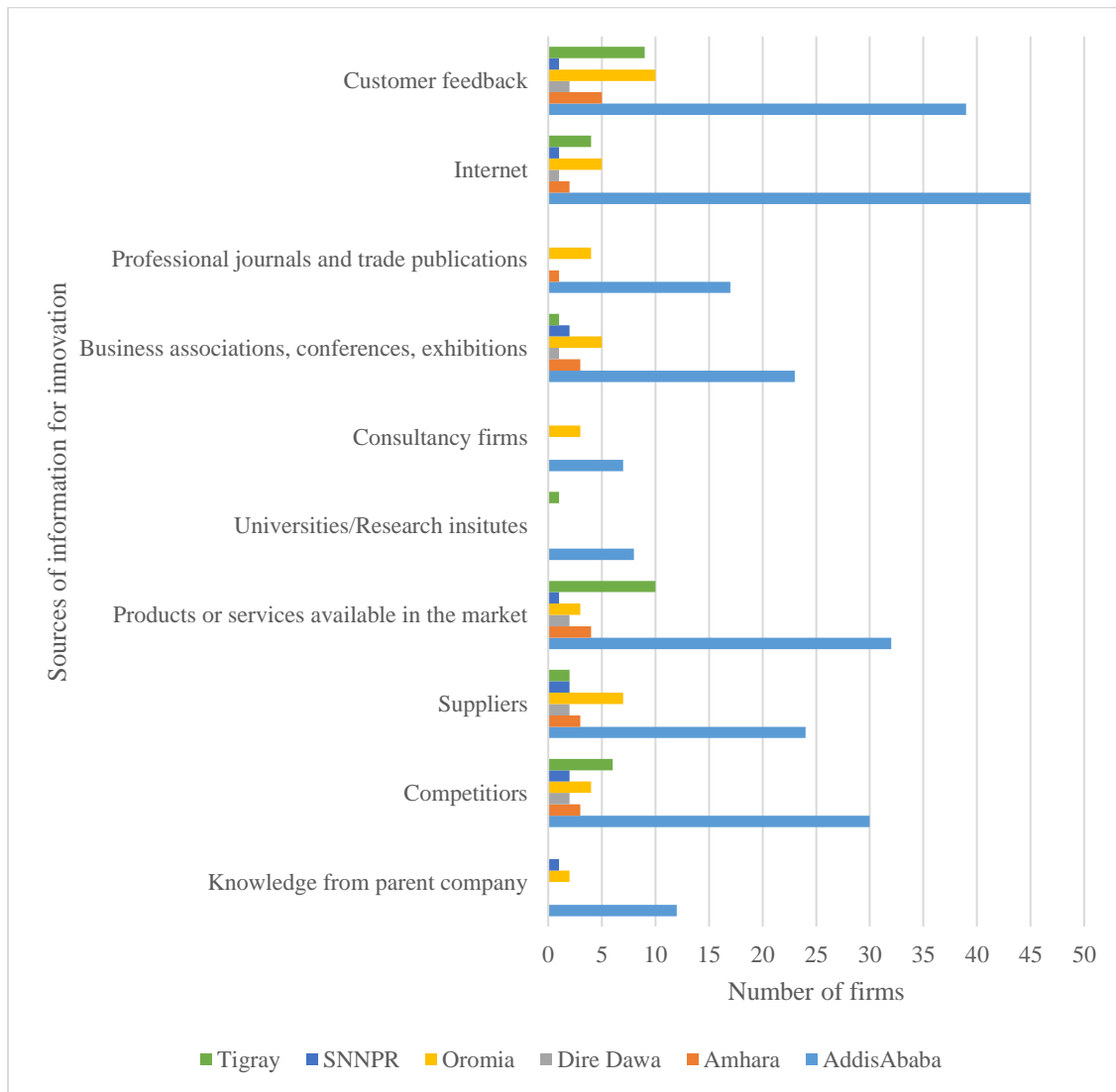
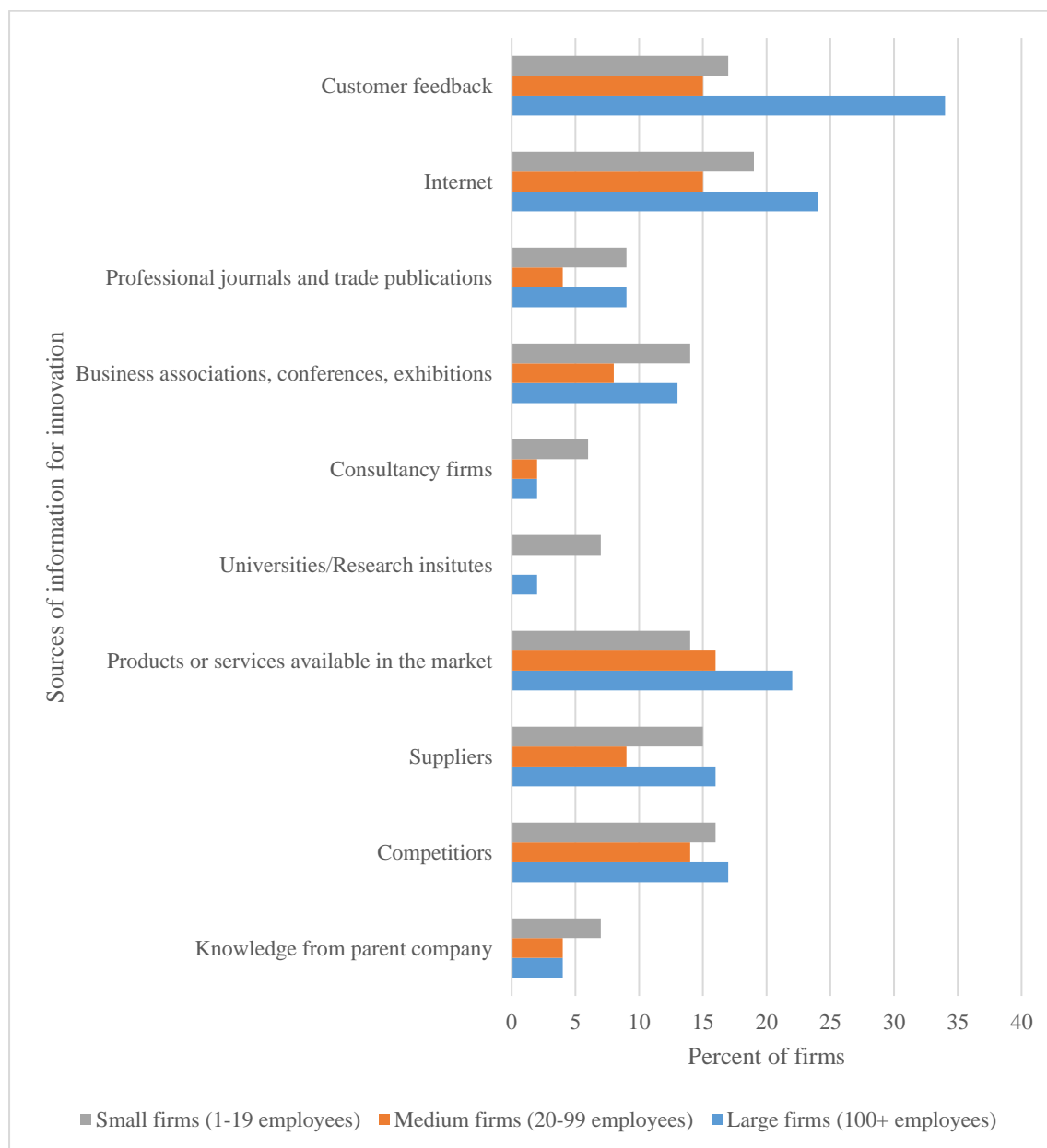


Figure 6 shows the distribution of the source of information for innovation activity by size of the firm. The internet, customer feedback and products or services available in the market remain the most important sources of information for all categories of firms consisting of small, medium, and large firms. The least important source of information for innovation activity for all sizes of firms is universities/research institutes and consultancy firms.

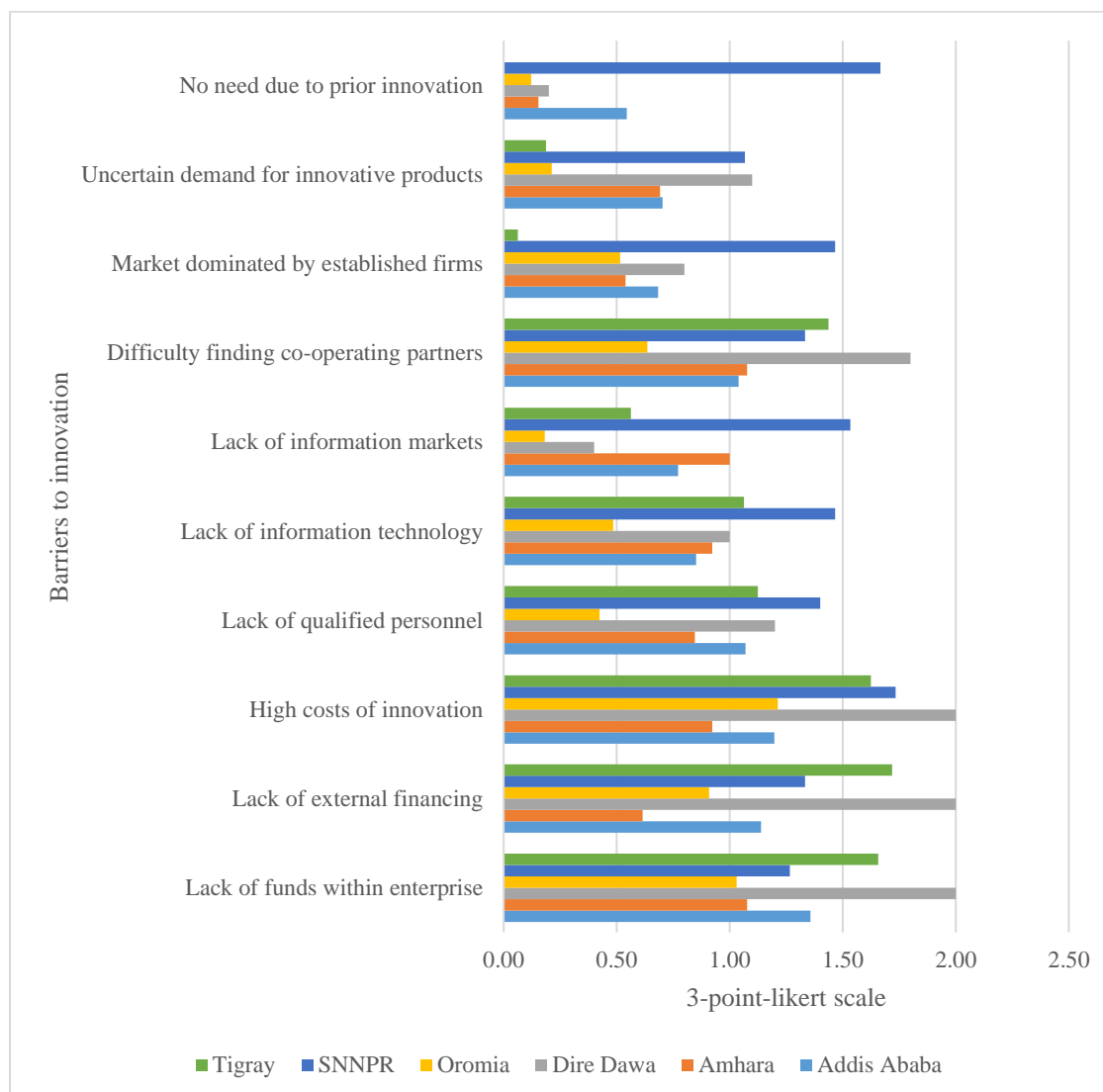
Figure 6. Sources of information for innovation by size



Barriers to innovation

Figure 7 reports on factors hampering innovation. A 3-point-likert scale ranging from not important to very important in the ICS instrument is used to measure factors that impede innovation. A majority of firms in Ethiopia report that lack of funds within the enterprise, lack of external funds, and high costs of innovation are very important barriers to innovation. The least important barriers to innovation for a majority of firms in all the regions include no need for innovation due to prior innovation and uncertain demand for innovative products.

Figure 7. Barriers to innovation

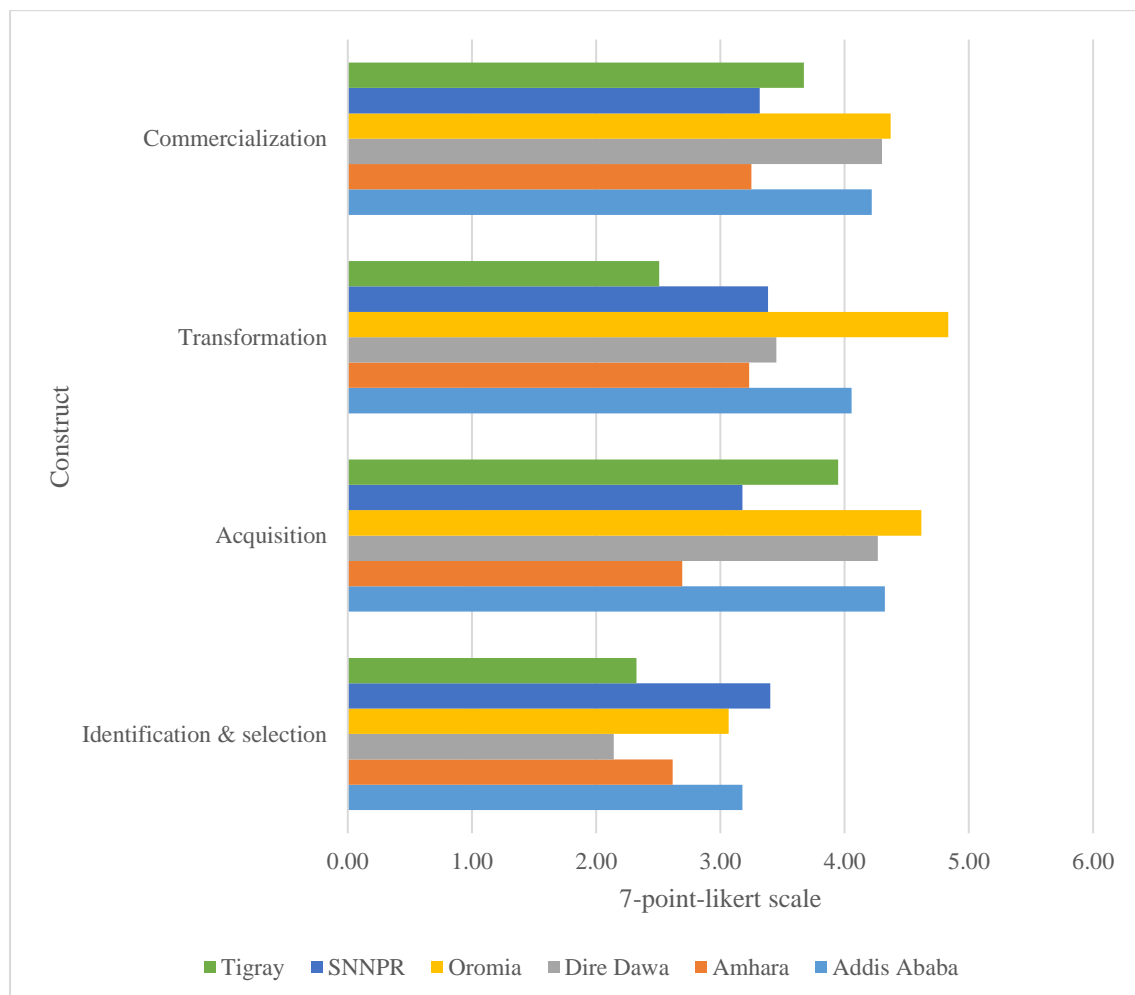


Dynamic capabilities

The role of firm capabilities has become more important in developing economies in recent years (Fainshmidt, Pezeshkan, Frazier, Nair, & Markowski, 2016). A dynamic capability refers to the capacity of an organization to purposefully create, extend, or modify its resource base (Helfat et al., 2007). In our survey, dynamic capabilities are reported using four constructs including identification and selection of knowledge, knowledge acquisition, knowledge transformation, and commercialization of products. Various items in the ICS instrument measured on a 7-point-likert scale ranging from completely disagree to completely agree are used for measuring each construct. Specifically, 5 items are used for measuring the firm’s ability for identifying and selecting knowledge, 3 items are used for measuring the firm’s ability for acquiring knowledge, and 4 items are used for measuring both the ability of transforming knowledge and commercializing products. The average values of the items within each construct measuring dynamic capabilities are shown in Figure 8. Oromia scores highly on knowledge acquisition, knowledge transformation, and commercialization. Notwithstanding, SNNPR scores highly on the remaining construct including identification & selection of knowledge. Dire Dawa and Tigray

regions post the lowest scores on identification & selection of knowledge and transformation of knowledge respectively. Amhara region has the lowest score on knowledge acquisition and commercialization. On the overall, firms report a high ability of knowledge acquisition, and commercialization. Contrastingly, the firms report a much lower ability of identifying and selecting knowledge. A high mean value on knowledge acquisition indicates that firms have a high ability of acquiring new and relevant knowledge from external sources for perceiving market opportunities. Additionally, a high ability of knowledge transformation suggests that firms recombine knowledge due to sound knowledge management systems. Furthermore, firms may have departments or coordinators who diffuse and disseminate knowledge effectively indicating that different departments work together with ease. A low ability for identification and selection of knowledge on the other hand may indicate poor networks between firms and scientific and research institutes coupled with poor access to specialised journals and magazines. It may also be the case that firms conduct technological audits ineffectively or that firms lack the ability for monitoring customers and client’s needs.

Figure 8. Dynamic capabilities



Trust

Table 9 reports the extent to which a firm trusts its partners, and other organizations in their business dealings. Four items measured on a 7-point-likert scale ranging from completely disagree to completely agree in the ICS instrument relating to the extent to which firms regard their partners as trustworthy, frank and truthful, honest, and including the extent to which firms trust other organizations are used to construct an averaged value for measuring trust. Tigray region reports the highest mean value on trust.

On the other hand, Amhara reports the lowest mean value on trust. It is noteworthy that the mean values are above average implying a relatively high level of trust. Nevertheless, none of the firms in all the regions reported that they completely disagreed that their business partners were trustworthy. This indicates relatively similar levels of trust among firms in the six regions.

Table 9. Trust

Region	min	max	mean	sd	N
Addis					
Ababa	1.75	6.00	4.50	0.83	101
Amhara	2.50	4.00	3.65	0.51	13
Dire Dawa	4.00	5.25	4.45	0.54	10
Oromia	3.50	5.75	4.77	0.64	33
SNNPR	1.75	5.00	4.08	1.06	15
Tigray	1.50	6.00	5.02	1.06	32
Total	1.50	6.00	4.54	0.89	204

We compare mean values of trust in partners, and other organizations in their business dealings with mean values of political trust reported in Table 10 to establish whether there is a general attitude of trust or distrust in government. We use the ES instrument to construct a measure of political trust that relates to the respondents evaluation of business-government dealings. This is also a measure of regional institutional quality (RIQ) that we examine in the second section of the report. An average of six items including tax rates, tax administration, business licensing and permits, political instability, corruption, and courts measured on a 5-point-likert scale ranging from “no obstacle” to “very severe obstacle” indicating the “degree to which e.g. corruption is an obstacle to the operations of the firm” is used for measuring political trust. Government performance relating to perceived corruption, judicial efficiency, and bureaucratic quality has been found to be associated with trust (La-Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997). Hence, government institutions will most likely not be perceived as an obstacle where we have high levels of trust. Table 10 strikingly reveals that the mean values for political trust are below average for all the regions. This implies poorly-functioning government institutions. Notwithstanding, Table 10 shows that Amhara reports the highest level of political trust. This may suggest that government institutions are relatively transparent in their dealings in this region. Tigray region on the other hand reports the lowest level of trust. A comparison of mean values of trust in business partners (Table 9) and political trust (Table 10) reveals that Tigray reports high levels of trust in business partners, but the lowest level of trust in government institutions. On the whole, the regions report below average levels of trust in government institutions relative to business partners. This may suggest the presence of poorly-functioning government institutions in Ethiopia.

Table 10. Political trust

Region	min	max	mean	sd	N
Addis					
Ababa	0	3.00	0.69	0.70	457
Amhara	0	3.33	1.01	0.91	69
Dire Dawa	0	2.17	0.61	0.53	27
Oromia	0	2.83	0.80	0.68	133
SNNPR	0	1.50	0.67	0.39	53
Tigray	0	2.50	0.26	0.48	109
Total	0	3.33	0.67	0.70	848

Relationship with customers and institutional actors

Relationships with buyers, suppliers, competitors, and institutional actors indicate the degree of firm embeddedness in local networks of economic activity. Four items measured on a 7-point-likert scale ranging from completely disagree to completely agree from the ICS instrument are used to construct an averaged value measuring whether the firms “have very well established relations” with these external actors. Table 11 shows that Oromia region reports the highest mean value on this indicator. Hence, firms in Oromia have relatively close relations with external actors. On the other hand, Dire Dawa and Amhara have the lowest mean value suggesting relatively distant relations with external actors. It can also be observed that none of the regions completely disagree that they have well established relations with external actors. Moreover, all the regions score mean values that are above average. This implies a high degree of embeddedness suggesting that firms are likely to benefit from information and opportunities in their local networks of economic activity.

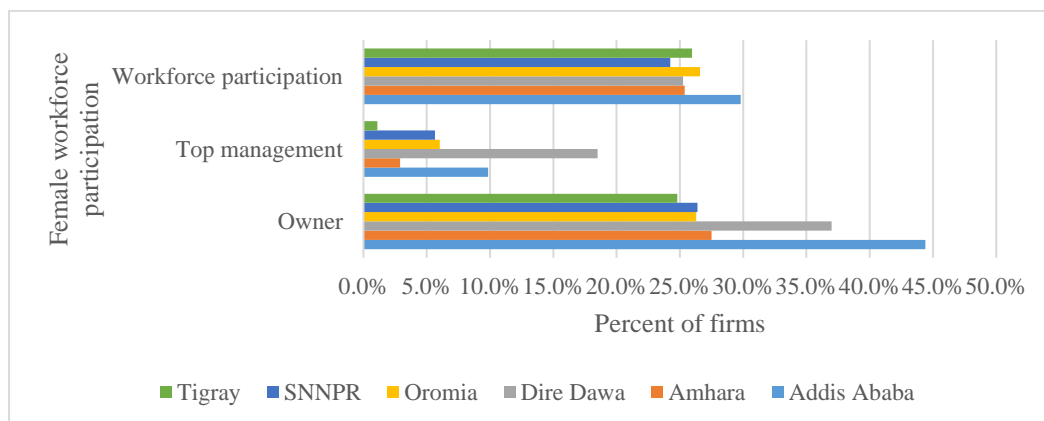
Table 11. Relationship with external actors

Region	min	max	mean	sd	N
Addis Ababa	2.75	6.00	4.49	0.74	101
Amhara	2.00	4.50	3.81	0.62	13
Dire Dawa	2.50	6.00	3.80	1.08	10
Oromia	3.50	6.00	5.20	0.55	33
SNNPR	2.75	5.00	4.33	0.68	15
Tigray	3.25	6.00	4.96	0.79	32
Total	2.79	5.58	4.43	0.74	204

Gender diversity

Figure 9 reports female participation at three hierarchical levels in the organization comprising ownership of the firm, participation in the top management, and participation in the overall workforce as reported in the WBES. A very large percentage of firms in Addis Ababa are owned by women. In addition, Addis Ababa reports the highest score on workforce participation by females. This is likely because Addis Ababa is the capital city of Ethiopia. Dire Dawa and Amhara post the second and third highest score respectively. We note that Tigray reports the lowest score on female ownership and female composition of top management as well. Dire Dawa reports the highest score on female composition of top management. SNNPR region reports the lowest score on workforce participation by females. On the overall, female workforce participation is below average for all the regions on all the three measures and particularly for top management participation.

Figure 9. Female workforce participation



Annex 3: EIP-LIC evidence addressing the original DFID research questions

Annex 3 present the report addressing the original DFID research questions with respect to the factors that drive innovation in Ethiopia by means of simple regressions. In addition, we examine how public-private sector linkages influence the development of innovations. We also investigate the significance of factors that firms perceive as critical barriers to the process of innovation and the diffusion of technology.

Firm characteristics, regional factors and innovation activities

In this section we address the following research question: “What firm-level and regional-level factors including size, ownership, market orientation, labour skills availability, gender, firm location, ties between public/private sector, role of intermediaries etc. hinder or foster the engagement of firms in innovative activities?” As such, firm-level and regional-level factors that are associated with firms engaging in innovation activities are examined in this section.

Firm-level factors include age, size, percentage of foreign ownership, percentage of fulltime employees with high school education, and access to a line of credit or loan from a financial institution Regional-factors comprise location of the firm which includes urban or rural, regional level of knowledge creation, and RIQ. We use a clustered robust standard errors logit model to examine whether these factors foster or hinder innovation activities including internal R&D, external R&D, formal training, and purchase of new equipment for the development of innovations. Standard errors are clustered at the regional level (region) to account for correlation between residuals at the firm-level and at the regional-level. Table 12 reports the results of our estimation. For the firm-level factors we observe that the coefficient for size is positive and significant across the internal R&D model and the new equipment model indicating that larger firms have a higher likelihood of engaging in these two innovation activities. Notwithstanding, size has a negative effect on formal training. Hence, larger firms are less likely to conduct formal training.

Table 12. Logistic regression coefficients (n = 204)

Variable	Internal R&D		External R&D		Formal training		New equipment	
<i>Firm-level factors</i>								
Age (log)	0.113	(0.088)	-0.651	(0.426)	0.178	(0.232)	0.125	(0.114)
Size (log)	0.608***	(0.083)	-0.128	(0.116)	-0.250***	(0.095)	0.403***	(0.066)
Foreign ownership	-0.008	(0.007)	0.0004	(0.003)	0.011**	(0.005)	-0.005	(0.008)
Education	0.010***	(0.003)	-0.028	(0.019)	-0.002	(0.004)	0.007	(0.006)
Access to credit	0.236	(0.264)	-0.397	(1.305)	-0.223	(0.170)	0.075	(0.278)
<i>Regional-level factors</i>								
Location	-0.258	(0.407)	1.442	(1.163)	-0.557**	(0.253)	0.442	(0.387)
Knowledge creation	0.087*	(0.051)	-0.097	(0.108)	-0.066*	(0.037)	0.022	(0.036)
RIQ	-0.159	(1.786)	-1.057	(2.758)	-3.226**	(1.307)	-0.300	(0.966)
Constant	-6.144	(6.418)	11.050	(9.819)	12.870***	(4.897)	-3.103	(3.604)

Clustered robust standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

The coefficient for education is also positive and significant in relation to internal R&D. Hence, firms with a large proportion of employees with high school education have a higher likelihood of engaging in internal R&D. Knowledge creation is the only regional-level factors are significant in this model. Thus, knowledge creation relating to regional R&D enhances knowledge sharing which benefits innovation. None of the coefficients are significant in the external R&D model. Nevertheless, the coefficient for foreign ownership is positive and significant in the formal training model. Hence, a large

proportion of foreign ownership increases the likelihood of conducting formal training for the development of innovative output. This may be as a result of foreign direct investment encompassing human capital development programs. For the regional-level factors, location, knowledge creation, and RIQ are negative and significant. Hence, firms located in urban areas are less likely to engage in formal training. This may be due to urbanization that may increase the cost of formal training in such regions. Furthermore, knowledge creation relating to the regional internal R&D by firms may diminish the need for formal training where many channels of knowledge sharing are available. The negative effect of RIQ on formal training suggests that a high degree of RIQ ensures the presence of a qualified pool of workers in the market, which may diminish the need for formal training for innovation. Furthermore, a high degree of RIQ reduces risks associated with entering into contracts for the production of innovative output. Hence, firms are more likely to engage independent skilled personnel for innovation purposes on a contractual basis as opposed to offering their employees training for the development of innovations. None of the regional-level factors are significant in the purchase of new equipment model.

Hence, from these results we conclude that the size of the firm is an important firm-level factor across all innovation activities. Furthermore, knowledge creation has opposing effects internal R&D and formal training in context of manufacturing firms in Ethiopia.

Commercialization of product and service innovation

This section answers the following research question: “Which firm-level and regional-level factors hinder or foster the extent to which firms successfully commercialize the outcomes of their innovation activities?” We examine the relationship between firm-level and regional-level factors, and commercialization of innovative output by means of an OLS regression model. The measure of the extent to which firms can commercialize its innovations is described in section I. This measure relates to the ability of firms capturing value from their innovative output. Hence, commercialization is conditioned upon innovation activities yielding successful outcomes. A simple OLS regression is used for exploring this relationship. Table 13 reports the results of our estimation. We observe that size is the only firm-level factor that has a significant effect on commercialization. Hence, larger firms have a higher likelihood of successfully commercializing their innovative output. A probable explanation could be that larger firms are likely to have sales and marketing departments. None of the regional-level factors have significant effects on commercialization.

Table 13. OLS regression coefficients (n = 204)

Variable	Commercialization	
<i>Firm-level factors</i>		
Age (log)	-0.061	(0.078)
Size (log)	0.368***	(0.046)
Foreign ownership	0.003	(0.003)
Education	0.002	(0.002)
Access to credit	0.132	(0.142)
<i>Regional-level factors</i>		
Location	0.063	(0.194)
Knowledge creation	0.015	(0.013)
RIQ	0.671	(0.505)
Constant	0.150	(1.835)

Robust standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

In-house innovation, collaborative innovation, and technology acquisition

This section addresses the following research question: “What is the impact of in-house innovation activities versus collaborative innovation activities or technology acquisition activities on the innovation performance of firms in developing countries?” In-house innovation activities relates to a firm developing innovative products or services entirely on its own. Collaborative innovation activities on the other hand indicate that firms cooperated with other external actors including firms, universities/research institutes, private consulting companies, individuals or government enterprises to develop their innovative output. Table 14 shows that firms engaging in-house innovation activities have a lower likelihood of innovation relative to those engaging in collaborative innovation activities. This suggests that firms in low income countries such as Ethiopia benefit from collaboration for innovation.

14. Logistic regression coefficients (n = 204)

Variable	Innovation	
<i>Firm-level factors</i>		
Age (log)	0.098	(0.155)
Size (log)	0.380***	(0.126)
Foreign ownership	0.004	(0.007)
Education	0.013***	(0.003)
Access to credit	0.534**	(0.271)
<i>Regional-level factors</i>		
Location	0.470	(0.441)
Knowledge creation	0.009	(0.035)
RIQ	0.484	(1.520)
<i>Innovation activities (Reference: In-house activities)</i>		
Collaborative activities	0.737**	(0.337)
Constant	-5.249	(5.689)

Clustered robust standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Economic spillovers and innovation

This section answers the following research question: “What is the role of economic spillovers within clusters of firms in fostering economic growth and innovation?” Table 15 reports on our estimation of the effects of spillovers generated by cooperative relationships with customers and suppliers on innovative performance. Cooperative relationships relate to the number of firms reporting that the main important source of information or idea for any innovative activity in their firms was from customers or suppliers.

Table 15. Logistic regression coefficients (n = 204)

Variable	Innovation	
<i>Firm-level factors</i>		
Age (log)	0.0614	(0.165)
Size (log)	0.382***	(0.108)
Foreign ownership	0.004	(0.008)
Education	0.014***	(0.004)
Access to credit	0.516	(0.332)
<i>Regional-level factors</i>		
Location	0.464	(0.405)
Knowledge creation	0.011	(0.033)
RIQ	0.538	(1.417)
<i>Cooperative relationships</i>		
Customer	0.673**	(0.323)
Supplier	0.327	(0.213)
<i>Cooperation for innovation</i>		
Firms	0.529	(0.428)
Private consulting company/universities	-0.336	(0.570)
Constant	-5.453	(5.289)

Clustered robust standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Furthermore, spillovers arising from cooperating with other firms, universities/research institutes, and consultancy firms in developing main innovative products are also reported. Innovation performance is a binary variable which indicates whether a firm introduced any new product or service. The coefficient for cooperation with customers is statistically significant. Nevertheless, the coefficients for cooperating with other suppliers, firms, consultancies and universities are not statistically significant. This implies that spillovers arising from collaborating for innovation with customers is important for manufacturing firms in Ethiopia.

Hence, vertical spillovers arising from customers are more critical for innovation in comparison to horizontal spillovers arising from firms, and private consulting companies and universities. Thus, innovation ideas from customers are vital for innovation performance for manufacturing firms in Ethiopia.

Barriers to innovation and technology diffusion

This section addresses the following research question: “What are the most critical barriers to the process of innovation and the diffusion of technology in low income country setting?” Table 16 reports the results of our estimation of the relation between barriers of innovation, and technology diffusion. Technology diffusion relates to firms adapting or reproducing a product or service already sold by another firm.

Lack of funds within the enterprise impedes innovation activities and the capacity of firms to innovate. Notwithstanding, the most critical barriers to technology diffusion include lack of funds within the enterprise, lack of external financing, lack of information on markets, and no need for innovating due to prior innovation. Nevertheless, high costs of innovation enhance technology diffusion. This suggests that high costs of innovation lead firms to adapt or reproduce products that are already existing on the market. Furthermore, market dominance by established firms also increases the likelihood of technology

diffusion. This may relate to competition between new market entrants and more established firms that drives new market entrants to opt for adapting and reproducing already existing products and services. Furthermore, this finding suggests lack of ease of entry on the market for manufacturing firms in Ethiopia.

Table 16. Logistic regression coefficients (n = 204)

Variable	Innovation		Technology diffusion	
<i>Firm-level factors</i>				
Age (log)	0.228	(0.180)	0.132	(0.220)
Size (log)	0.298**	(0.117)	0.530**	(0.243)
Foreign ownership	0.002	(0.007)	0.010***	(0.002)
Education	0.013***	(0.004)	0.001	(0.009)
Access to credit	0.590**	(0.266)	0.760***	(0.206)
<i>Regional-level factors</i>				
Location	0.833**	(0.379)	1.521*	(0.866)
Knowledge creation (log)	0.023	(0.035)	0.016	(0.050)
RIQ	1.109	(1.663)	6.903**	(2.701)
<i>Barriers to innovation</i>				
Lack of funds within enterprise	-0.646*	(0.337)	-0.805***	(0.136)
Lack of external financing	0.259	(0.171)	-0.478*	(0.258)
High costs of innovation	0.069	(0.182)	1.024***	(0.189)
Lack of qualified personnel	-0.131	(0.200)	-0.651	(0.655)
Lack of information technology	-0.259	(0.273)	0.388	(0.300)
Lack of information on markets	0.062	(0.136)	-0.737*	(0.390)
Difficulty finding co-operating partners	0.149	(0.111)	0.285	(0.310)
Market dominated by established firms	0.108	(0.126)	0.460**	(0.205)
Uncertain demand for innovative products	0.196	(0.320)	0.318	(0.517)
No need due to prior innovation	-0.009	(0.066)	-0.124***	(0.044)
Constant	-7.110	(6.220)	-29.42***	(10.923)

Clustered robust standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Thus, the most critical barrier to innovation activities and the capacity to innovate is lack of internal funds. This implies that firms may not be profitable enough for sufficient retained earnings for innovation activities. Furthermore, financial constraints, lack of information on the markets and no need of innovating due to prior innovation impede adapting and reproducing of existing products. Nevertheless, high costs of innovation and market dominance drive the imitation of existing products by manufacturing firms in Ethiopia.

Linkages with external agents and innovation

This section addresses the following research questions: “What types of links between public/private sector, universities, government, NGOs and the private sector are more conducive to innovation activity? What is the role of universities for facilitating or propagating innovation in LICs? What is the role of the private sector?” In some instances, firms collaborate with external agents for realizing the development of innovative products or services. External agents include affiliated firms and non-affiliated firms. Relatively few firms report on the measures of co-operation for the development of innovations. Table 17 reports the results of the estimation of the relation between collaboration with external agents and innovative activity in the firms.

Table 17. Logistic regression coefficients (n = 204)

Variable	Internal R&D		External R&D		Formal training		New equipment	
<i>Firm-level factors</i>								
Age (log)	0.052	(0.324)	-0.651	(0.438)	0.250	(0.229)	0.084	(0.259)
Size (log)	0.579***	(0.203)	-0.128	(0.272)	-0.305**	(0.142)	0.459***	(0.158)
Foreign ownership	-0.008	(0.009)	0.0004	(0.012)	0.011*	(0.006)	-0.004	(0.006)
Education	0.010	(0.010)	-0.028*	(0.016)	0.00002	(0.006)	0.005	(0.007)
Access to credit	0.354	(0.528)	-0.398	(0.668)	-0.203	(0.354)	0.044	(0.417)
<i>Regional-level factors</i>								
Location	-0.028	(0.955)	1.442	(1.054)	-0.381	(0.484)	0.442	(0.648)
Knowledge creation	0.068	(0.069)	-0.097	(0.099)	-0.056	(0.035)	-0.001	(0.040)
RIQ	-0.368	(3.402)	-1.057	(3.293)	-3.924***	(1.375)	-0.281	(1.782)
<i>Linkages</i>								
Affiliated firms	0.227	(0.523)	0.002	(0.690)	-2.066***	(0.377)	1.683***	(0.396)
Non-affiliated firms	2.098**	(0.873)			-1.990**	(0.817)	3.075***	(0.945)
Constant	-5.353	(11.783)	11.005	(11.889)	15.54***	(5.020)	-3.650	(6.306)

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Firms collaborating with affiliated enterprise groups and non-affiliated firms have a lower likelihood of conducting formal training for developing innovations. Nevertheless, collaboration with affiliated firms and non-affiliated firms increases the likelihood of acquisition of new equipment for innovation. Similarly, collaboration with non-affiliated firms increases the likelihood of firms conducting internal R&D. Notwithstanding, none of the linkages have significant effects on conducting external R&D.

Different types of linkages matter for different innovation activities in the context of innovation in LICs. Linkages with non-affiliated have a much larger effect on internal R&D and purchase of new equipment. Linkages with both affiliated and non-affiliated firms have negative effects on formal training. This suggests that linkages may negate the need for providing formal training for innovation because they are likely to provide an avenue for transferring knowledge and skills related to developing innovations.

The role of demand side versus supply side policies

In this section we address the following research question: “What is the role of the demand side versus the supply side policies (e.g. AMC, tax credit on R&D, technoparks, export processing zones, trade preferences). In what sectors/contexts can they be applied? What are the lessons? Governmental support for innovation activities is reported by few firms in the sample. Specifically, several firms report receiving non-financial support from government for innovation related activities. Non-financial support includes training in the use of innovation equipment, and assistance in research and product development. Table 18 reports the results of the estimation of the relationship between non-financial government support and innovation performance. The coefficient for non-financial government support is negative but statistically nonsignificant.

Table 18. Logistic regression coefficients (n=204)

Variable	Innovation	
<i>Firm-level factors</i>		
Age (log)	0.099	(0.161)
Size (log)	0.384***	(0.129)
Foreign ownership	0.003	(0.007)
Education	0.014***	(0.004)
Access to credit	0.570*	(0.294)
<i>Regional-level factors</i>		
Location	0.487	(0.467)
Knowledge creation	0.020	(0.037)
RIQ	0.636	(1.649)
<i>Government support for innovation activities</i>		
Non-financial support	-0.276	(0.331)
Constant	-5.663	(6.185)

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Gender diversity and innovation

In this section we address the following question: “What is the role of gender diversity in fostering innovation performance for firms in developing countries?” Table 19 provides an overview of how gender diversity impacts innovation performance which is measured as the introduction of new products or services. Gender diversity relates to female participation in the ownership of the firm, top management and overall workforce. Innovation is measured as whether or not a firm introduced new products or services. We find that the coefficient for female ownership is positive and significant. Notwithstanding, the coefficients for female participation in top management and the workforce are not significant.

Table 19. Logistic regression coefficients (n=204)

Variable	Innovation	
<i>Firm-level factors</i>		
Age (log)	0.070	(0.197)
Size (log)	0.355***	(0.136)
Foreign ownership	0.003	(0.008)
Education	0.014***	(0.004)
Access to credit	0.605*	(0.340)
<i>Regional-level factors</i>		
Location	0.506	(0.427)
Knowledge creation	0.004	(0.039)
RIQ	0.309	(1.652)
<i>Gender diversity</i>		
Female ownership	0.168	(0.370)
Female top manager	0.116	(0.449)
Female workforce participation	1.494**	(0.722)
Constant	-4.746	(6.176)

Clustered robust standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

These results suggest that firms with a more gender diverse workforce participation are significantly more likely to introduce product or service innovations. Essentially, workers with a higher degree of female participation have a higher likelihood of introducing innovations in the context of developing countries. The coefficients for female ownership and female participation in top management are positive but nonsignificant. Hence, female participation in the overall production and non-production processes is critical for innovation in the context of manufacturing firms in Ethiopia.

Conclusions

This report highlights some important descriptive statistics capturing variables such as turnover, number of fulltime employees, labour productivity, and gender diversity of firms in six regions in Ethiopia. These variables are for data analyses in the subsequent sections to provide a deeper understanding of the context of innovation in manufacturing firms in Ethiopia.

Export status and origin of inputs

Export status and origin of material inputs and supplies is contrasted with that of economies in various regions with the aim of providing a background to the context of innovation in Ethiopia. Essentially, it is observed that the sampled firms report relatively large proportions of direct exports. This suggests that the customs and business regulatory environment facilitate direct exporting in Ethiopia. Additionally, sampled firms generally rely on domestic inputs. Some possible explanations include availability of alternative local suppliers and purchasing from local importers which may reduce the cost of inputs.

Innovation activities

This report also highlights the topic of innovation where reported measures of innovation, innovation activities, sources of information for innovation, and barriers to innovation are discussed extensively. The difference between the percentage of firms reporting innovation in Ethiopia and the EU-28 firms is accentuated. It is highly probable that self-reported measures of innovation may focus on less incremental forms of innovation, which is likely to be the case for Ethiopia. Regarding innovation activities, it is observed that R&D activities are regarded as less important innovation activities relative to new equipment and formal training. This indicates that firms are more likely to invest in physical assets including equipment, machinery, or software and formal training for developing human capital as opposed to internal and external R&D.

Sources of information for innovation and barriers to innovation

Customer feedback and the internet are the most important sources of information for innovation. This section also reveals that high costs of innovation, lack of internal funds, and lack of external finance are perceived as the most critical barriers to innovation for manufacturing firms in Ethiopia. This indicates the existence of credit constraints.

Dynamic capabilities, trust, and relationships with external actors

Dynamic capabilities, trust, and relationship with external actors including institutions are described in the context of the firm's operational environment. Dynamic capabilities including commercialization of new products and services and knowledge acquisition are apparent in manufacturing firms in Ethiopia. Furthermore, on average, firms in Ethiopia trust their business partners much more than they trust government institutions. This suggests that interactions with the government hamper firms in their operations. Thus, this suggests that firms are likely to be operating in an environment with weak institutions (see Barasa et al., 2017). A high degree of embeddedness of firms is also observed indicating that firms have higher likelihood of benefiting from information and opportunities within the environment of their operations.

Gender diversity

The role of gender diversity is critical in fostering innovation performance. Female workforce participation is positively associated with innovation performance in Ethiopia. This indicates that the role of women in driving the innovation process should be emphasized especially in the manufacturing industry which is likely to be male-dominated.

Firm size and innovation

From addressing the research questions, we find that size is a very important firm-level factor that fosters innovation activities including internal R&D and acquisition of new equipment. Notwithstanding, firm size has negative effects of formal training. This may suggest that large firms face high costs of providing formal training for innovation. Furthermore, larger firms have a higher probability of successfully commercializing innovation. This indicates that large firms are likely to have more resources dedicated for innovation and commercialization activities.

Linkages with external actors

One major observation cooperation and linkages for the development of innovation is critical for enhancing innovation in Ethiopia. Firms engaging in collaborative innovation activities increase the degree of innovation. Additionally, vertical spillovers arising from sources of innovation ideas from customers enhance innovation. Furthermore, cooperating with affiliated enterprise groups and non-affiliated firms is critical for internal R&D and the purchase of new equipment for innovation. Notwithstanding, cooperation with affiliated and non-affiliated firms has negative effects of formal training. This suggests that some forms of collaboration may have a component of transferring absorptive capacity that negates the need for conducting formal training.

In sum, these salient features of manufacturing firms in Ethiopia provide insightful contextual information that is crucial to understanding innovation in Ethiopia.

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Appendix. Variable measurement

Variable	Measurement	Source
<i>Innovation performance</i>		
Innovation	Firm introduced any new product or service: "1" Yes "0" No	WBES
<i>Firm-level factors</i>		
Age (log)	Year of survey (2013) less the year the establishment began its operations	WBES
Size (log)	Number of permanent full-time employees at the end of the last fiscal year	WBES
Foreign ownership	% owned by private foreign individuals, companies or organizations	WBES
Education	% of full-time workers completed high school	WBES
Access to credit	Establishment has a line of credit or loan from a financial institution: "1" Yes "0" No	WBES
<i>Regional-level factors</i>		
Location	City with population over 1 million: "1" Urban "0" Rural	WBES
RIQ	Composite measure of mean of standardized firm-level scores of corruption, rule of law and regulatory quality in each region	WBES
<i>Corruption</i>		
	Corruption as an obstacle is measured: five-point scale (0 = not an obstacle, 4 = very severe obstacle).	WBES
<i>Rule of law</i>		
	Courts as obstacle: five-point scale (0 = not an obstacle, 4 = very severe obstacle)	WBES
	Political instability as obstacle: five-point scale (0 = not an obstacle, 4 = very severe obstacle)	WBES
	Crime, theft, disorder as obstacle: five-point scale (0 = not an obstacle, 4 = very severe obstacle)	WBES
<i>Regulatory quality</i>		
	Tax rates as obstacle: five-point scale (0 = not an obstacle, 4 = very severe obstacle)	WBES
	Tax administration as obstacle: five-point scale (0 = not an obstacle, 4 = very severe obstacle)	WBES
	Customs and trade regulations as obstacles: five-point scale (0 = not an obstacle, 4 = very severe obstacle)	WBES
	Business permits and licensing as obstacles: five-point scale (0 = not an obstacle, 4 = very severe obstacle)	WBES
Knowledge creation	% of firms conducting internal R&D within a region	ICS
<i>Innovation activities</i>		
Internal R&D	Dummy variable: "1" Yes "0" No	ICS
External R&D	Dummy variable: "1" Yes "0" No	ICS
Formal training	Dummy variable: "1" Yes "0" No	ICS

New equipment	Dummy variable: "1" Yes "0" No	ICS
<i>Commercialization</i>	Average value of items in commercialization construct	ICS
	Extent to which firm can successfully commercialize products: 7-point-likert scale (0= completely disagree, to 6=completely agree)	ICS
	Extent to which firm can commercialize completely new products: 7-point-likert scale (0= completely disagree, to 6=completely agree)	ICS
	Extent to which firm can commercialize new products in existing markets: 7-point-likert scale (0= completely disagree, to 6=completely agree)	ICS
	Extent to which firm can commercialize new products in new markets: 7-point-likert scale (0= completely disagree, to 6=completely agree)	ICS
<i>Collaboration</i>		
Collaborative activities	Innovation with firms, universities/research institutions, private consulting companies, individuals: "1" Yes "0" if otherwise	ICS
In-house activities	Innovation developed entirely by the firm: "1" Yes "0" if otherwise	ICS
<i>Spillovers</i>		
Customers	Number of firms reporting most important source of information/knowledge to be from customers	ICS
Suppliers	Number of firms reporting most important source of information/knowledge to be from suppliers	ICS
Other firms	Number of firms reporting most important source of information/knowledge to be from parent or another firm	ICS
Consultancy firms/Universities	Number of firms reporting most important source of information/knowledge to be from private consulting company/individuals	ICS
<i>Barriers</i>		
Lack of funds within enterprise	3-point-likert scale (0= not important, to 3=very important)	ICS
Lack of external financing	3-point-likert scale (0= not important, to 3=very important)	ICS
High costs of innovation	3-point-likert scale (0= not important, to 3=very important)	ICS
Lack of qualified personnel	3-point-likert scale (0= not important, to 3=very important)	ICS
Lack of information technology	3-point-likert scale (0= not important, to 3=very important)	ICS
Lack of information markets	3-point-likert scale (0= not important, to 3=very important)	ICS
Difficulty finding co-operating partners	3-point-likert scale (0= not important, to 3=very important)	ICS
Market dominated by established firms	3-point-likert scale (0= not important, to 3=very important)	ICS
Uncertain demand for innovative products	3-point-likert scale (0= not important, to 3=very important)	ICS
No need due to prior innovation	3-point-likert scale (0= not important, to 3=very important)	ICS
Technology diffusion	Use of technology licensed from a foreign-owned company: "1" Yes "0" No	ICS
<i>Linkages</i>		

Affiliated firms or enterprise groups	Innovation developed with affiliated firms or enterprise groups: "1" Yes "0" No	ICS
Non-affiliated firms or enterprise groups	Innovation developed with non-affiliated firms or enterprise groups: "1" Yes "0" No	ICS
<i>Demand vs supply side policies</i>		
Non-financial support	Government agencies or departments source of non-financial support for innovation activities: "1" Yes "0" No	ICS
<i>Gender diversity</i>		
Female ownership	Ownership of firm: "1" if female, "0" if otherwise	WBES
Female top manager	Top manager of firm: "1" if female, "0" if otherwise	WBES
Female workforce participation (log)	Ratio of number of female full-time employees to the number of full-time employees both at the end of the last fiscal year	WBES
