



Radboud University



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

Country Report Bangladesh



December 2017

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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 4-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. Vietnam is included as one of the countries of study. Although Vietnam is classified as a (lower) middle income country, the data and insights collected provide very informative and useful insights for the research and policy materials developed under the project.

On behalf of Tilburg University and Radboud University Nijmegen I would like to thank the British people and DFID, in particular the Growth Research Team, for the support in this project.

This report present the findings of the research activities in Bangladesh. The research output on Vietnam was amongst others the result of a fruitful cooperation with the Chittagong Independent University (CUI), in particular Vice Chancellor Dr. Mahfuzul Hoque Chowdhury for the fruitful cooperation and Dr. Mir Mohammed Nurul Absar for organising the research activities in Bangladesh and sharing his valuable observations and thoughts.

We hope that this report is informative for policy makers within governmental agencies, donors and NGOs involved in the promotion of innovation in manufacturing SMEs in Vietnam 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.

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Disclaimer

This material has been funded by UK aid from the UK government; however the views expressed do not necessarily reflect the UK government’s official policies.

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 2017, 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 low and (lower) middle income 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 ‘Bangladesh Country Report’ presents an overview of the scientific output and policy implications relating to Bangladesh. The report first introduces the qualitative research in Bangladesh and presents three cases. It subsequently reviews key outcomes of the DFID/World Bank EIP-LIC survey in Bangladesh. The report continues to discuss additional studies and policy implications from four papers within the ‘Innovation Systems’ theme, and three papers within the ‘Finance and Productivity Growth’ theme. These studies concern other countries of study as well because they contain relevant and useful insights for Bangladesh.

In Annex 1, a comprehensive list of all research working papers written in the framework of EIP-LIC is presented. The key research findings addressing the original DFID questions is presented in Annex 2.

Qualitative research

The qualitative research findings are written down in a report accessible via the project website. It is based on data collected through open semi-structured interviews with owners and managers of SMEs in Bangladesh and the surrounding area. The qualitative report provides context to the other research activities to validate, compare and complement existing theory in literature and research design and hypothesis development with contemporary bottom-up realities on the ground in Bangladesh, as perceived by manufacturing SME owners and managers. Specifically, the case descriptions illustrate the different ways in which companies in Bangladesh introduce new products, processes, technology, or machinery.

Most interviewed owners and managers in the companies, in different ways, introduced new products, processes and technology in order to improve and expand their business operations. 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, it is evident that the new elements introduced in the interviewed companies resulted in improved and expanded business operations. Owners are aware of the importance of introducing new products and technology to raise productivity and efficiency to maintain their level of competitiveness. The ideas for new products are mainly acquired from the market. Customers come with requests and suggestions, or the owners talk with clients. It is therefore mostly demand-driven innovation. All interviewed SME owners and managers indicate that the business environment is challenging in Bangladesh. Several of them have a negative perception about frequent changes in government policies and regulations. There is no clarity about these changes and SME owners have to navigate the requirements themselves.

DFID/World Bank EIP-LIC survey in Bangladesh

The enterprise survey of EIP-LIC conducted in Bangladesh in collaboration with The World Bank, involved 300 Bangladeshi companies which were interviewed for the Innovation Capabilities Survey (ICS). These 300 companies were selected from a larger group of companies which were also interviewed for the Innovation Follow-up Survey (IFS) in 2013 and 2014. These companies in its turn, belong to a group of 1442 companies which were interviewed in 2013 for the Enterprise Survey (WBES) from the World Bank. Most of the companies are located in Dhaka, followed by Chittagong, Khulna and Rajshahi. The majority of the companies is small or medium sized.

Of the 300 companies most introduced both a product and process innovation. Of the remaining companies 102 only introduced a process innovation, 37 only a product innovation and 7 neither sort of innovation. The introduced product and process innovations are mainly new to the local market (42.9% of product innovations and 23.1% of process innovation, compared to resp. 16.2% and 10.9% which were new to the international market, and resp. 4.2% and 4.3% which were new to the international market). The fact that innovations in Bangladesh tend to be new to the local market might mean that innovations are mostly incremental rather than radical in nature.

Four sorts of activities affecting innovation were distinguished, i.e. internal and external R&D, providing formal training, and buying new equipment. In Bangladesh this latter activity is by far the most important, with 82% of the 300 companies having done so. This is followed by providing formal training (37%), internal R&D (27%) and external R&D (9%). The importance of buying new equipment as innovative activity might be related to the finding that most innovations in Bangladesh seem to be incremental. To implement incremental innovation buying new equipment might suffice, or in order to implement more radical innovations companies might have to conduct R&D and provide training to their staff.

Sources of information for innovation tend to be close to the company, i.e. customer feedback, products and services already available in the market and knowledge from a parent or another firm. More distant sources of information, such as government, universities and research institutes are hardly mentioned by Bangladeshi companies, and if so, only by large companies. This again might be related to the less radical nature of innovations. Although customer feedback is mentioned as most important source of information for innovation, companies who rely on this sort of information are not significantly more likely to have introduced an innovation. The same is true for companies for which suppliers are the most important source of information. These companies are also not significantly more likely to have introduced an innovation.

Lack of funding seems to be the least important barrier to innovation for Bangladeshi companies. Companies with access to a loan or credit from a financial institution are significantly more likely to have conducted internal R&D, but significantly less likely to have conducted external R&D. A possible explanation might be that companies that engage in external R&D do not need loans or credit from financial institutions and predominantly rely on their own finances.

The fact that buying new equipment is the most important of the four innovative activities, is reflected in companies' dynamic capabilities. It is especially noteworthy that Bangladeshi companies consider themselves as having very limited contacts with researchers and universities. Most Bangladeshi companies develop their innovations in-house. Cooperation with another company (domestic or foreign, including a foreign parent firm) to develop innovations is not very common. Also government support for innovation is not very common in Bangladesh.

A company's age is not significantly related to most aspects of innovation. Older companies tend to introduce more innovations, but this does not mean these companies are better at commercializing their innovations. And, although age does not seem to be significantly related to a company's perception of being able to commercialize its' innovations, in fact younger companies seem to be better at this.

With respect to size, we find that larger companies are more likely to engage in innovative activities such as R&D, formal training and buying new equipment, and are more likely to have introduced an innovation. However, size is not significantly linked to the number of innovations introduced. Although large companies think of themselves as being better suited to commercialize on innovations, this is not confirmed by actual figures.

Companies with a higher educated workforce are more likely to engage in R&D. Higher educated employees might be better able to conduct R&D or might get more time and means to invest in this. The fact that companies with higher educated employees invest more in formal training might indicate that companies are more willing to trust and invest in the capabilities of higher educated employees. The finding that a higher educated workforce is negatively linked to buying new equipment, possibly indicates that companies with this kind of workforce develop and build their own equipment, or are more likely to conduct innovations for which no new equipment is necessary. The finding that a higher educated workforce is linked to a higher number of innovations might prove that these companies are right in putting more trust in higher educated employees' ability to develop innovations, although these innovations do not have to lead to higher sales figures.

Foreign ownership is significantly positive related to external R&D and negatively related to buying new equipment. Foreign parties might have easier access to external R&D or might have more trust in conducting R&D externally, making it more likely they'll invest in this. The negative link between foreign ownership and buying new equipment, might be explained by the foreign owners buying and providing the new equipment, not the establishment itself. Companies which are foreign owned are less likely to have introduced its main

innovative product to offer products or services already offered by competitors and are more likely to have introduced a higher number of innovations.

Companies in provinces with higher levels of investment in internal R&D (higher level of knowledge creation), invest more in internal R&D and formal training, and less in external R&D, are less likely to have introduced an innovation and create fewer innovations. Companies in provinces where institutional quality is perceived to be of lower quality, are less likely to invest in external R&D.

Innovation systems

In the framework of the ‘Innovation Systems’ research theme, two scientific papers (downloadable from the project website) were developed involving quantitative data on Bangladesh. 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, including Bangladesh. 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. Regarding policy implications, the research suggests that 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.

The second paper within the ‘Innovation Systems’ research theme using data from Bangladesh amongst others analyses the relationship between gender diversity and innovation output of firms. 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.

Finance for productivity growth

The first scientific paper within the ‘Finance for Productivity’ theme studies small poor entrepreneurs in the developing world, vulnerable to a range of negative shocks and constraints associated with a lack of development. The research explored the issue of income variability in Vietnam, which is comparable to Bangladesh in terms of the businesses of poor entrepreneurs, and which possibly impedes the cognitive

functioning of low-income individuals. The research was conducted through a field experiment inducing thoughts about finances to a sample of small low-income retailers in their local setting. The results suggest that a lack of financial resources does not necessarily impede cognitive functioning. Cognitive performance in financially stressful situations is not affected by absolute poverty as measured by wealth or income. Instead, what seems to create cognitive stress is the subjective feeling of poverty together with the variability of income. Cognitive performance in financially stressful situations has an inverted U-shaped relationship with income variability: being exposed to very low or very high income variability can be detrimental for cognitive capacity. There seems to be an optimal income variability which maximises the cognitive capacity of the retailers when they face financially stressful situations, which impede their cognitive functioning. The research has policy implications to safeguarding the cognitive functioning of people on low incomes. Assuring an optimal amount of income variability to assure maximum cognitive functioning: the effectiveness of policy and programmes that focus on the beneficiaries' lack of financial resources, for instance, could be increased if income variability is also given careful consideration. Stability and maintaining the status quo of income variability is also an issue to be considered in new policies and programmes.

The second paper within the 'Finance for Productivity Growth' theme analyses the interplay between informality and access to finance. The research explored financial sector development in the formal and informal manufacturing sector in neighbouring country India, which is comparable with Bangladesh in the sense that both countries have a large informal sector and informal ways of finance. Actually, a large share of private sector activity in LICs takes place in the informal sector, which almost always has negative economic and development consequences. There is among others a large productivity gap between formal and informal firms. The research focussed on the effect of financial development on formal and informal manufacturing firms and explores two dimensions of financial development namely outreach (the ease of access to financial services, including credit) and depth (the overall formal credit volume in the economy). Overall, the empirical findings suggest two positive effects of financial deepening on the incidence of formality in manufacturing: reducing barriers to formality and increasing productivity. The research results show that both depth and outreach are important but in a different way. Financial outreach - measured in the research as branch penetration - helps to reduce formality barriers and thus increases the number of formal firms. Financial depth mainly affects informality through increasing productivity of industries dependent on external finance. The paper confirms the policy assumption that promoting the informal manufacturing sector to become formal will raise productivity and economic growth.

The research suggest that government policies towards financial deepening can play an important role in reducing informality, though with important differences across industries. In terms of promoting raising productivity, a policy implication is to focus on financial depth; increasing the overall formal credit volume in the economy. The working paper demonstrates that financial depth promotes economic growth in LICs via increased productivity of firms. The working paper is also informative for policy makers with regard to their expected impact of their policies. Policy makers should not expect that policies aimed at outreach will increase productivity. The same holds true for the development of financial depth, such policies will have a modest effect on reducing informality of enterprises.

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 'Bangladesh Country Report' presents a summary of the key findings of EIP-LIC research of Bangladesh 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 finding and context of the qualitative study. Chapter 4 presents the main findings of the EIP/LIC innovation survey conducted in Bangladesh. Chapter 5 summarizes of two related research papers and policy implications developed within the 'Innovation Systems' theme. Chapter 6 presents summaries of two research papers and policy implications developed within the 'Finance for Productivity Growth' theme. The policy implications in chapters 3 to 6 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 Bangladesh. Annex 2 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. Vietnam are presented in chapter 3.

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 Vietnam.

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 ... 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 Bangladesh

3.1 Case study method and fieldwork

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 Bangladesh. 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 Bangladesh involved a series of 16 interviews with managers and/or owners of manufacturing SME in Chittagong and around. The qualitative data collection through interviews took place from 20 to 31 May 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 10-150 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 Bangladesh, accessible via the project website, three cases are presented below to provide some insight on the daily realities of SMEs in manufacturing.

3.2 Selected cases

Case 1: Metal – crucible casting for steel mill supplies (50 employees)

The company is located in the outskirts of Chittagong and produces crucibles as supplies for the steel mill industry. Crucibles are board-based containers, pots and plates into which melted metals or other metal substances in liquid form may be poured, and are able to withstand high temperatures.

The company was set up 17 years ago as a family business, when the father suggested that it would be profitable to produce boarded products. He used to work as general manager for a leading steel manufacturing company in Bangladesh, which imported board pots from India. The interview is held with the two brothers (aged 25 and 29), who manage the business today.

The basic raw material is board and clay, to which some chemical substances are added. The clay input comes from India and China. The composite product is mixed and baked at 200°C, a process which the brothers comment is not very difficult – *“it is like baking biscuits.”* Sourcing and importing high quality chemical input is more complicated. The chemicals are procured from South Africa, India, Australia and China. According to the brothers, the production process is not risky in terms of safety or working conditions. The temperature of the oven in the production line is *“only”* 200°C and the production process is not very labour intensive.

The younger brother acts as the director of the company. He has an MBA degree, which is a great help in running the business. Their retired father is still actively involved – *“he takes care of research and development and procurement of chemical and clay inputs.”* The older brother manages the staff and looks after the daily company administration. He acknowledges that he relies a lot on his younger brother. None of them have a technical educational background in the production of crucibles or steel.



Internal capabilities

While still in high school, the younger brother was already motivated to join the family business. He has no regrets about his career path, and is happy to take responsibility for the firm. He feels that his generation has developed itself quickly through social media – *“which means that the older generation relies on us.”* He mentions that their father has faith and trust in them and their capabilities. The father has accepted the new style of management and trusts his sons – *“today we sign cheques for 2 million Taka, and our father does not ask any more about that.”* At the same time, their father is consulted on a daily basis. The whole family lives in one large house – *“every night, we talk with my dad for about an hour and discuss everything about the day’s business.”*

The company has a small office and a large production facility, where 45 people work in three eight-hour shifts – *“we run the plant 24 hours a day.”* Ten to twelve workers and one supervisor cover each shift. In the daytime, the production manager is nearby, but *“we don’t need a manager in the night shift because of the senior workers who can run the plant at night.”* All staff have leave on Fridays and government holidays.

In the past, the company had a high staff turnover. The company established a policy that salaries would be paid on the 10th of every month, on condition that workers were present the first ten days of the month – *“it was kind of a risky management innovation but it worked out well. The staff turnover has reduced to a minimum level.”* Initially, there was some opposition to the new salary payment strategy, but today the workers are content with the regulation and give notice before leaving the company.



The company is hindered by the lack of skilled manual labour in Bangladesh. The brothers are also dissatisfied with the attitude of several of their workers, who lack ambition and motivation to do manual work – *“some labourers just want to work for fifteen days to earn minimum survival income for the month, and then take the rest of the month off.”* The workers are reluctant to change these habits.

To address the motivation issue, the brothers set up a bonus system and provide extra benefits. During religious celebrations, they hand out bags of food and rice as presents for the workers – *“it is a practice our father began. It is a good policy from our company’s perspective but also from a religious perspective.”* The company does not employ child labour on principle. However, there are occasional exceptions – *“a few days ago a kid came looking for a job. He needed money urgently for his family.”* Motivated by compassion, the younger brother gave him light work and told the child that this work was temporary and outside the core work of the company.

The company has hired several external technical consultants in the past, all from India – *“over the last few years, we have learned most of the technical details of the regular production process.”* The brothers explain that India is much more experienced in the steel industry – *“so Indian companies are dominant in Bangladesh.”*

To reduce their dependency on manual labour, they modernised the plant three years ago and automated the production process and management system – *“demand was increasing so it was originally our idea to improve the production process so that we could speed up our production.”* For technical advice on the automation implementation, they hired a specialised Indian technician, who came over for four months. He was recruited through their father’s network of contacts.

The technician, who had designed many plants in India, proposed a new production line set-up. The brothers had to invest in several new machines and installed a new oven. The actual construction was completed by local technicians. The new installation was a *“costly”* investment of 4 million Taka (50,000 USD). Since then, the production process and quality have both improved substantially, according to the brothers. The production cycle period decreased from 6 hours to 20 minutes – *“it is a drastic change in productivity and we still maintain the same quality.”* The brothers consider the design an open invention – *“if someone wants to copy our production line, that is okay, it doesn’t matter.”* The Indian technician continues to be employed as a consultant – *“he gives regular technical advice over Skype.”*

The company does not pollute the environment, according to the brothers. Water, pumped from the ground, is mostly used for preparing the input composite. Waste water is recycled in a small treatment plant. Hot air from the gas oven is also recycled. There is little solid waste – *“pollution is not a big issue in this kind of business.”*

External business and institutional context

The external business environment is challenging, according to the brothers. There are small competitors trying to copy the company *“but because of our higher quality, we are able to keep 70-80% of the local market share.”*

A bigger problem is competition with the Indian multinational Tata and other Indian suppliers – *“it is a huge fight. They are too dominant in our country.”* Tata develops similar steel industry supplies and sells these in Bangladesh. Many steel companies in Bangladesh engage Indian consultants and technicians. As a result, these companies prefer to buy from Indian suppliers, rather than from local producers in Bangladesh. *“We also guess that personal relations in the supply chain are critical here. The procurement officers may have a vested interest, greater than the interest of the local company.”* Despite the fact that the company delivers higher quality at a lower price, the brothers cannot sell to many of the steel producers in Bangladesh.

One day, the younger brother was approached by an individual from an Indian company who offered money to close down his company – *“they are afraid they will lose their customers because of our local business.”*

The investment for the new facilities was financed by a bank loan and their own savings. *“One problem we are facing in our country is that the interest rate is very high compared to developed countries, around 14%. It used to be even higher.”* One reason that the interest rate is high is because people take out loans but fail to repay them.

The brothers wonder why the government is not helping the local industries in Bangladesh – *“in India, there are export policies helping Indian companies to export to Bangladesh.”* The key issue is that the government opened the local markets for imports and now international companies are dumping – *“they are killing the local manufacturers in business.”* The brothers are somewhat cynical – *“the government officials are only doing what is necessary for their personal interests, with a short-term view.”* As an example, they describe their imports of raw materials – *“we have to bribe the customs officials every month. You have to give them incentives every month. If we miss a single payment, they create unnecessary problems.”*



“Giving them a bribe became a regular procedure.” Sometimes they are invited for meetings at government agencies – *“not much happens after these meetings, there is no follow-up on our recommendations.”* The company has to work within the limitations of its market share and it will not develop – *“there is no possibility to innovate.”*

There is no association for their industry since they are a pioneering sector in Bangladesh. There are no links with universities or technical institutes – *“the gap between the practitioner and academic communities is substantial.”* University graduates only learn theory from international textbooks and lack both the ability to apply it and a notion of the reality – *“there is no management textbook explaining that you have to bribe government officials to get things done!”*

The brothers explain that all this results in low return on investment. For the time being, they are running the factory to survive – *“the margin that we have is very poor. If these things do not change, how can we local entrepreneurs do business?”*

The brothers expect positive policy changes in the future because politics has opened up. People are more educated, involved and concerned and they talk about government policy openly – *“it was not the same 20 years ago.”* The brothers are still optimistic. They have an emotional attachment to their factory, which was initiated by their father – *“we are still fighting every now and then. We are hopeful that the situation will improve.”*

Case 2: Textiles – textile prints (40 employees)

The company prints letters, shapes and figures on textiles for T-shirts, as subcontract orders for domestic garment industries in Bangladesh, who in turn produce for large international buyers. It has a rented production hall and an office in the outskirts of Chittagong. The company gets the T-shirts from the garment industry, prints and returns them to the same garment industry – *“we do not work directly with the international buyers.”* The international buyers provide the designs for the T-shirts and prints, while the owner handles colour selection only. He has guidelines for colours and quantities.

The interview is held with the owner, who started the company one and a half years ago. He installed a production line involving Korean technology and equipment, financing the investment through a bank loan of 20 lakh Taka

(4,800 USD) at an interest rate of 20% per year, *“which is very high.”* He expects to have repaid the loan in three years.

The main challenge currently is that American and European buyers are pressuring local textile manufacturers to comply with the ‘Accord’² – *“they have placed so many conditions and restrictions on our garments.”* The owner is upset that on the one hand the international buyers force local producers to comply, but on the other, they continuously negotiate the price down – *“we fulfil their requirements, and we get lower payments for our work after all.”*

The international buyers are not willing to pay reasonable prices – *“we are suffering from lower prices. Several thousand garments factories have already closed.”* The owner illustrates this with the example of Walmart, which buys T-shirts for four dollars apiece and sells them for thirty dollars in the US – *“we do not get a fair share. Manufacturers face a lot of problems. Compliance is not making things better in Bangladesh.”*



Internal capabilities

The owner studied fine arts in university and is an artistic person. He set up in the garment business because he believes that it is a promising sector – *“moreover, garments are based on colours.”* The owner knows about colours and how to apply them – *“I like the business very much.”*

The company has 40 employees, who all live nearby – *“they are hard-working and loyal.”* The employees work in two shifts of eight hours daily. Some of his workers have 25 years of experience in textile printing.

He explains that there are many jobs available in textile factories in Chittagong due to a shortage of skilled workers, so it is important to pay their salaries on time – *“if there is a delay, they will look for other jobs.”* The workers are trained before starting the work. It is difficult for the owner to find workers, particularly for printing. Skilled workers come through references or apply directly themselves. The owner has no written contract with the workers – *“it is more an oral and gentleman’s agreement.”*

Some children of around 14 years of age are working in the factory, *“supporting their families.”* The owner believes it is better that they work in a company since they lack government or other support – *“they are not educated and they have nothing to do. If they do not work in a company, they do illegal work like selling drugs or theft.”* Moreover, the owner mentions that their families force him to employ them – *“the children learn lots of things here that are useful for the future.”*



The owner says that he pays them a good monthly salary, but acknowledges that it is much cheaper than skilled labour. The large garment industries do not have any child labour due to international pressure, only small

² As a measure after the Rana Plaza building collapse, the ‘Accord’ agreement was established. It is an independent, legally binding agreement between brands and trade unions, designed to work towards a safe and healthy Bangladeshi Ready-Made Garment Industry. The purpose is to enable a working environment in which no worker needs to fear fires, building collapses, or other accidents that could be prevented with reasonable health and safety measures.

subcontractors like his company. Sometimes the international buyers also come to visit the subcontractor – *“and we have hidden our child labour.”*

He has plans for the future in terms of acquiring a compliance certification by Oeko-Tex – *“it will be a compliance factory, in sha Allah.”* The owner hopes to find direct international buyers and earn more income. There are several things he has to do in order to get the compliance certification. Labour conditions should be improved by providing more working space, light and fresh air. There should be fire extinguishers and medical facilities. The company cannot engage child labour. The procedure to get an Oeko-Tex compliance certificate costs about 7,000 USD per year.

The company has a production line involving Korean equipment. This owner finds the technology *“much better than Chinese equipment.”* His production line produces 200 items per hour, but in a compliance factory with modern machines he visited, they produce 600 items per hour. In fact, the owner would prefer to have Japanese technology, but it would be too expensive. For the future, he plans to buy more machines for finishing such as a large ironing machine, which costs 10,000 USD. He is also planning to have a better ventilation system to make the factory more airy.

External business and institutional context

At present, the garment sector is growing in Bangladesh, which has become the world’s second largest manufacturing country, according to the owner – *“because of its quality.”* There are numerous textile related companies all over Chittagong, including 20 garment and two textile printing businesses near his factory. Indeed, his neighbour has a similar printing factory – *“he is my competitor.”* There are many more textile printing competitors in the city – *“someone can always offer a cheaper price.”* The owner does not like to unite or associate with other factories because of a lack of trust – *“if I associate with my neighbour, he will kick me out. So I do everything myself.”*

To secure subcontract orders, he contacts the garments industries directly. It is regular practice to pay the purchasing manager money under the table to get a subcontract – *“it is illegal but some money needs to be paid. It is very difficult to work in this context.”* Then, after delivering the order, the garment industries do not make payments on time – *“even four months late and I have to survive between these times.”* Going to court is not an option to enforce payment as agreed in the terms of the subcontract.



There is also a practice by some garment industries that, after the first delivered order, *“they do not pay and they say that they will not do business with you anymore.”*

The imported dye is bought locally in traders’ shops. The quality used for printing depends on the subcontract price offered by the garment industry. For special prints, such as for Walmart, the owner uses higher quality dye from Korea. Sometimes the garment industries provide specific instructions about the dye and chemicals. After printing, the garment industry checks the quality of the prints in detail. If something is wrong, they might pay less than initially agreed in the subcontract.

With regard to the initial set-up technology and exploring new technologies, the owner studied the machinery in a number of factories in Chittagong he visited through personal links and references. Some of the factories

advised him on what machinery to buy. He also visited several “*compliance factories.*” His brother is a politician and local councillor and has many contacts. His uncle also has an influential position in politics – “*in case of problems, I am safe.*”

The owner is not happy with the efforts of the government. In his view, the government is not developing policies to promote the sector for the benefit for Bangladesh, nor to solve the compliance issue – “*they do not bother, they are busy taking money through corruption.*” He feels that India is doing much better in terms of policies and regulations, and is competing with Bangladesh in garment production. In India, they have a lot of rules to make it run better – “*our government is totally different from the government of Modi.*”

To improve the compliance challenges of the sector, the owner feels that non-government garment-related organisations and garment trade bodies are better placed and committed to look after the industry. They can give solutions to specific problems. Under the Trade-Alliance, to be eligible for compliance, you also need to have labour unions. These unions occasionally visit the company, but the owner feels they are not effective and not independent from government – “*they are very politicised.*”

The company faces ongoing challenges with electricity provision. In the days preceding the interview, he had only four hours of electricity. The workers can do the job manually, without electricity, and the printed textiles dried on the roof – “*I have no choice but to continue working without a power supply, to deliver on time.*”

His current profit margin is zero. The owner has a small restaurant too, which provides some financial stability for him. Otherwise he could not survive the difficult periods. He is committed to his factory for the time being, because forty people and their families depend on it. In fact, he is very much aware of the social side of the business and his responsibility in that regard. Then again, the owner is not sure about the future – “*I will try one more year and then I will leave the country*” He mentions that his future might be in Malaysia.

Case 3: Chemicals – lubricant recycling (150 employees)

The company produces base oil by recycling used industrial lubricants and used oil. The base oil is sold as lubricating grease, motor oil and other metal processing fluids. It is a research oriented company and has a laboratory with advanced technology. The interview is held with the owner.

The owner is from a middle class Bangladeshi agrarian family. He is educated as an economist and considers himself a generalist. He is proud that the Grameen Bank founder Mohammad Yunus was his teacher at university – “*he moulded us as entrepreneurs.*” His university studies were interrupted for two years because of the outbreak of the Liberation War (the country was previously occupied by Pakistan and named East Pakistan). After independence, all the industries were nationalised and abandoned by their foreign managers, so university teachers encouraged their students to start in business by themselves.

He established the company in 1974 as a small project, after graduation. The government provided him with a small plot of land at a low interest rate – “*I came out of university with only a certificate – not a penny in my hand.*”



After this initial support from the government, some years later, the company acquired the current area of BSCIC³ land on a 99-year lease term. He faced lot of obstacles when he started – *“resilience is the secret. Keep on knocking at the door. We had to pass through many hardships.”*

Innovation

After graduation, he was not interested in trade or the construction business – *“I was thinking of starting something new that no one else could do.”* In the course of his studies, he discovered that Bangladeshi people consume 100,000 metric tons of lubricants a year in cars, trucks, ships and other types of engines – *“it becomes dirty and polluting after its use. People used to throw it in the drain.”* Since Bangladesh is a rainy country, the used oil spread everywhere, resulting in severe environmental damage.

At that time, the government realised the magnitude of the problem and forbade the dumping of used oil in the drains. Moreover, around 1974, the oil market was in turmoil and oil prices started increasing – *“there was demand in the local market, which presented a business opportunity.”* He started a company specialised in the refinery process – *“once the dirt is removed, then oil becomes clean and a highly valued product.”* It is technically feasible to refine the used oil many times. The owner sees an important contribution of his company *“to society and civilisation – “our slogan is: ‘save that drop of oil’.”*

Since then, households and businesses have become aware of the problem and have started saving dump oil. The company organises meetings for households and small companies to explain how harmful it is and the possibility of collecting it for recycling. The company prints and disseminates flyers and leaflets in Bengali.

The company produces the recycled oil for the local market. The owner has greater ambitions and is trying to expand into an export business.

The current production level is 10,000 tonnes – *“we are going to raise our capacity to 60,000 tonnes.”* He has acquired land in the port area of Chittagong to construct a terminal. When the new investments are realised, the owner expects that *“the company will produce 60% of the country’s requirement for lubricants.”* A few months ago, the owner concluded a joint venture agreement with a German partner, which will help him to export. He has started to export already on a small scale to neighbouring countries such as Nepal and Myanmar.



The oil comes from many sources. End users collect the oil and he pays a little for it. The informal sector of dump oil collectors in Chittagong provides most of the input. There are rickshaw drivers with small oil drums who go door to door to collect the used oil. Initially, all transactions were in cash, but the owner encouraged the rickshaw drivers to open bank accounts. The company also organised trucks and a designated location in the community to collect the used oil. These storage tanks are surrounded by a dyke wall, so that in case of emergency, any leakage will not spread. Ship recycling also provides used oil – *“before I started to collect the oil, it was floating in the Bay of Bengal.”*

Internal capabilities

The company employs 150 workers, *“who are committed to the company. We call it a family organisation.”* The company has an organogram and job descriptions including workers in the installation, engineers (electrical,

³ Bangladesh Small and Cottage Industries Corporation

chemical and process engineers), laboratory staff, management and administration, sales, marketing and communication.

In the absence of any technical expertise of the recycling process among his staff, the owner had to build his internal knowledge base himself – *“the practical application of oil recycling is not taught in university.”* Initially, he hired external and international experts and exposed the staff to new technology. Now the laboratory is systematically organised, with the head of the laboratory and operations responsible for technical oversight of the work. Most of the laboratory staff hold PhDs in chemistry.

Initially, the quality of the lubricants produced by the company was average, but now the products meet international quality standards, following major investments in the R&D laboratory. The equipment and skills are state-of-the-art and purchased from the US and the UK. There are 500 listed competency laboratories in the world – *“we are one of them.”* It is an accredited laboratory (ISO 17025 and UCAS). The owner has applied for ISO 14001 and ISO 80001, and is also in the process for BMW and Volvo certifications.

The company is working on several technical challenges. One is to meet the requirements of the US aircraft industry – *“the base oil should be clean, with a very limited number of particles.”* Another example is the smell of the oil – *“that is important because the clients always smell the oil.”* The owner challenges his young technical staff to improve these things.

External business and institutional environment

Regarding the supply of used oil, the business environment has changed over the years. Households and small businesses have started to ask more money for the used oil – *“people have greater awareness, they want more money.”* The owner tries to convince the suppliers that if the price is too high, he cannot operate. On the demand side, consumers in Bangladesh were initially reluctant to buy recycled oil, but now many people are picking up the idea. The owner mentions that he faces opposition from multinational oil companies, who want to increase their lubricants business in Bangladesh and *“I have become a formidable competitor.”*

Regarding the finances, the company has mobilised its own equity over time. To scale up, the company applied successfully for bank loans. The owner explains that the government has reduced some of the bank interest rates to encourage the import of machinery – *“the interest rate used to be double digit, now it is single digit.”* Market capitalisation is also very strong in Bangladesh – *“I have made the company public now.”* Many people were interested to invest in the company.

Available land remains an issue for expanding companies in Bangladesh. The acquisition of land, particularly in the past, used to be *“tricky because the land must be undisputed.”* When an individual or company buys a plot of land, *“shortly thereafter an individual will come to you and claim some portion of it.”* Now the government is acquiring land and developing infrastructure (electricity, water and gas) for new plots to be made available for young entrepreneurs.

The owner stresses that Bangladesh is an underdeveloped country – *“it used to be one of the richest countries in the region, but Bangladesh passed through many difficult historical times.”* He appreciates the government’s efforts to help the private sector – *“the government is trying to the best of its ability. We business people are sometimes not very good. We also sometimes mis-utilize resources.”* At the same time, the owner feels that entrepreneurs in Bangladesh are resilient – *“taught by our history.”*

With regard to his interactions with the government, he has a pragmatic approach. Many government officials have good intentions, according to him. Their attitude is ultimately to develop the industry and the country – *“if some people are not, then you have to buy them out. Japan developed in spite of having corruption.”* The owner

has a lot of business contacts. He is also president of the employers' association. He travels around the world and has built a large international network.

The owner sees that universities in Bangladesh mostly teach theory. There are only a few practical sessions for industrial application, which he regrets. The company collaborates actively with the university in Chittagong by sponsoring activities and students. The owner is also invited for guest lectures on how to build a career and on technical issues in practice – *“all those practical things are not taught in the university.”* Once the owner went to Japan and Germany and learned about fruitful industry-university collaborations – *“I saw that professors went to the industry partners and listened to the workers on the work floor.”* He hopes that such collaborations will also materialise in Bangladesh.

3.3 Key findings qualitative research

A first overall observation during the preparation of the fieldwork in Bangladesh, compared to organising the qualitative interviewing in other Asian and African countries, was the relatively limited number of formally registered SMEs (10-100 employees) in the manufacturing sector in Chittagong and around. This supports the earlier signalled observation that the so-called ‘missing middle’ of SMEs⁴ is a key issue in Bangladesh (see chapter 2). SME owners and managers were open and happy to receive the research team at their premises for an interview.

Most interviewed owners and managers in the companies in Chittagong, 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*⁵ (OECD, 2005). From a radical technology perspective, many of the elements of ‘newness’ introduced in the Bangladeshi 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 centres 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*

⁴ This phrase has been used relatively loosely in economic development discussions, meaning a lack of SMEs, particularly in the developing world. See: http://www.africa.com/blog/investing_in_africa_defining_themissing_middle/

⁵ <https://www.oecd.org/sti/inno/2367580.pdf>

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.

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 the business and attract new clients; (iv) functional innovation, assuming responsibility for new activities in the value chain, such as design, marketing and logistics; and (v) inter-chain innovation, moving to new and profitable chains. These types of innovation are considered in the analysis in this report.

In many innovation definition and measurement documents, such as the OECD *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 so far in Kenya, Ghana, Tanzania, Vietnam and Bangladesh 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 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 companies qualify as innovation or not.

- 1 The crucibles company producing supplies for the steel mill industry has introduced a new style of management with regard to salary payment, set up a bonus system and provides extra benefits (management innovation). Moreover, the owners modernised the plant three years ago, automated the production process and invested in several new machines (process innovation). This resulted in raising productivity while maintaining quality.
- 2 The company printing text, shapes and figures on textiles for T-shirts wished to secure a compliance certificate from Oeko-Tex. The owner hopes to find direct international buyers and earn more income. The company has a production line involving Korean equipment. In the future, he plans to buy more machines for finishing, such as a large ironing machine. Although the owner has many plans, the innovations have not yet materialised.
- 3 The oil company introduced the idea of recycling oil to the market in Bangladesh (product innovation). The company is a family organisation with an organogram and job descriptions, which is not common in Bangladesh (management innovation). The equipment and skills are state-of-the-art and purchased from the US and the UK (process innovation). The owner has applied for ISO 14001 and ISO 80001, and is also in the process of applying for BMW and Volvo certifications (business practice innovation).

Trends and patterns in the cases

The *Global Competitiveness Report 2015-2016* of the World Economic Forum suggests that Bangladesh is a ‘factor-driven’ economy, competing based on factor endowments, primarily unskilled labour and natural resources. Companies process and sell basic products or commodities, with their low productivity reflected in low wages. This is confirmed in the textile cases of the research in particular, a key sector in the country.

As a country becomes more competitive, productivity will increase and wages will rise. In the efficiency-driven stage, companies begin to develop more efficient production processes and increase product quality further because wages have risen and they cannot increase prices. Interestingly, the introduction of new technologies in the cases studied was aimed at enabling production of higher quality products and access to new (international) markets. Most interviewed SMEs expect to hire more staff in this process of expansion. Most of the entrepreneurs demonstrate social awareness and see their importance in the community.

Owners are aware of the importance of introducing new products and technology to raise productivity and efficiency to maintain their level of competitiveness. At the same time, most of the interviewed SMEs introduced management and organisation innovations, whereas the product and process innovations were less important. The new products and processes in the innovative companies were not radical and not 'new to the world'. The ideas for new products are mainly acquired from the market. Customers come with requests and suggestions, or the owners talk with clients. It is therefore mostly demand-driven innovation.

A new phenomenon is green sustainable factories in Bangladesh, established according to environmental codes, using less power, polluting less and recycling waste materials and energy. These practices are increasingly imposed by international buyers. If the factory is sustainable, the firm may be able to negotiate better prices.

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. Several companies have a design or R&D department or a specialist employee with this function. Roughly, there are two types of innovators in Bangladesh: those who innovate using their technical background and those who innovate from a business managerial perspective.

The workforce in the companies were mostly lower educated yet skilled labourers in the production workshop on the one hand, and well-educated staff in management and marketing on the other. Typical fixed employment contracts are only for key and higher educated staff. Regular work is subcontracted to middlemen who come with a pool of workers, often migrants who work under unfavourable conditions.

Several owners face difficulties resulting from the high turnover rate of unskilled production workers. There are plenty of employment opportunities in the textile sector in Bangladesh for lower educated workers, as reported by several of the managers and owners interviewed. All the companies have some form of reward and bonus system, which results in loyalty to the company. The recruitment of workers is an ongoing concern for the owners and managers.

The education system in Bangladesh does not deliver workers trained to do most of the production skills required by the interviewed firms. Graduates from colleges and universities have theoretical knowledge but lack practical skills, so most companies have to do additional in-house training. Although in some cases the employees provide innovative ideas, most owners signal the limited creativity of their workers and refer to a passive attitude. There are very limited connections between universities and industries. The managers and owners see a gap between industry and academia in the context of Bangladesh, where both parties seem to avoid each other.

Typically, the 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, but 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, and have ideas and plans for upgrading and expanding their companies. However, new (technological frontier) machines are too expensive and advanced compared to the expected returns on investment in the short run. With regard to the long run, the macro-economic and institutional context does not provide sufficient confidence for such extensive investments with bank credit. The owners and

managers are only confident about short- and medium-term stability. The ‘glass ceiling’ situation seems to be the case among most interviewed SMEs.

External business environment and formal and informal institutions

Bangladesh has many SMEs involved in textile manufacturing, whose product quality meets international and export standards. The working conditions of labourers has been publicly questioned, and as a result, international buyers have set up a compliance certification system. However, compliance is a challenge for smaller firms, involving substantial investment, as explained by the owner of the textile printing company. The process of acquiring compliance is itself an innovation. However, several SMEs report that they are worse off because of the compliance standards, since international buyers are not willing to pay higher product prices incorporating the investment costs.

The cases suggest that entrepreneurs with a family background in a business group can set up a business more easily than those without family support. They know how to play according to the rules and have technical and financial back-up. This might explain the ‘missing middle’: there are many household-based companies, whereas companies with 10-50 employees are less common. Larger companies and family business groups with 150 and more employees are more prevalent in Bangladesh.

All interviewed SME owners and managers indicate that the business environment is challenging in Bangladesh. There is no ‘one-stop shop’ offering information on how to set up a business, nor is there information online on licence requirements. Several of them have a negative perception about frequent changes in government policies and regulations. There is no clarity about these changes and SME owners have to navigate the requirements themselves. Many ministries and governmental agencies have different and unpredictable regulations.

Only a few interviewed companies received support from the government. The other owners and managers express regret that they have not received such support, and feel that they have to survive on their own. The banking system is not an attractive source of finance for SMEs. High interest rates and complex paperwork are critical issues.

Branch associations in general are an important source of information and business contacts and contracts for the owners and managers of the cases. Most of them are members of an association. Interaction with formal technology institutions, as suggested in the innovation systems literature (Lundvall, 1997), does not happen. Many SME owners and managers indicate that they would like to cooperate with universities to undertake research at their premises, sharing 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

The owners and managers in the cases suggested in the interviews that the government is not really interested in the development of the manufacturing sector, and that government officials are interested in short-term financial gains particularly. This also raised issues for the DFID project in terms of disseminating policy recommendations. As one of the interviewed entrepreneurs put it, “How can you give policy recommendations to government officials who are basically not interested?”

Various ministries within the government have defined and implemented industrialisation and innovation policies. However, these seem not to reach the SME owners interviewed. Some SME owners and managers are aware of R&D centres and programmes aiming at technology development for SMEs, but few are actively engaged. One explanation could be that technology dissemination is implemented in a technocratic top-down

way. The companies are seldom consulted, in fact they prefer to stay at a distance from formal institutions. The result is that the interviewed SME owners failed to benefit from any innovation policies.

Owners and managers are aware of state-of-the-art technology but cannot afford the high cost of the machines. Even owners with sufficient financial means do not invest because of their uncertainty about the future. The government provides neither assurance nor governance stability to the sector, 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, evident in the cases in Bangladesh. Therefore, the development process in LICs 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 would be 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.

The notion of growth as ‘manna from heaven’ reflected in convergence theory, see the exogenous growth model of Solow and Swan, was earlier rejected by scholars as described by Fagerberg et al. (2010). However, it seems this 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. 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 preventing ‘convergence’ from happening. At the same time, the ‘manna from heaven’ of technology developed elsewhere may not address local needs or issues in Bangladesh.

Innovation climate

How then can the innovative capacity of SMEs in developing countries be increased? According to the World Bank (2010), an efficient innovation policy by governments 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 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 workers and operators to work with modern machines. 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 Bangladesh. 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 shifting the focus from governmental policy makers only, to incorporate 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 Asia 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 EIP/LIC innovation survey in Bangladesh

Annex 2 uses data from 300 Bangladeshi firms which were interviewed for the World Bank Enterprise Survey (WBES), the Innovation Follow-up Survey (IFS) and the DFID project, i.e. the Innovation Capabilities Survey (ICS). The WBES data were collected in 2013 among 1442 companies. Of these companies 990 were later the same year and in 2014, interviewed for the IFS. Of these, 300 companies were interviewed in 2015 for the ICS. A description of the data collected in all three surveys for these 300 companies is given in sections 1 to 6 of this report.

4.1 General description of the sample

Distribution of firms by sector and province

The surveys contain a variable indicating in which province of Bangladesh a company is located (A2 from WBES survey). As can be seen in Figure 1 most of the firms in the ICS-sample (188) are from Dhaka. This is followed by Chittagong (73), Khulna (24) and Rajshahi (15). The province Dhaka is where the nation's capital and largest city, also called Dhaka, is located. The province is in the centre of the country. Chittagong province is located to the south east of Dhaka province and is home to (and named after) the largest port of the country, and second economic city. Khulna is located south west of Dhaka, houses the third largest economic centre in the country, also called Khulna, while Rajshahi is located north west of Dhaka.

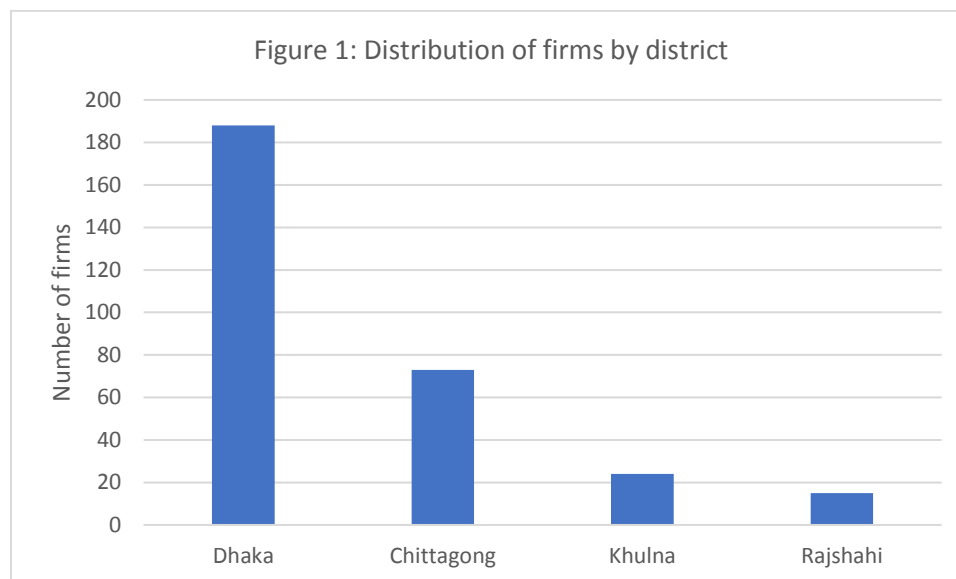


Table 1 shows the number of companies per industrial subsector (A4b from WBES) and province. All companies interviewed in Bangladesh for the ICS-survey are manufacturing companies. Most companies in our sample are in the textile, garments and leather sector (105), followed by the food products and chemical sectors (including rubber and plastic) (both 45 companies). The sectors which are fourth and fifth in size are the furniture sector (27 companies) and the metal sector (incl. fabricated metal products and machinery and equipment; 26 companies), closely followed by the publishing sector, which has 23 companies. The smallest sectors are the wood and paper, and the transport equipment sector (both 13 companies). Of the electronics sector and the non-metallic mineral products sector only two, respectively one company was interviewed.

In Dhaka most of the textiles, garments and leather companies (79 of 115 for the whole country), publishing, printing and recording media companies (21 of 23 for the whole country) and chemical companies (19 of total of 36) are found. In Chittagong textiles, garments and leather (18 companies), chemicals and food (both 16 companies) are also important sectors, as well as furniture (11). The majority of the companies interviewed in Khulna belong to the food sector (14 out of 24).

Code	Subsector	Dhaka	Chittagong	Khulna	Rajshahi	Total per subsector
15	Food	13	16	14	2	45
17	<i>Textiles</i>	18	7	3	4	32
18	<i>Garments</i>	31	7	0	1	39
19	<i>Leather</i>	30	4	0	0	34
	Textiles, garments, leather sector	79	18	3	5	105
20	Wood	1	2	2	2	7
21	Paper	4	0	2	0	6
22	Publishing, printing and recorded media	21	1	1	0	23
24	<i>Chemicals</i>	19	16	0	1	36
25	<i>Plastics and rubber</i>	7	1	0	1	9
	Chemical sector	26	17	0	2	45
26	Non metallic mineral products	1	0	0	0	1
27	<i>Basic metals</i>	4	3	1	0	8
28	<i>Fabricated metal products</i>	9	2	0	1	12
29	<i>Machinery and equipment</i>	4	0	0	2	6
	Basic metals sector	17	5	1	3	26
31	Electronics	2	0	0	0	2
34	<i>Transport machines</i>	5	3	1	1	10
35	<i>Transport machines</i>	3	0	0	0	3
	Transport equipment	8	3	1	1	13
36	Furniture	16	11	0	0	27
	Total per district	188	73	24	15	300

Descriptive statistics

Table 2 lists descriptives of some of the major variables in our database. The companies vary considerable in size. Measured in terms of sales turnover in fiscal year 2011/12 (D2 from WBES), they range from USD 3,784 to USD 113,526,000, with an average of a little less than USD 4 million. Also in terms of number of full-time employees (L1 from WBES), there is much variation between the companies. The majority of companies in our sample is small or medium sized, with half having 39 or fewer full-time employees. Only 25% have 198 employees or more, with a maximum of 6,784.

	min	p25	p50	p75	max	mean	N
Turnover 2011/12 in USD 1,000	3.78	90.82	378.42	2579.56	113526	3919.97	293
Employment 2011/12	4	17	39	197.5	6784	238.45	300
Age	2	12	20	29	94	22.8	300
Labour productivity 2011/12 in USD 1,000	0.18	3.47	7.57	19.06	1261.4	22.86	293
Turnover growth 2009/10-11/12	-0.87	-0.07	0.13	0.33	165.67	1.28	283
Employment growth 2009/10-2011/12	-0.84	0	0.08	0.25	2.75	0.12	297

Age (Year of the survey- value for B5 from WBES) of the companies ranges from only two to almost 100 (94) years, with an average of 23 years. Labour productivity (turnover divided by the number of full-time employees) also varies considerable, with the least productive firm having productivity of USD 180 per employee, and the most productive firm having productivity of USD 1,261,400 per employee. These very high productivity figures are limited to a small set of companies, with six companies reporting figures higher than USD 100,000 and two companies reporting productivity higher than USD 200,000. The majority of firms showed an increase in turnover growth and growth in the number of employees over the last three fiscal years.

Sales and exports

Table 3 given an overview of the percentages of sales from direct exports (D3c from WBES) and indirect exports (D3b from WBES) per province. As can be seen the percentage of sales from direct exports is highest in Khulna province, followed by Dhaka and Chittagong.

Province	Direct exports	Indirect exports	N
Dhaka	19.46	6.52	188
Chittagong	18.32	4.38	73
Khulna	37.5	0	24
Rajshahi	0	0	15
Total	19.65	5.15	300

Table 3a shows that 218 of our 300 companies do not export either directly or indirectly. Of the remaining 82 companies, 61 export directly (but not indirectly), 12 export indirectly (but not directly) and 9 export both directly and indirectly. For the companies which export directly, 91% of their sales stems from exports. For the companies which export only indirectly, this is somewhat lower, 87.5%. For the companies which export both directly and indirectly sales from indirect export is somewhat higher (55%) than sales from direct exports (38%).

	N	% of sales through	
		Indirect export	Direct export
Company only sells on domestic market	218	0	0
Company also exports indirectly	12	87.5	0
Company also exports directly	61	0	91.07
Company also exports indirectly and directly	9	55	37.78
	300	5.15	19.65

Of the 70 companies which export directly (or directly and indirectly), most (58) export to Western countries (Europe, the USA and Canada; SARD3d from WBES; Table 4). Interestingly, this is far more than the number of companies which export to its neighbour India (11; SARD3a from WBES) and to other South Asian countries (8; SARD3b from WBES). What is also interesting is the percentage of sales from export. For the companies which export to western countries this is much higher (81%), than for companies which export to India (25.5) or other South Asian countries (29%).

Table 4: Export status by region		
	Number of comp	% of sales from export these
India	11	25.5
Other South Asia (Afghanistan, Pakistan, Bhutan, Nepal,	8	29.0
China and Hong Kong	21	37.0
Europe, USA and Canada	58	81.0
Other countries	27	37.4

Supplies and imports

Table 5 makes clear that in all provinces at least two third of inputs is from domestic origin (D12a from WBES). Firms in Dhaka and Chittagong have the highest percentage of inputs from foreign origin (34.6 and 34.0%), while Khulna has the lowest percentage (12.1%).

Table 5: Origin of inputs and supplies			
	% of sales through		N
	Foreign origin	Domestic origin	
Dhaka	34.6	65.4	187
Chittagong	34.0	66.0	73
Khulna	12.1	87.9	24
Rajshahi	28.3	71.7	15
Total	32.3	67.7	299

Of the 299 companies which provide information about the source of their inputs, 134 only use domestic inputs (D12a from WBES), 140 use both domestic and foreign inputs, and 25 only use foreign inputs (Table 6). For the 140 companies which use both domestic and foreign inputs, foreign inputs are somewhat more important (51.2 vs 48.8 percent).

Table 6: Origin of inputs and supplies			
	N	% of inputs from	
		Domestic origin	Foreign origin
Only domestic	134	100.0	0.0
Only foreign	25	0.0	100.0
Domestic and foreign	140	48.8	51.2
Total	299	67.7	32.3

4.2 Innovation

Product and process innovation

Of the 300 companies in our sample, the majority (154) introduced a product as well as a process innovation between 2009/10 and 2011/12 (Table 7a). The questions about product innovation (HB1) and process innovation

(HC1) both come from the IFS survey. Of the remaining companies 102 only introduced a process innovation, 37 only a product innovation and 7 neither sort of innovation.

	Number	Percentage
No innovation	7	2.3
Only product innovation	37	12.3
Only process innovation	102	34.0
Product and process innovation	154	51.3
Total	300	100.0

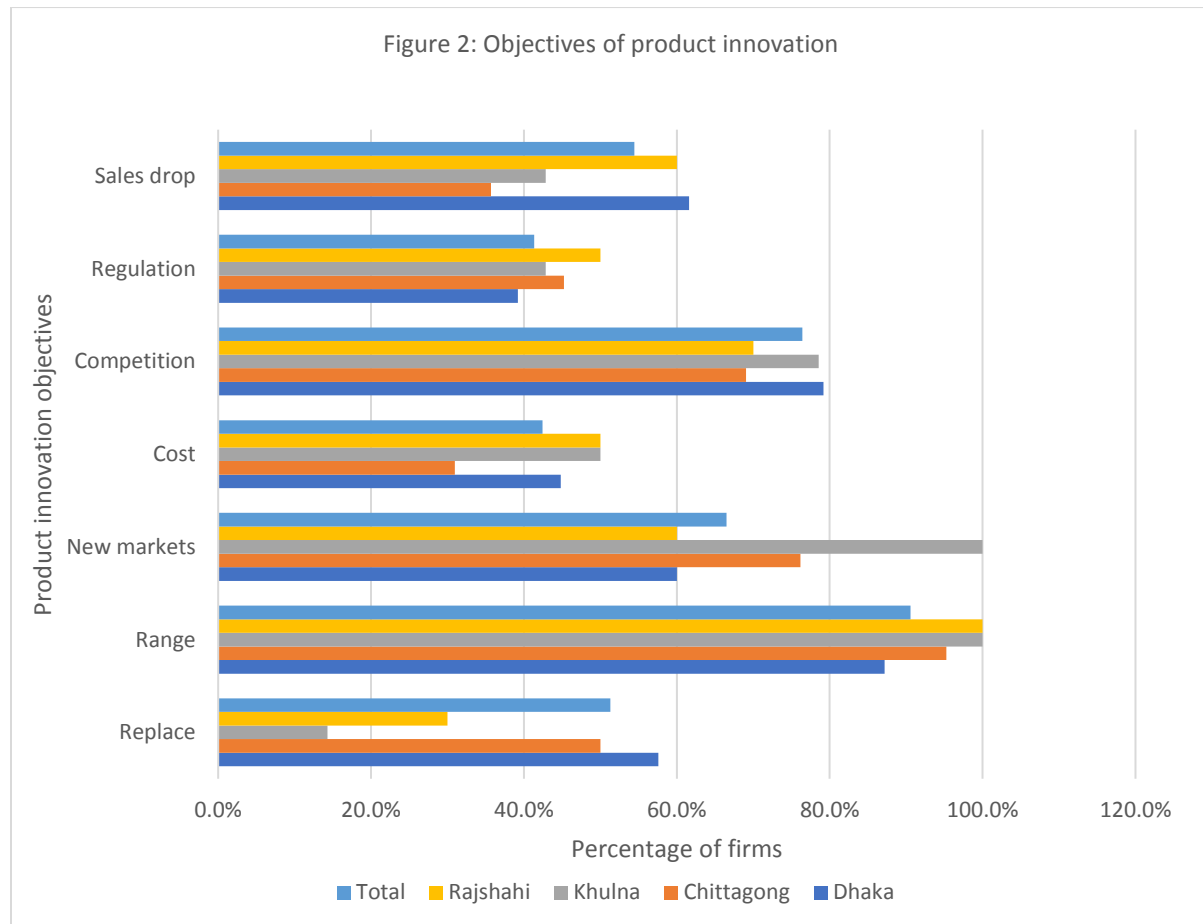
In all provinces, a higher percentage of companies is engaged in process than in product innovation (Table 7). Dhaka and Rajshahi have higher percentage of product innovation than Chittagong and Khulna. Process innovation is clearly highest in Rajshahi. As was already pointed out in the country report for Kenya, such high levels of self-reported innovations probably arise from a rather subjective definition of innovation in the surveys, with innovations probably being more incremental and less radical (Cicera and Muzi, 2016).

Province	% of companies engaged in		N
	Product innovation	Process innovation	
Dhaka	66.5%	84.6%	188
Chittagong	57.5%	84.9%	73
Khulna	58.3%	87.5%	24
Rajshahi	66.7%	93.3%	15
Total	63.7%	85.3%	300

Table 8 shows for which market product and process innovation were new when they were introduced by the company (questions HB11a-c and HC11a-c from the IFS survey). As can be seen, both product and process innovations are mainly new to the local market. Of the 191 companies which introduced a product innovation, 42.92% introduced one which was only new to the local market, 16.2% which was new to the national market, and 4.2% which was also new to the international market. For the 256 companies which introduced process innovations these figures are 23.1%, 10.9% and 4.3% respectively. This also indicates that most of these innovations probably were more incremental than radical in nature.

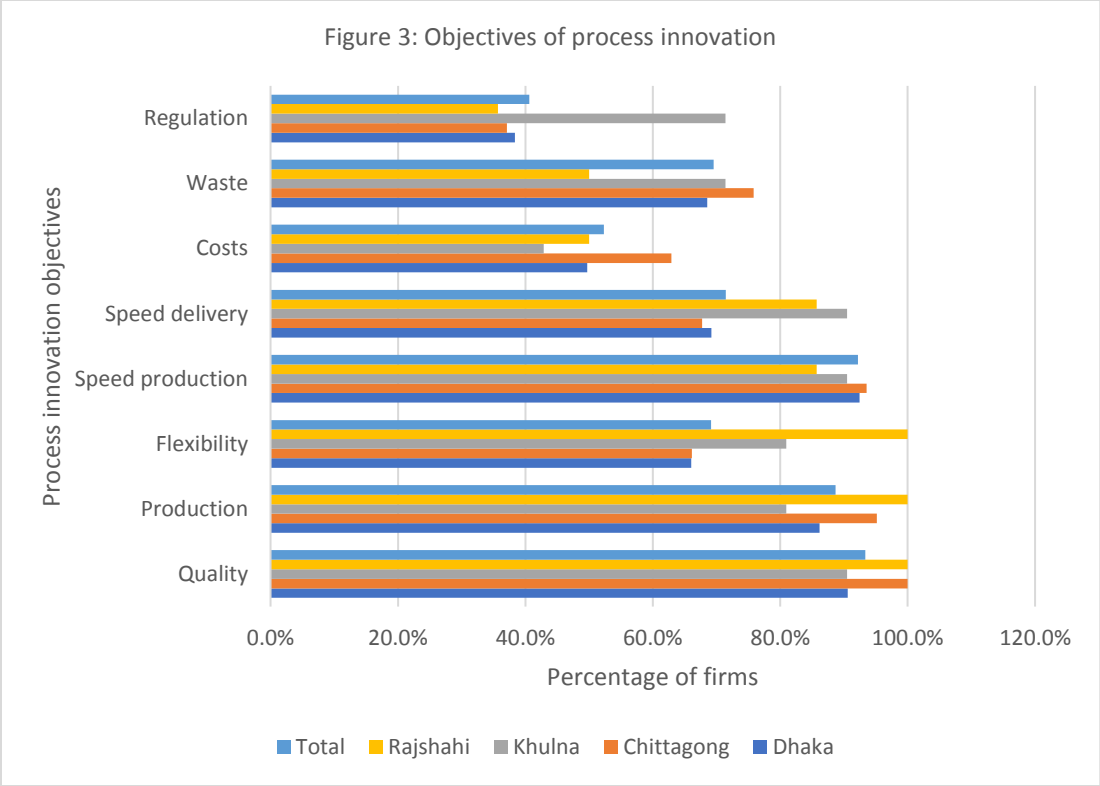
Province	Product innovation				Process innovation			
	Local	National	International	N	Local	National	International	N
Dhaka	40.8%	16.0%	4.8%	125	23.9%	13.8%	6.9%	159
Chittagong	42.9%	9.5%	0.0%	42	22.6%	4.8%	0.0%	62
Khulna	57.1%	28.6%	7.1%	14	14.3%	4.8%	0.0%	21
Rajshahi	50.0%	30.0%	10.0%	10	28.6%	14.3%	0.0%	14
Total	42.9%	16.2%	4.2%	191	23.1%	10.9%	4.3%	256

Objectives of innovation



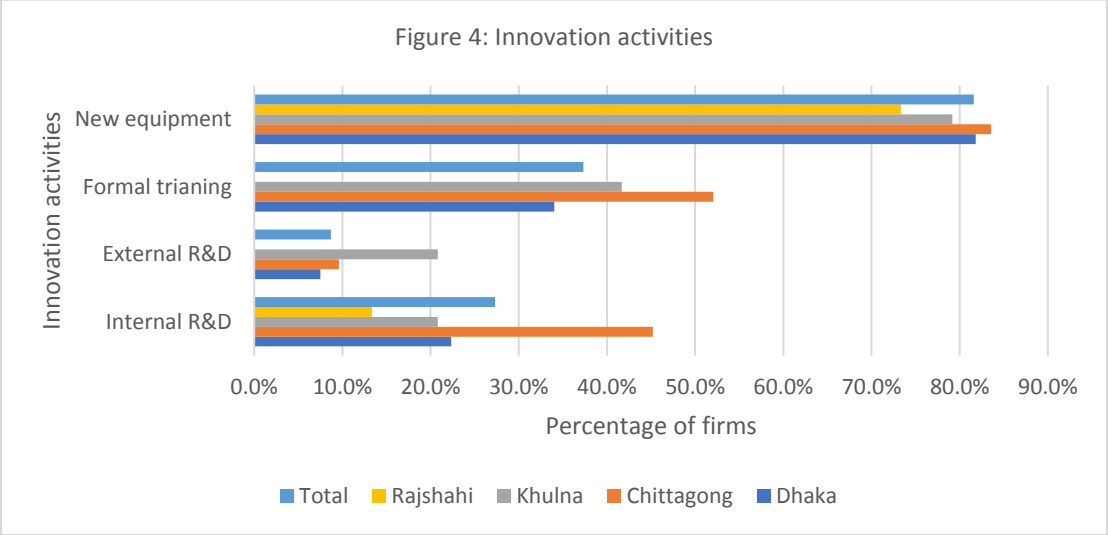
The reasons mentioned by firms for introducing their main innovative product or service can be found in Figure 2 (HB10a-g from IFS survey). The main reason is to expand the range of products or services offered (90.6%). This is followed by increasing competitiveness by offering products or services already offered by competitors (76.4%). Two thirds of firms which conduct product innovation do so to open up new markets or to increase market share (66.5%), and a little over half of companies do so to deal with a decrease in demand for other products or services (54.5%) or to replace a product or service already offered by the company (51.3%). Decreasing the cost of production or offering service (42.4%) or to comply with regulations or standards (41.4%) were mentioned less often.

Figure 3 gives an overview of the reasons mentioned for introducing a process innovation (HC10a-h from IFS). Most companies do so to increase the quality of products or services (93.4%), to increase the speed of production or offering services (92.2%), or to increase the total production or amount of services offered (88.7%) as a reason for process innovation. A little more than two third of companies mention increasing speed of delivery to the customer (71.5%), reducing waste or errors (69.5%) or increasing flexibility (69.1%) as reasons for the introduction of process innovation. As with product innovation, decreasing costs (52.3%) or complying with regulations or standards is a reason mentioned less often (40.6%).



Innovation activities

The activities associated with the development of product or process innovations can be found in Figure 4. Purchasing new equipment, machinery or software is the most important activity for Bangladeshi companies (81.6%; HF4a from IFS). This is followed by providing formal training, especially for the development and/or introduction of innovative products or processes (37.3%; HF3a from IFS). R&D, both internal (27.3%; HF1a from IFS) and external (8.7%; HF2a from IFS), are least common. Note that for Dhaka, internal R&D and formal training were based on data for 188 companies, the other two variables were based on data for 187 companies.



Sources of information for innovation

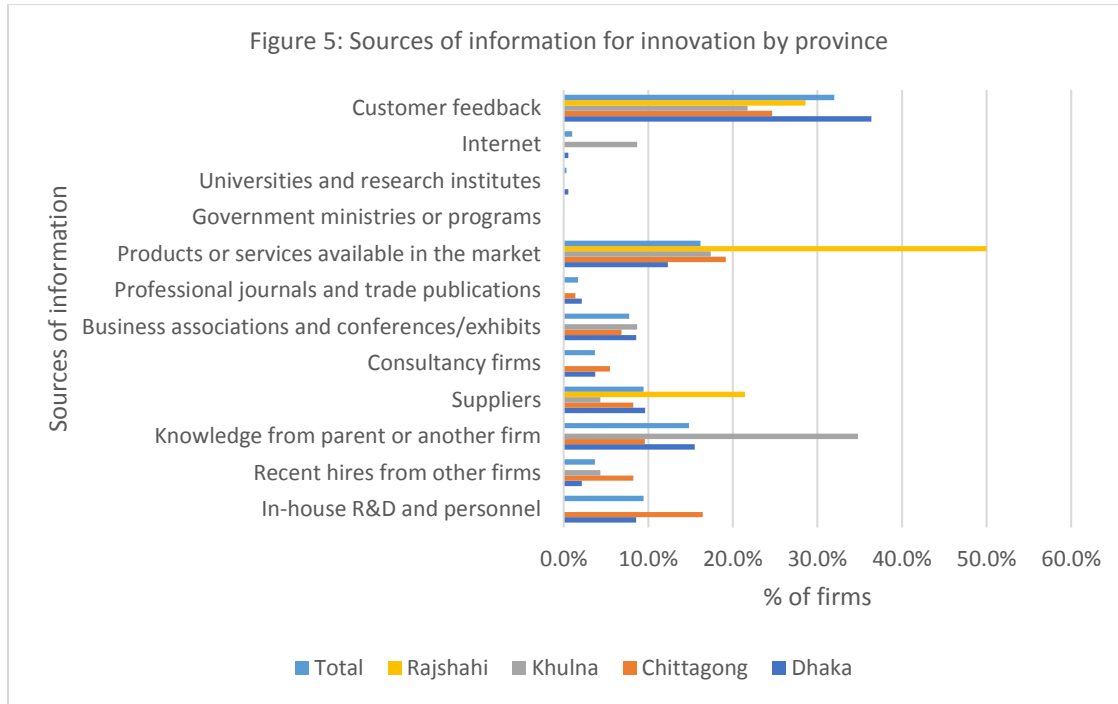
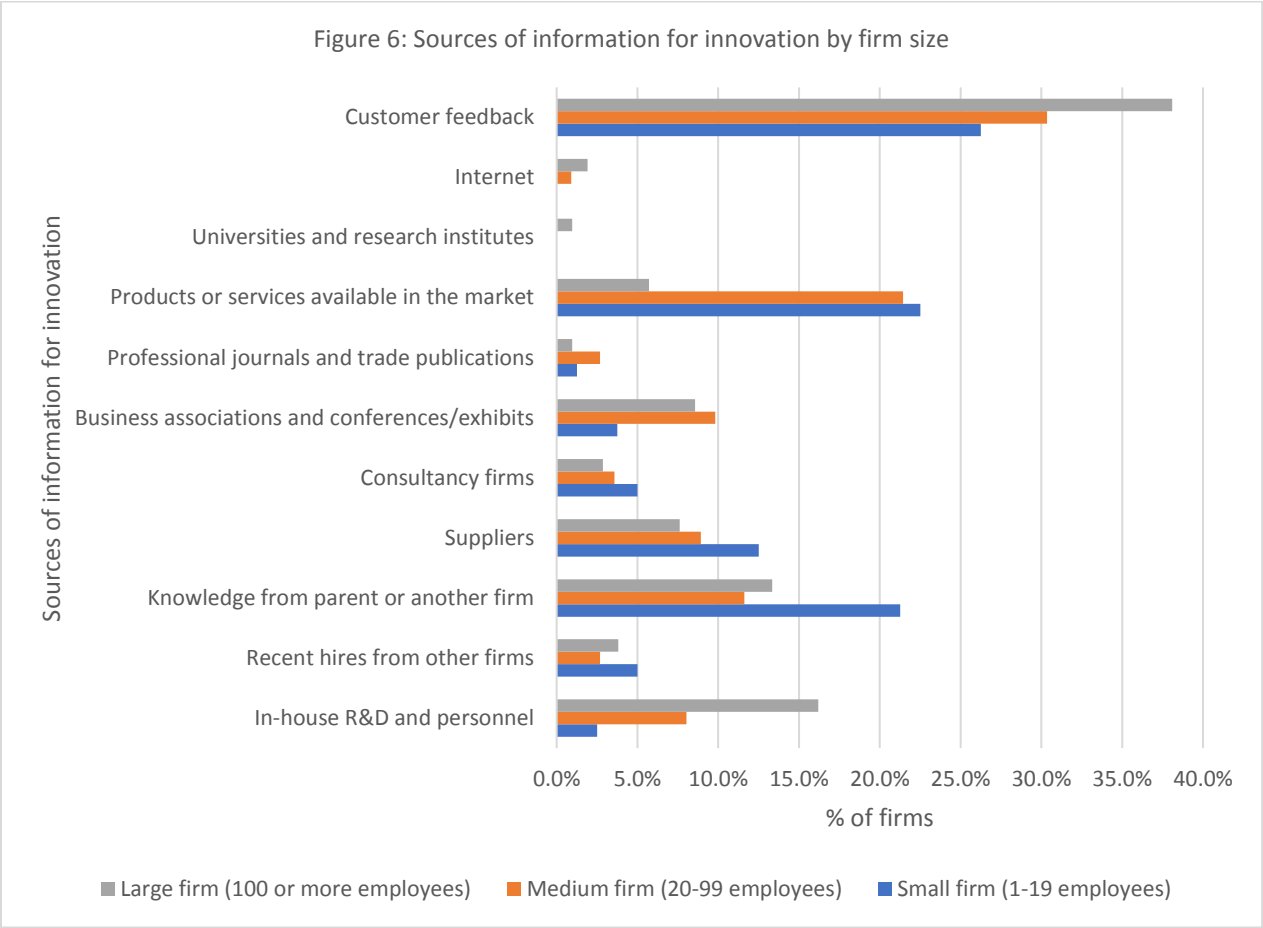


Figure 5 shows the sources of information which were mentioned as most important for innovation (HF6 from IFS). Customer feedback is the most important source of information for these firms, followed by products or services available in the market, and knowledge from parent or another firm. This illustrates the idea that innovations in Bangladesh tend to be incremental/modest in nature. The fact that government ministries or programs, universities and research institutes and internet do not or hardly play a role as information source, further indicates that innovations in Bangladesh do not tend to be radical.

Figure 6 shows the same information according to size of the company. Of the 300 companies, 80 can be classified as small (1-19 employees), 112 as medium sized (20-99 employees) and 105 as large (100 or more employees). For all companies customer feedback is the most important source of information. This is especially the case for large companies, for which customer feedback is more than twice as important as their second source of information, in-house R&D and personnel. For medium and especially small firms this latter source of information is relatively little important, maybe not unexpectedly given the smaller numbers of employees.

Conversely, while products and services available in the market is the second most important source of information for both medium and small companies, for large companies this source only ranks sixth. For all companies knowledge from parent or another firm is the third most important source of information for innovation.

Universities and research institutes are only mentioned by large companies as source of information, although only by a very small percentage of large companies. Internet is mentioned by a small percentage of large companies and an even smaller percentage of medium companies. Small companies do not mention these sources of information at all. This indicates that more radical innovations are more likely to be implemented by large companies, while small and medium sized companies rely more on incremental innovations.

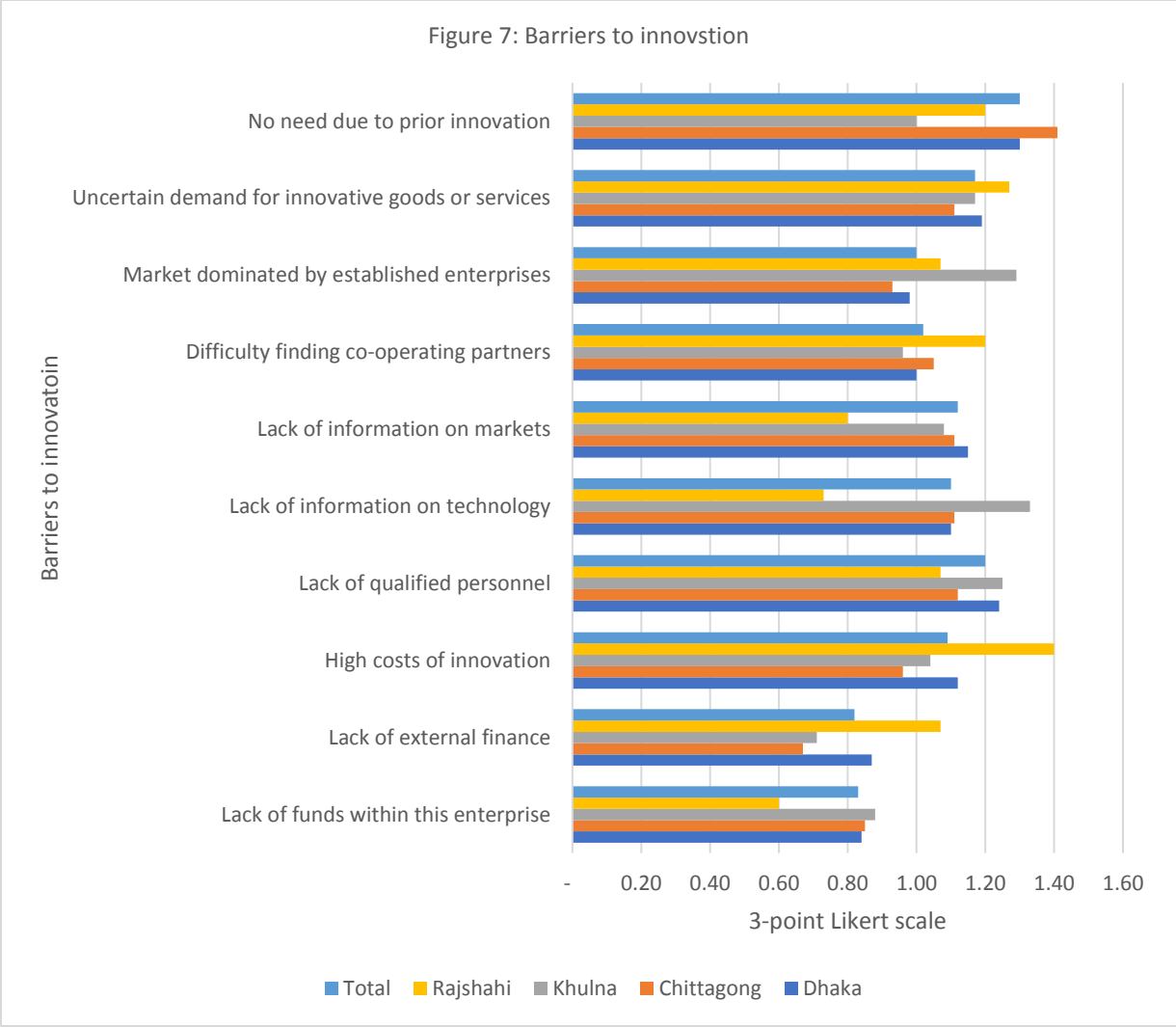


Barriers to innovation

Figure 7 gives an overview of the importance companies assign to several barriers to innovation (B3a-j from ICS survey). Each barrier is measured on a 3-point Likert scale, with values 0 for not important, 1 for moderately important and 2 for very important. For firms in Dhaka and Chittagong no need due to prior innovation is the most important reason mentioned for not conducting innovative activities. This is followed by lack of qualified personnel and uncertain demand for innovative goods or services. For companies from Chittagong, lack of information on markets and technology is also important.

For companies in Khulna and Rajshahi the most important barriers to innovation are respectively lack of information on technology and high costs of innovation, but given the low numbers of companies for these provinces (24 and 15), the picture might be somewhat distorted.

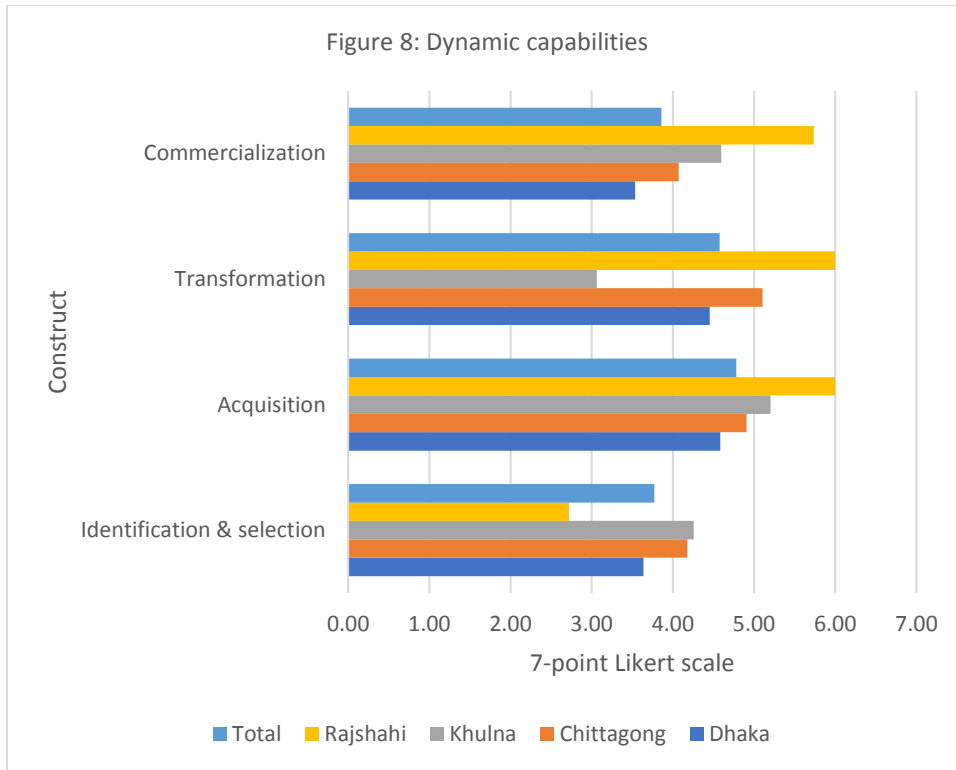
More interesting perhaps is what companies mention as the least important barrier to innovation. For companies in Dhaka and Rajshahi this is lack of funds within the enterprise, and for companies in Chittagong and Khulna this is lack of external finance. This indicates that funding is not a major worry for Bangladeshi companies, a finding which will also show in the regression analyses in the second part of this paper.



4.3 Dynamic capabilities

Figure 8 shows how companies in the four provinces on average score on four aspects of dynamic capabilities. As mentioned in the country report for Kenya, dynamic capabilities refer to the capacity of an organization to purposefully create, extend or modify its resource base (Helfat et al., 2007). Each of the four capabilities is measured with several statements which can be answered on a 7-point Likert scale from 0 when the respondent completely disagrees to 6 when the respondent completely agrees. The statements and the average scores for Bangladeshi companies can be found in Appendix A.

On average companies in Bangladesh as a whole as well as in the four provinces, seem somewhat better at transformation and acquisition than at commercialization and identification & selection. The pattern is somewhat different in Khulna, where companies consider themselves clearly better at commercialization than at transformation.



Looking at the individual statements which make up the four capabilities gives us some interesting background information. Especially Table A1 in Appendix A has some interesting information. It clearly shows that establishments have relatively little contact with researchers and universities. Specialized journals are a bit more important as source of information, but the most important sources of information are clients and customers. This clearly reflects the information already shown in Figures 5 and 6.

Bangladeshi companies' faith in their understanding of customers' needs is also reflected in Tables A2 and A4. As Table A2 shows establishments consider themselves better at acquiring knowledge to understand customer needs and to identify market opportunities than to comply with expectations of trading partners. The relative high scores for acquisition reflect the high percentage of companies which buys new equipment as an innovative activity (Figure 4). Table A4 shows that companies find selling new products in existing markets on average easier than selling them in new markets, again indicating that companies feel they understand their (current) customers.

Trust

A company's level of trust in its partners is measured with four statements which can be answered on a 7-point Likert scale from 0 when the respondent completely disagrees to 6 when the respondent completely agrees. The statements and the average scores for Bangladeshi companies can be found in Appendix B. The average value for the statements among Bangladeshi companies is 5.17 (on a scale from 0 to 6). As can be seen in Table 9, in the capital Dhaka average level of trust is the lowest (4.98), while the variation is highest. On the other hand, in Rajshahi, to the north west of Dhaka and close to the Indian border, the average level of trust is highest (5.93) and variation lowest. In the other two provinces, which are near the sea, level and variation in trust fall in between those of Dhaka and Rajshahi.

District	Min	Max	Mean (absolute; 0-6 scale)	Mean (converted to 0-10 scale)	SD	N
Dhaka	0.5	6	4.98	8.30	0.9233	188
Chittagong	4	6	5.43	9.05	0.5192	73
Khulna	3.75	6	5.39	8.98	0.8242	24
Rajshahi	5	6	5.93	9.89	0.2582	15
Total	0.5	6	5.17	8.62	0.8521	300

The average level of political trust of companies in the four provinces can be found in Table 10. Political trust is determined by six statements on how much of an obstacle 1) tax rates (J30a) tax administration (J30b), 3) business licensing and permits (J30c), 4) political instability (J30e), 5) corruption (J30f) and 6) courts (H30, all WBES survey) are. Answers are on a 5-point Likert scale ranging from 0 for 'No obstacle' to 4 for 'Very severe obstacle'. The scales for Tables 9 and 10 differ (resp. 0-6 and 4-0) and contrast each other, with value 6 in Table 9 representing the highest level of trust, and value 4 in Table 10 representing the lowest level of trust. When we convert the averages of 5.17 on a scale from 0-6 and 1.54 on a scale from 4-0 to a scale of 0-10, the average level of trust in partners corresponds to 8.62, while the level of political trust is 6.16 ($5.17/6*10$ vs $(10-1.54/4*10)$). Consequently, in all four provinces, the average level of political trust is much lower than the level of trust in partners. Whereby levels of trust in partners and politics are lowest in Dhaka.

District	Min	Max	Mean (absolute; 4-0 scale)	Mean (converted to 0-10 scale)	SD	N
Dhaka	0	3.83	1.73	5.68	0.7889	188
Chittagong	0.17	2.67	1.19	7.01	0.5182	73
Khulna	0.17	2.17	1.05	7.38	0.5784	24
Rajshahi	1	2.5	1.55	6.13	0.5464	15
Total	0	3.83	1.54	6.16	0.7515	300

Relations with customers and institutional actors

Table 11 shows that establishments on average rate their relations with external actors as rather high. The average value for this among Bangladeshi companies is 5.44, or 9.06 on a scale of 0-10.

There is not much variation between the provinces, although companies in Dhaka consider their relations to be somewhat below average, and companies in the other provinces rate their relations somewhat above average. The relatively low average rating combined with high variation for companies in Dhaka was also found for the rating companies give to trust in their partners and political trust as was shown in Tables 9 and 10.

District	Min	Max	Mean	Mean (converted to 0-10 scale)	SD	N
Dhaka	0.75	6	5.27	8.79	0.7505	188
Chittagong	4.5	6	5.67	9.46	0.2937	73
Khulna	5	6	5.75	9.58	0.3297	24
Rajshahi	4.5	6	5.83	9.72	0.4499	15
Total	0.75	6	5.44	9.06	0.6612	300

Table C in Appendix C shows the questions used to construct this variable. On average companies rate relations with buyers and institutional actors higher (5.66 and 5.68) than relations with their suppliers (5.54) and competitors (4.88).

Gender diversity

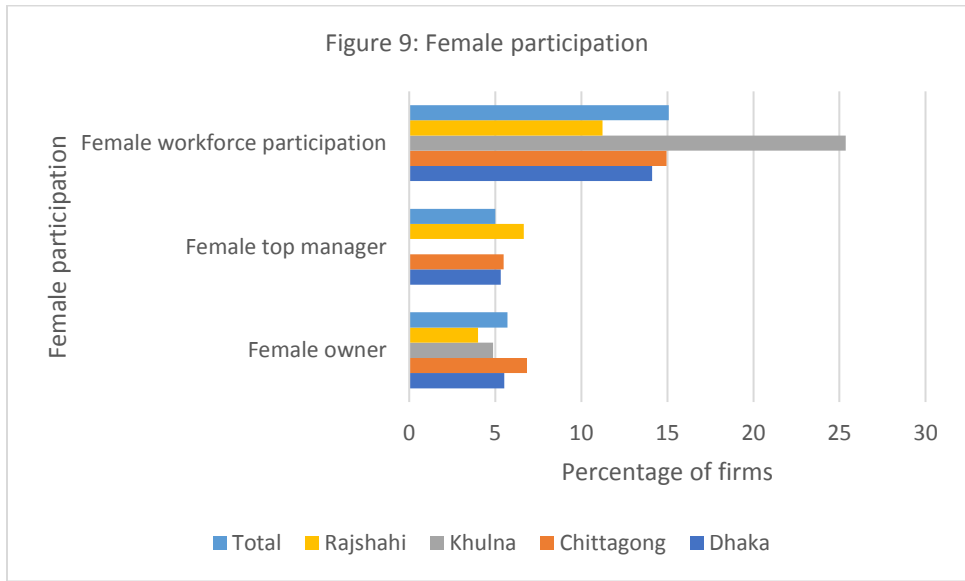


Figure 9 shows female participation at three distinct levels, i.e. percentage of the permanent, full-time workforce (production and non-production) which is female (L1, L5a and L5b from WBES; 2 companies with missings on L5a and L5b were excluded), whether (1) or not (0) the top manager is female (B7a from WBES), and percentage of the firm owned by women (B4 and B4a from WBES; 4 companies with missing for B4a were excluded). Female participation at all three levels is rather low. On average 15% of workforce is female. Figures for ownership and top management are even lower (around 5%).

Khulna shows the highest percentage of female workforce participation, combined with the lowest level (0%) of women in top management positions. A possible explanation could be that the companies interviewed in Khulna belong to industries which traditionally hire women for lower-level position, but not for the managerial positions.

5 Innovation Systems

The ‘Innovation System’ team produced two scientific papers involving data from Bangladesh. The research findings of each paper are discussed and policy implications are reviewed in the paragraphs below. The full working papers including scientific analysis details and associated policy briefs are listed in the project website.

5.1 Innovation, downsizing and labour flexibility

The first scientific paper involving data from Bangladesh within the ‘Innovation Systems’ theme 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 behaviors 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 Labor Flexibility Can Retain Firm Innovativeness in Times of Downsizing’ (2017) by Daniela Ritter-Hayashi, Joris Knobben 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 fourth scientific 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 Knobben.

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.

6 Finance for Productivity Growth

The ‘Finance for Productivity Growth’ team produced two scientific papers with special significance to Bangladesh. The first paper addresses income variability in a field experiment in Vietnam. The second paper analyses informality and access to finance in India, a country comparable to Bangladesh. The research findings of each paper are discussed and policy implications reviewed in the paragraphs below. The associated policy briefs and many others are listed in the project website.

6.1 Income variability – a field experiment

The second scientific paper within the ‘Finance for Productivity Growth’ theme analyses income variability in Vietnam. Small poor entrepreneurs in the developing world are vulnerable to a range of negative shocks and constraints associated with a lack of development. They spend most of their lives coping with frequent income disruptions, balancing expenses, and making difficult trade-off decisions. This is not without implications; some studies suggest that entrepreneurs' preoccupations with pressing budgetary concerns and income variability could leave them with a reduced mental capacity to guide their decision making in business management.

In the framework of a DFID-funded research project entitled ‘Enabling Innovation and Productivity Growth in Low Income Countries (EIP-LIC)’, a team of researchers from Tilburg University explored the issue of income variability in Vietnam and which possibly impedes the cognitive functioning of low-income individuals. The research was conducted through a field experiment inducing thoughts about finances to a sample of small low-income retailers in their local setting. The intervention consisted of asking retailers to think about scenarios describing a financial situation they might encounter in their daily lives.

The experiment was carried out in May 2015, in Tam Bac Market, one of the biggest markets in Hai Phong, in northern Vietnam. The original working paper is entitled ‘The Right Amount of Income Variability: Evidence from Small Retailers in Vietnam’ (2016) by Patricio S. Dalton, Nguyen Nhung and Julius Rüschenpöhler .

Research approach and findings

The results, confirmed in earlier literature, suggest that a lack of financial resources does not necessarily impede cognitive functioning. Cognitive performance in financially stressful situations is not affected by absolute poverty as measured by wealth or income.

Instead, what seems to create cognitive stress is the subjective feeling of poverty together with the variability of income. Cognitive performance in financially stressful situations has an inverted U-shaped relationship with income variability: being exposed to very low or very high income variability can be detrimental for cognitive capacity. There seems to be an optimal income variability which maximises the cognitive capacity of the retailers when they face financially stressful situations, which impede their cognitive functioning.

This points to the existence of an optimal degree of income variability. Retailers who are used to facing some intermediate degree of fluctuation in their revenues reach the highest cognitive performance when they are confronted with financially stressful situations. The effect of income variability on the cognitive function of low-income retailers remains valid even for the poorest retailers.

Policy implications

The research has policy implications to safeguarding the cognitive functioning of people on low incomes. The underlying idea is to avoid their cognitive functioning being unintentionally harmed as a result of financial, fiscal or income generating policies and programmes.

Assuring an optimal amount of income variability to assure maximum cognitive functioning: the effectiveness of policy and programmes that focus on the beneficiaries' lack of financial resources, for instance, could be increased if income variability is also given careful consideration.

In concrete terms, it is preferable for policies and programmes to include an assessment of the optimal (context-specific) income variability. This depends, amongst other factors, on the macro-economic environment and beneficiaries' educational background. Finding, monitoring and assuring the right amount of income variability may substantially increase the effectiveness of a given policy or programme.

Alternatively, in measuring the impact of finance policies and programmes, an indirect indicator of success can be an increase in cognitive capacity in combination with income variability. This equally relates to entrepreneurial activity. Risk taking is central and related to cognitive capacity in terms of understanding and interpreting the economic context. Thus maximum cognitive capacity, risk taking and innovation are all linked to optimal income variability.

Stability and maintaining the status quo of income variability is also an issue to be considered in new policies and programmes. For instance, new fiscal policies can in fact create additional cognitive stress if they bring lower or higher income variability. This is the case if government regulations change often or are unclear, which often happens in LICs, and was signalled in the various cases in the EIP-LIC qualitative studies in Vietnam. Entrepreneurs complained a great deal about unclear and constantly changing government policies and regulations, which brought changes in income variability – “time and again the government regulation is a headache.”

6.2 Informality and Access to Finance

The second scientific paper within the “Finance for Productivity Growth’ theme analyses the interplay between informality and access to finance. The research explored financial sector development in the formal and informal manufacturing sector in India, which is comparable with Vietnam in the sense that both countries have a large informal sector and informal ways of finance. The original working paper is entitled ‘Informality and Access to Finance: Evidence from India’ (2014) by Thorsten Beck and Mohammad Hoseini. This policy brief provides the research approach, main outcomes and policy implications of the paper.

Actually, a large share of private sector activity in LICs takes place in the informal sector, which almost always has negative economic and development consequences. There is among others a large productivity gap between formal and informal firms. The productivity is higher in the formal manufacturing sector due to access to better formal services. However, firms have to pay ‘entry costs’ to overcome the barrier to formality. This barrier includes registration costs, indivisibility of investment and formal property claims, where the latter enables entrepreneurs to use assets as collateral and thus gain access to formal finance. Informality can indirectly hamper firm growth through the lack of provision of public services and infrastructure caused by deficits in the government revenue.

Research approach and outcomes

The informal sector suffers from the lack of access to formal sources of external finance too. One of the important differences between formal and informal enterprises, is that around 44 percent of informal enterprises considers access to financing as the main obstacle of doing business, whereas this number is 21 and 14 percent for small and large formal enterprises. It is not clear, however, whether the lack of access to formal finance discourages entrepreneurs from entering the formal economy, or whether informality prevent them from accessing formal finance.

Better access to financial services is assured through financial sector development, also referred to as financial deepening. This constitutes an increased provision of financial services and institutions with a wider choice of services geared to all levels of society. Beck and co-authors earlier found a positive relationship between financial deepening and economic growth in LICs, a relationship that goes more through productivity growth than capital accumulation.

Other previous research work and theory suggest an impact of financial deepening on pulling more firms into the formal sector as well as increasing total production of the formal sector.

The DFID research of Beck and Hoseini focussed on the effect of financial development on formal and informal manufacturing firms and explores two dimensions of financial development namely outreach (the ease of access to financial services, including credit) and depth (the overall formal credit volume in the economy). The research involves firm-level data between 1989-2010 from different regions in India with different levels of depth and outreach allowing a cross-regional comparison with regard to incidence of informality.

Overall, the empirical findings suggest two positive effects of financial deepening on the incidence of formality in manufacturing: reducing barriers to formality and increasing productivity. The research results show that both depth and outreach are important but in a different way.

Financial outreach - measured in the research as branch penetration - helps to reduce formality barriers and thus increases the number of formal firms. Theory already suggested that one effect of access to finance enables firms to overcome the costs of formality. This is especially the case in industries with a higher demand for external finance. Given the importance of geographic proximity in lending relationships especially of smaller firms, small firms stand to benefit more from financial outreach than large firms. There is no significant effect on productivity for branch penetration.

Financial depth mainly affects informality through increasing productivity of industries dependent on external finance. There is a lesser effect on reduced informality. Thus in conclusion, financial deepening increases the productivity of formal sector and reduces informality.

Summary research outcomes

	Outreach	Depth
Reduced informality	++	+
Productivity	0	++

Policy implications

The working paper of Beck and Hoseini confirms the policy assumption that promoting the informal manufacturing sector to become formal will raise productivity and economic growth. A formal sector, and entrepreneurs choosing to become formal, implies more commitment to the firm's survival and consequently a more stable economic sector. Formality also means tax revenue with government can use for developing public services and institutional stability. A formal economy brings benefits for its workforce too. Formal companies usually have an organised system of employment with written rules and has a standardised relationship between the employer and the employee is maintained through a formal contracts.

The research suggest that government policies towards financial deepening can play an important role in reducing informality, though with important differences across industries. A key insights of this paper is that broadening access through outreach plays will have a more important effect on reducing informality than financial depth. In particular, access to bank account makes the operation of firms at least partly observable and reduces the information asymmetry between firm and formal agency. This particularly the case for smaller firms that face high entry barrier to the formal sector. Decentralisation policies of the banking sectors, establishing easy accessible small branches in the more remote areas, is one way forward. Policy of government, but also the policies and strategies within state or private banks, may focus on the ease of access to financial services, including credit.

In terms of promoting raising productivity, a policy implication is to focus on financial depth; increasing the overall formal credit volume in the economy. The working paper demonstrates that financial depth promotes economic growth in LICs via increased productivity of firms.

The working paper is also informative for policy makers with regard to their expected impact of their policies. Policy makers should not expect that policies aimed at outreach will increase productivity. The same holds true for the development of financial depth, such policies will have a modest effect on reducing informality of enterprises.

In addition, the outcomes of the working paper can be further discussed in the context of the different stages of economic development. In factor-driven economies, where informal labour intensive enterprises compete in terms of factor endowments. These informal enterprises process raw materials and have low productivity, while the urgency for efficiency is not so evident. Then outreach oriented policies seems to be the logical way to promote formality. In the next stage of economic development, efficiency-driven economy, more enterprises are formal while the incomes the skilled labour force have risen. In this stage, price competition by production efficiency and products services quality is critical, so raising productivity becomes important. Policy making within an efficiency-driven economy aiming at raising productivity, developing financial depth is a more effective option than outreach.

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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 **)
4. Osoro, O., S. Kirama, J. Knoben and P.A.M. Vermeulen. 2015. Factors Affecting Engagement and Commercialization of Innovation Activities of Firms in Tanzania. DFID Working Paper
5. Barasa, L. P. Kimuyu, B. Kinyanjui, P. Vermeulen and J. Knoben. 2015 R&D, Foreign Technology and Technical Efficiency in Developing Countries. DFID Working Paper
6. Vannoorenberghe, G. 2015, Exports and innovation in emerging economies, Firm-level evidence from South Africa. DFID Working Paper. Universite Catholique de Louvain and Tilburg University
7. Daniela Ritter-Hayashi, Patrick Vermeulen, Joris Knoben Gender Diversity and Innovation: The Role of Women's Economic Opportunity in Developing Countries DFID Working Paper. Nijmegen: Radboud University
8. Barasa, L., B Kinyanjui, J. Knoben, P. Kimuyu and P. Vermeulen. 2016. Export and Innovation in Sub-Saharan Africa. DFID Working Paper. Nijmegen: Radboud University
9. Bos, M. and G. Vannoorenberghe. 2017 Imported input varieties and product innovation: Evidence from five developing countries
10. Ritter-Hayashi, D., P. Vermeulen and J. Knoben. 2017. Success belongs to the Flexible Firm: How Labor Flexibility Can Retain Firm Innovativeness in Times of Downsizing. Working paper Radboud University
11. Thuy M.T. Phung, P. Vermeulen, J. Knoben and Dat Tho Tran. 2017. Made in Vietnam: The Effects of Internal, Collaborative, and Regional Knowledge Sources of Product Innovation in Vietnamese Firms Working paper Radboud University
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All papers are accessible at the EIP-LIC project website: <https://www.tilburguniversity.edu/dfid-innovation-and-growth/>

Annex 2: EIP-LIC evidence addressing the original DFID research questions

In Annex 2 various aspects of innovation in Bangladesh are further analysed against the original research questions of EIP-LIC. We, the innovation systems research team responsible for Bangladesh, do this through regression analyses. In several of these regressions we used only data from the WBES and IFS surveys. For these analyses we wanted to make use of the fact that these data are available for more than the 300 companies which were interviewed for the ICS. Consequently, in the regression analyse we used data for more companies where this was possible.

We have run several regression analyses to determine the factors affecting several aspects of innovation. The aspects of innovation we look at are: whether or not the company implemented an innovation (sections 7.4 and 7.8), the number of innovations a company implemented (sections 7.3, 7.5 and 7.7), the firm's capability to commercialize its innovation (section 7.2), the innovation activities the company undertook (sections 7.1 and 7.6), and whether the company introduced its main innovation as a response to its competitor's activities (section 7.5). A description of the dependent variables can be found in Appendix D.1.

In the analyses we have included a fixed set of control variables. At the company level these are age, size, foreign ownership, education of the workforce and access to credit. We did not include the location of the company, i.e. whether a company is located in an urban or rural area, as was done in the analyses for other countries. Of the 300 Bangladeshi companies for which ICS-data are available, 233 companies are located in a city of more than 1 million, 43 companies in a city of 250,000 to 1 million, 20 in a city of 50,000 to 250,000 and only 4 companies in a city with less than 50,000 inhabitants. For the 990 companies for which WBES and IFS data are available these numbers are 743, 176, 59 and 12, and for the 1440 companies for which WBES data are available these numbers are 1035, 268, 102 and 37.

At the province-level, we included two variables. The first measures institutional quality, which is similar to political trust, as is explained in the country report on Kenya. This is the average score for companies in a province on a composite of eight questions related to perceived institutional quality. The second variables measures knowledge creation, which is the percentage of firms in the province which conducts internal R&D.

Depending on the research question at hand, we have also included additional variables, which will be discussed in the following sections. More information on the independent variables (control variables and additional variables) can be found in Appendix D.2.

Appendices D.1 and D.2 also include information about which survey the dependent and independent variables come from. WBES-data are available for 1440 companies, IFS-data for 990 of these, and ICS-data for 300 of these. In the analyses in which we only included variables based on WBES and IFS-information, we used information for 990 companies. In the analyses in which we also used ICS-information, we only used information for 300 companies.

Firm characteristics and innovation activities

In this section we address the following research question: 'Which firm-level and province-level factors hinder or foster the engagement of firms in innovative activities?'. We distinguish four sorts of innovation activities: 1) Internal R&D, 2) External R&D, 3) Formal training to employees for the development of innovations, 4) New equipment to develop or produce any innovations. Companies with missings on the dependent variables were excluded from the analyses (for external R&D and formal training each one company, and three companies with missings on new equipment).

Larger companies are more likely to engage in innovative activities, independent of the sort of activity (Table 12). Foreign ownership is significantly positive related to external R&D, and negatively related to buying new equipment. It might be that these foreign parties have easier access to external R&D. It could also be the case that foreign parties have more trust in external R&D than in the other forms of innovative activities, making it more likely they'll invest in this. Interestingly, foreign ownership is negatively linked to buying new equipment. A possible explanation is that new equipment was bought and provided to the establishment by the foreign owners, not by the establishment itself.

Companies which have a higher educated workforce are more likely to engage in R&D (internal or external) and to provide formal training to their employees. The positive significant coefficients for internal and external R&D might imply that higher educated employees are better able to conduct this form of innovative activities or that higher educated employees get more time and means to develop these forms of innovative activity. The positive significant coefficient for formal training might indicate that companies are more willing to invest in training of employees who are better educated. A higher educated workforce is negatively linked to buying new equipment, possibly indicating that companies with this kind of workforce develop and build their own equipment, or are more likely to conduct innovations for which no new equipment is necessary.

Companies with access to credit are more likely to engage in internal R&D, but less likely to engage in external R&D. Since access to credit is measured as whether or not has credit or a loan from a financial institution, it could be that companies which engage in external R&D simply do not need this kind of finance, and predominantly rely on internal finance.

Table 12: Logistic multilevel regression coefficients of firm characteristics on innovative activities												
<i>Firm-level factors</i>	Internal R&D			External R&D			Formal training			New equipment		
	Coef	SE	Sign	Coef	SE	Sign	Coef	SE	Sign	Coef	SE	Sign
Age (ln)	0.022	0.093		0.012	0.055		-0.037	0.049		0.131	0.124	
Size (ln)	0.429	0.091	***	0.358	0.046	***	0.500	0.131	***	0.251	0.087	***
Foreign ownership (%)	-0.006	0.005		0.018	0.008	**	0.001	0.001		-0.010	0.004	**
Education (% ft workers with sec ed)	0.015	0.005	***	0.005	0.002	**	0.009	0.002	***	-0.008	0.004	*
Access to credit	0.232	0.096	**	-0.250	0.114	**	0.125	0.129		0.170	0.179	
<i>Province-level factors</i>												
Knowledge creation	5.277	0.472	***	-6.434	0.628	***	4.265	0.475	***	-0.323	0.254	
Institutional quality/political trust	0.049	0.130		-1.168	0.132	***	-0.164	0.221		-0.073	0.090	
Constant	-4.832	0.396	***	-0.894	0.291	***	-3.606	0.381	***	0.409	0.521	
N	990			989			989			987		
*p<0.10, **p<0.05, ***p<0.01												

In provinces with a higher level of knowledge creation, companies are more likely to invest in internal R&D and formal training, but less likely to invest in external R&D. here institutional quality is perceived to be of lower quality (higher value), companies are less likely to conduct internal R&D or formal training.

In provinces where institutional quality is perceived to be of lower quality (higher value), companies are less likely to conduct external R&D.

Commercialization of innovation output

In this section we look at 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?”. To determine a firm’s ability to commercialize its innovative products and services we constructed two dependent

variables. The first one, firm capability to commercialize, is similar to the one constructed in Section 3 for Figure 8 and which was also used in the country report on Kenya in the regression similar to the one done here. Sixteen companies with missing values on this variable are excluded from the analysis.

The second one, percentage of sales from innovative product/service, is measured with a variable which indicates the percentage of the establishment's total sales represented by sales from all its innovative products and services. Companies which did not introduce any innovative product or service during that period, were given value 0. Five companies with missings on this variable were excluded from the analysis.

Table 13: Multilevel regression coefficients of firm characteristics on commercialization of innovative activities						
	Firm capability to commercialize			Perc. of sales from innovative product/service		
	Coef	SE	Sign	Coef	SE	Sign
<i>Firm-level factors</i>						
Age (ln)	-0.039	0.099		-3.286	1.684	*
Size (ln)	0.083	0.044	*	0.069	0.751	
Foreign ownership (%)	0.000	0.004		0.060	0.100	
Education (% ft workers with sec ed)	-0.001	0.003		-0.108	0.047	**
Access to credit	-0.053	0.136		-7.864	2.436	***
<i>Province-level factors</i>						
Knowledge creation	-0.042	3.812		25.303	21.198	
Institutional quality/political trust	-0.395	0.976		-1.440	6.993	
Intercept	5.347	2.047	***	45.862	15.710	***
N	284			985		
*p<0.10, **p<0.05, ***p<0.01						

The results in Table 13 make clear that larger companies consider themselves better able to commercialize their innovations. However, as the results in the right side of the table show, this is not reflected in a significantly higher percentage of sales from innovative products or services for these companies. Instead, it is younger firms, who do not think of themselves as significantly more capable of commercializing their innovations, who are better at doing so.

Access to credit is associated with a smaller part of sales coming from innovations. Similar to what was found in the previous subsection, since access to credit is measured as whether or not the establishment has credit or a loan from a financial institution, it could be that companies for who sales are to a larger degree made up of innovations, simply do not need this kind of finance.

Interestingly, for companies with a higher educated workforce a smaller share of sales comes from innovations. Apparently, although a higher educated workforce is associated with a higher level of R&D and formal training, this does not have to lead to a larger share in sales from innovations.

Commercialization does not seem to be significantly influenced by context characteristics as knowledge creation and institutional quality.

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?”.

Table 14: Multilevel regression coefficients of firm characteristics and source of collaborative activities on number of innovations			
	Coef	SE	
<i>Firm-level factors</i>			
Age (ln)	-0.414	1.154	
Size (ln)	0.112	0.495	
Foreign ownership (%)	0.049	0.064	
Education (% ft workers with sec ed)	0.090	0.031	***
Access to credit	-0.652	1.621	
<i>Province-level factors</i>			
Knowledge creation	-35.251	14.360	**
Institutional quality/political trust	3.703	4.619	
<i>Collaboration (Ref. external technology)</i>			
In-house activities	2.245	2.517	
Collaboration	0.782	3.788	
Intercept	8.995	10.665	
N	627		
*p<0.10, **p<0.05, ***p<0.01			

Companies which did not introduce any innovations were excluded from the analysis (362 cases). If we would have kept these companies in the analysis, these companies would have been the reference category for the three dummies (in-house innovation activities, collaborative innovation activities and technology acquisition). Such an analysis would not have been very informative since we want to compare the effect of these activities on innovative performance.

Three companies with an exceptional high number of innovations (one with value 495 and two with value 999) were given the fourth highest value (160). One company with missing value was excluded from the analysis. Two companies that introduced innovations, but for whom the source was not given, were included in the largest category, i.e. in-house.

The results in Table 14 make clear that companies with a higher educated workforce and that are located in provinces with lower levels of knowledge creation, are more likely to have introduced more innovative products and services. The source of the innovative activities, whether this is in-house activities, collaboration with external partners or development exclusively through external partners is not associated with significantly more innovations.

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?”. Dependent variable is whether (1) or not (0) the establishment introduced any innovative product or service.

Table 15: Logistic multilevel regression coefficients of firm characteristics and cooperative relations on innovative performance (did est introduce new innovative product or service)			
	Coef	SE	Sign
<i>Firm-level factors</i>			
Age (ln)	-0.193	0.183	
Size (ln)	0.042	0.015	***
Foreign ownership (%)	0.005	0.006	
Education (% ft workers with sec ed)	0.000	0.004	
Access to credit	-0.427	0.040	***
<i>Province-level factors</i>			
Knowledge creation	-1.669	0.495	***
Institutional quality/political trust	-0.204	0.133	
<i>Cooperative relations</i>			
Customers	-0.062	0.088	
Suppliers	-0.119	0.354	
<i>Cooperation for innovation</i>			
Firms	-0.535	0.140	***
Private consulting companies/individuals	-0.875	0.755	
Constant	2.006	0.250	***
N	990		
*p<0.10, **p<0.05, ***p<0.01			

Main independent variables included in the analysis are cooperative relations with customers or suppliers, and cooperation for innovation with firms or private consulting companies. Companies mentioning universities and research institutes as most important source for innovation were not included as separate category as was done for other countries, since this was only mentioned by three companies. Other possible categories for this variable are: in-house R&D (87 companies), recent hires from other firms (29), business associations and conferences/exhibits (59), professional journals and trade publications (11), products or services available in the market (170), internet (14). Together these companies form the reference category. Eight companies with missings on this variable were included in this reference category.

As can be seen in Table 15 larger firms are more likely to have introduced an innovation, while companies with access to credit are significantly less likely to have introduced an innovation. The negative coefficient for this variable was also found in the second analysis in Table 13 with the percentage of sales from innovations as dependent variable. It seems that, at least in Bangladesh, access to credit is not a necessary precondition for

(successful) innovations. Companies from districts with a higher level of knowledge creation (higher average percentage of firms conducting internal R&D) are less likely to have introduced an innovation.

Companies for which suppliers or customers are the main source of innovation are not significant more likely to have introduced an innovation than companies from the reference category (i.e. companies for which the main source of innovation is in-house R&D, recent hires from other firms, business associations and conferences, professional journals and trade publications, products or services available in the market, internet or universities/research institutes). Firms for which the main source of innovation are other firms, are less likely to have introduced an innovation than companies from this reference category.

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?”. Dependent variables are the number of innovations (measured as was described in section 6.3), and technology diffusion, which is measured as whether (1) or not (0) the establishment introduced its main innovative product to offer products or service already offered by competitors. Companies which did not introduce an innovation were included in the ‘not’-category, two companies with missings on the variable were excluded from the analysis.

Results in Table 16 make clear that barriers are not significantly associated with the number of innovations introduced. Only age is significantly positive related to the number of innovations.

With respect to technology diffusion, we find that companies are less likely to have introduced an (or its main) innovation in order to be able to offer products or services already offered by competitors, when they consider 1) lack of funds within the enterprise or 2) high cost of innovation to be a bigger barrier. Companies with scarce internal funds, might save these funds for completely new innovations, or might not innovate at all. This might also be the case when innovation is considered to be too costly.

Companies are more likely to have introduced its main innovation in order to be able to offer products or services already offered by competitors when they consider 1) lack of external finance, or 2) no need due to prior innovations to be a bigger barrier to innovation. Lack of external finance might mean companies do not want to take too much financial risks in producing a new innovation and instead are more likely to copy an already proven innovation. Companies that do not feel the need to come with new innovations because they rely on previous innovations, might still introduce innovations when they can simply copy them.

Table 16 Multilevel and logistic multilevel regression coefficients of firm characteristics and barriers on innovative performance (number of innovations) and technology diffusion						
	Innovative performance			Technology diffusion		
<i>Firm-level factors</i>	Coef	SE	Sign	Coef	SE	Sign
Age (ln)	2.360	1.104	**	-0.133	0.216	
Size (ln)	0.109	0.489		-0.005	0.049	
Foreign ownership (%)	-0.007	0.050		-0.015	0.003	***
Education (% ft workers with sec ed)	-0.008	0.035		0.001	0.006	
Access to credit	-1.267	1.543		-0.588	0.237	**
<i>Province-level factors</i>						
Knowledge creation	-10.081	13.608		1.854	1.001	*
Institutional quality/political trust	3.257	4.458		0.373	0.230	
<i>Barriers to innovation</i>						
Lack of funds within enterprise	-0.264	1.374		-0.179	0.061	***
Lack of external financing	1.435	1.375		0.337	0.110	***
High costs of innovation	0.311	1.500		-0.345	0.200	*
Lack of qualified personnel	0.033	1.374		0.273	0.219	
Lack of information technology	0.197	1.425		-0.207	0.296	
Lack of information markets	0.242	1.354		0.391	0.263	
Difficulty finding cooperating partners	1.228	1.288		-0.254	0.406	
Market dominated by established firms	-0.860	1.316		0.126	0.132	
Uncertain demand for innovative products	0.550	1.203		-0.217	0.145	
No need due to prior innovation	-0.445	1.228		0.300	0.074	***
Intercept/Constant	-6.941	11.451		-0.676	0.725	
N	299			300		
*p<0.10, **p<0.05, ***p<0.01						

Linkages with external agents and innovation

In this section we address the following research question: “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/propagating innovation in LICs? What is the role of the private sector?”. As in section 7.1 we distinguish four sorts of innovation activities: 1) Internal R&D, 2) External R&D, 3) Formal training, and 4) Purchasing new equipment. Information about missings on these variables can be found in section 7.1.

Given the low number for developing the main innovation in cooperation with academic, research institutions, consultants and government, we only included the variable measuring whether the main innovation was developed in cooperation with a domestic or foreign firm in the analysis.

Table 17: Logistic multilevel coefficients of firm characteristics and linkages on innovative activities												
	Internal R&D			External R&D			Formal training			New equipment		
<i>Firm-level factors</i>	Coef	SE	Sign	Coef	SE	Sign	Coef	SE	Sign	Coef	SE	Sign
Age (ln)	0.022	0.094		0.012	0.056		-0.035	0.047		0.128	0.123	
Size (ln)	0.433	0.083	***	0.355	0.048	***	0.494	0.130	***	0.258	0.080	***
Foreign ownership (%)	-0.006	0.005		0.018	0.008	**	0.000	0.001		-0.010	0.005	**
Education (% ft workers with sec ed)	0.015	0.005	***	0.005	0.002	***	0.010	0.002	***	-0.008	0.004	*
Access to credit	0.232	0.095	**	-0.245	0.109	**	0.129	0.124		0.165	0.181	
<i>Province-level factors</i>												
Knowledge creation	5.371	0.366	***	-6.705	0.383	***	4.096	0.565	***	-0.192	0.361	
Institutional quality/political trust	0.054	0.132		-1.180	0.123	***	-0.163	0.216		-0.082	0.094	
<i>Linkages (Was main innovative product/service developed in cooperation with:)</i>												
Other firm	-0,232	0,463		0,474	0,734		0,624	0,546		-0,460	0,308	
Constant	-4,866	0,351	***	-0,828	0,310	***	-3,573	0,390	***	0,397	0,495	
N	990			989			989			987		
*p<0.10, **p<0.05, ***p<0.01												

As can be seen in Table 17, linkages apparently do not have a significant effect on any of the four innovative activities. The explanation could very well be that the reference category includes a rather diverse group of companies, i.e. companies that did not engage in innovation, companies that developed the innovation completely in-house, and companies that entirely relied on external companies for their innovation.

What can be further seen in Table 17 is that the results for the control variables are identical to the ones found in Table 12. Larger companies are more likely to engage in innovative activities, independent of the sort of activity. Foreign ownership is significantly positive related to external R&D, and negatively related to buying new equipment. Companies which have a higher educated workforce are more likely to engage in R&D (internal or external) and to provide formal training to their employees, and less likely to buying new equipment. Companies with access to credit are more likely to engage in internal R&D, but less likely to engage in external R&D. Also, in provinces with a higher level of knowledge creation (i.e. a higher percentage of companies which conduct internal R&D), companies are more likely to invest in internal R&D and formal training, but less likely to invest in external R&D. In provinces where institutional quality is perceived to be of lower quality (higher value), companies are less likely to conduct external R&D.

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?”. To answer this question, we look at the effect of government support for innovative activities on innovative performance. As in Section 7.3, innovative performance is measured as the number of innovative products or services the company introduced.

Of the 990 companies which were included for the IFS-questionnaire, 361 were asked whether they received government support (financial or nonfinancial). For Bangladesh there are no companies which funded its innovation activities through government agencies or departments. We therefore only included a variable indicating whether the establishment received any non-financial support from the government for innovation

related activities. Of the 361 companies which answered the question, 338 did not, 19 did and 4 did not know. We only included the 357 companies which gave a valid answer on the question. We also excluded one company with missing value on our dependent variable.

Table 18: Multilevel regression coefficients of firm characteristics and non financial government support on number of innovations			
	Coef	SE	
<i>Firm-level factors</i>			
Age (ln)	-1.677	1.314	
Size (ln)	-0.616	0.604	
Foreign ownership (%)	0.280	0.121	**
Education (% ft workers with sec ed)	0.155	0.032	***
Access to credit	3.411	2.040	*
<i>Province-level factors</i>			
Knowledge creation	-48.917	17.844	***
Institutional quality/political trust	-8.395	6.227	
<i>Government support</i>			
Non-financial	-0.767	4.353	
Intercept	31.665	13.755	**
N	356		
*p<0.10, **p<0.05, ***p<0.01			

The results in Table 18 show that governmental support is not related to the number of innovations companies introduced. Companies with a higher percentage of foreign ownership, a higher educated workforce and access to credit are more likely to have introduced more innovations.

Gender 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?”. Innovative performance is a dummy. Two companies with missings on this variable are excluded from the analysis.

To check for the effect of female involvement, we include three variables. The percentage of the full time permanent workers which is female, whether (1) or not (0) the top manager is a woman, and the percentage of the firm owned by women.

Table 19: Logistic multilevel regression coefficients of firm characteristics and female participation on innovative performance			
	Coef	SE	Sign
<i>Firm-level factors</i>			
Age (ln)	-0.143	0.220	
Size (ln)	0.075	0.033	**
Foreign ownership (%)	0.003	0.008	
Education (% ft workers with sec ed)	-0.001	0.007	
Access to credit	-0.412	0.056	***
<i>Province-level factors</i>			
Knowledge creation	-0.801	0.211	***
Institutional quality/political trust	0.062	0.105	
<i>Female participation</i>			
Gender diversity ownership	-0.011	0.005	**
Gender top manager	0.536	0.311	*
Gender diversity workforce	0.000	0.000	*
Constant	1.006	0.425	**
N	843		
*p<0.10, **p<0.05, ***p<0.01			

As can be seen in Table 19, companies with a higher female diversity of the workforce companies which have a female top manager are significantly more likely to have introduced an innovation. A likely explanation might be that it is quite difficult for women to be hired as top manager. To achieve such a position as a woman, you have to have certain characteristics, such as determination, motivation, etc., which also have a positive effect on willingness and ability to pursue innovative activities. Interestingly, a higher ownership by women is negatively linked to innovative performance. A possible explanation might be that companies where women own a positive percentage tend to be older, established firms, where women have inherited their ownership from their fathers or husbands who were the main drivers behind the initial growth of the company. The fact that companies where women own a positive percentage are on average older than companies where women don't own a share, might point to this fact. This is especially the case for companies where women own a positive share and a man is the top manager.

The analysis further shows that large companies are more likely to have introduced an innovation. Companies with access to credit, and companies from provinces with a higher level of knowledge creation are less likely to have introduced an innovation.

Conclusions

In this country report for Bangladesh analyse are analysed data from 300 Bangladeshi companies which were interviewed for the Innovation Capabilities Survey (ICS). This survey was conducted as part of the DFID-project. These 300 companies were selected from a group of 990 companies which were also interviewed for the Innovation Follow-up Survey (IFS) in 2013 and 2014. These companies in its turn, belong to a group of 1442 companies which were interviewed in 2013 for the Enterprise Survey (WBES) from the World Bank. Most (188) of the 300 companies are located in Dhaka, followed by Chittagong (73), Khulna (24) and Rajshahi (15). The

majority of the companies is small or medium sized. Half have 39 or fewer full-time employees and only 25% have 198 employees or more.

Most of the companies do not export, neither directly, nor indirectly, and two-third of companies use domestic inputs. For the companies that do export, an important share of their sales stems from this, 87.5% for companies that export indirectly and 91% of sales for companies that export directly. For the companies that export, Western countries are important trade partners. Of the 70 companies that export directly or directly and indirectly, 58 do so to countries in Europe, the USA and Canada. This is a much higher number than the 11 which export to neighbour India or the 8 which export to other South Asian countries.

Of the 300 companies most (154) introduced both a product and process innovation. Of the remaining companies 102 only introduced a process innovation, 37 only a product innovation and 7 neither sort of innovation. The introduced product and process innovations are mainly new to the local market (42.9% of product innovations and 23.1% of process innovation, compared to resp. 16.2% and 10.9% which were new to the international market, and resp. 4.2% and 4.3% which were new to the international market). The fact that innovations in Bangladesh tend to be new to the local market might mean that innovations are mostly incremental rather than radical in nature.

Four sorts of activities affecting innovation were distinguished, i.e. internal and external R&D, providing formal training, and buying new equipment. In Bangladesh this latter activities is by far the most important, with 82% of the 300 companies having done so. This is followed by providing formal training (37%), internal R&D (27%) and external R&D (9%). The importance of buying new equipment as innovative activity might be related to the finding that most innovations in Bangladesh seem to be incremental. To implement incremental innovation buying new equipment might suffice, or in order to implement more radical innovations companies might have to conduct R&D and provide training to their staff.

Sources of information for innovation tend to be close to the company, i.e. customer feedback, products and services already available in the market and knowledge from a parent or another firm. More distant sources of information, such as government, universities and research institutes are hardly mentioned by Bangladeshi companies, and if so, only by large companies. This again might be related to the less radical nature of innovations. Although customer feedback is mentioned as most important source of information for innovation, companies who rely on this sort of information are not significantly more likely to have introduced an innovation. The same is true for companies for which suppliers are the most important source of information. These companies are also not significantly more likely to have introduced an innovation.

Lack of funding seems to be the least important barrier to innovation for Bangladeshi companies. Regression analyses show that companies with access to a loan or credit from a financial institution are significantly more likely to have conducted internal R&D, but significantly less likely to have conducted external R&D. A possible explanation might be that companies that engage in external R&D do not need loans or credit from financial institutions and predominantly rely on their own finances. Companies with access to a loan or credit from a financial institution, are less likely to have introduced an innovation. Also, for these companies, a significantly smaller part of sales comes from innovation. This might indicate that more innovative companies do not need external finance. In this respect the finding that lack of internal and external funding is least often mentioned as barrier to innovation is interesting. Companies with access to a loan or credit from a financial institution are less likely to have introduced its main innovative product to offer products or services already offered by competitors.

The fact that buying new equipment is the most important of the four innovative activities, is reflected in companies' dynamic capabilities. On a scale from 0 (completely disagree) to 6 (completely agree), companies think of themselves as being best at acquiring knowledge (4.78). Better than at transforming or recombining

knowledge (4.58), commercializing knowledge (3.86) or identifying and selecting sources of knowledge (3.77). With respect to this last capability, it is especially noteworthy that Bangladeshi companies consider themselves as having very limited contacts with researchers and universities.

Bangladeshi companies on average rate their relations with external actors as rather high (5.44 on scale of 0 to 6, equivalent to 9.06 on a scale from 0-10). They have a higher level of trust in their partners than in politics. When we convert the scores to a scale of 0 to 10 these are respectively 8.6 and 6.2.

Most Bangladeshi companies develop their innovations in-house. Cooperation with another company (domestic or foreign, including a foreign parent firm) to develop innovations is not very common (only 44 of 990 companies interviewed for the IFS-questionnaire) and is not significantly related to R&D, formal training or buying new equipment. Also government support for innovation is not very common in Bangladesh. No companies funded their innovative activities with financial government support, and 19 received non-financial government support (out of 361 companies which answered questions about this). This was not significantly related to the number of innovations a company introduced.

We distinguish three levels of gender diversity: the percentage of permanent, full-time workforce which is female, the percentage of companies with a female top manager, and the percentage of female-owned firms. Female participation is rather low at all these three levels. Companies with a female top manager are significantly more likely to introduce an innovation. Since it is rather difficult for women to be hired as top manager, the women who manage to achieve such a position might possess specific qualities which make them also better suited as developers of innovations. A higher percentage of female ownership of the company is negatively linked to innovation. A possible explanation might be that these women have inherited their share from their fathers or husbands, who were the main drivers behind the innovation in the firm, but who are no longer there.

A company's age is not significantly related to most aspects of innovation. Older companies tend to introduce more innovations, but this does not mean these companies are better at commercializing their innovations. And, although age does not seem to be significantly related to a company's perception of being able to commercialize its' innovations, in fact younger companies seem to be better at this.

With respect to size, we find that larger companies are more likely to engage in innovative activities such as R&D, formal training and buying new equipment, and are more likely to have introduced an innovation. However, size is not significantly linked to the number of innovations introduced. Although large companies think of themselves as being better suited to commercialize on innovations, this is not confirmed by actual figures.

Companies with a higher educated workforce are more likely to engage in R&D. Higher educated employees might be better able to conduct R&D or might get more time and means to invest in this. The fact that companies with higher educated employees invest more in formal training might indicate that companies are more willing to trust and invest in the capabilities of higher educated employees. The finding that a higher educated workforce is negatively linked to buying new equipment, possibly indicates that companies with this kind of workforce develop and build their own equipment, or are more likely to conduct innovations for which no new equipment is necessary. The finding that a higher educated workforce is linked to a higher number of innovations might prove that these companies are right in putting more trust in higher educated employees' ability to develop innovations, although these innovations do not have to lead to higher sales figures.

Foreign ownership is significantly positive related to external R&D and negatively related to buying new equipment. Foreign parties might have easier access to external R&D or might have more trust in conducting R&D externally, making it more likely they'll invest in this. The negative link between foreign ownership and

buying new equipment, might be explained by the foreign owners buying and providing the new equipment, not the establishment itself. Companies which are foreign owned are less likely to have introduced its main innovative product to offer products or services already offered by competitors and are more likely to have introduced a higher number of innovations.

Companies in provinces with higher levels of investment in internal R&D (higher level of knowledge creation), invest more in internal R&D and formal training, and less in external R&D, are less likely to have introduced an innovation and create fewer innovations. Companies in provinces where institutional quality is perceived to be of lower quality, are less likely to invest in external R&D.

Notes:

1. For the analyses using WBES and IFS data, 2 companies had missings on this variable. These were given the value 21.58. For the analyses using WBES, IFS and ICS data no companies had missings on this variable.
2. For the analyses using WBES, IFS and ICS data, 4 companies had missings on this variable. These were given the value 17.76. For the analyses using WBES and IFS data 11 companies had missings on this variable. These were given the value 20.93. For the analysis using only WBES data, 17 companies had missings on this variable. These were given the value 19.90.
3. For the analyses using WBES, IFS and ICS data, 4 companies had missings on this variable. For the analyses using WBES and IFS data 15 companies had missings on this variable.