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

Country Report Vietnam

September 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 present report present the findings of the research activities in Vietnam. The research output on Vietnam was amongst others the result of a fruitful cooperation with the National Economics University (NEU) in Hanoi. In particular Prof. Dr. Trần Thọ Đạt and Dr. Đào Thanh Tùng were very supportive and constructive in our collaboration. Also a special thanks to PhD candidate Phùng Minh Thu Thủy (MBA) for her special effort in addressing DFID's research questions and to former Tilburg University student, Nguyen Nhung, for her field work in the experiment ran in a local market in Hai Phong.

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.

Prof. Lex Meijdam (Dean Tilburg University)

[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
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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 'Vietnam Country Report' presents an overview of the scientific output and policy implications relating to Vietnam as a (lower) middle income country. Since the number of studies and papers is different for each country of study, the report include some additional studies of other countries as well because they contain relevant and useful insights for Vietnam. In short, the scientific output comprises a qualitative research report, four papers within the 'Innovation Systems' theme, and three papers within the 'Finance and Productivity Growth' theme.

In Annex 1, a comprehensive list of all research working papers written in the framework of EIP-LIC is presented. The key DFID/World Bank survey findings for Vietnam are presented in Annex 2 and the research addressing the original DFID questions is presented in Annex 3.

Qualitative research

The qualitative report is based on data collected through open semi-structured interviews with owners and managers of SMEs in Vietnam 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 Vietnam, as perceived by manufacturing SME owners and managers. Specifically, the case descriptions illustrate the different ways in which companies in Vietnam introduce new products, processes, technology, or machinery.

The set of Vietnamese cases explored fits best in the economic stage classification of an *efficiency-driven* economy. The companies interviewed in Vietnam are competing less on factor endowments, unskilled labour and natural resources, as many African countries do. The cases in the latter countries are more involved in trade (export) and processing of basic products based on their factor endowments. These activities are labour intensive, requiring unskilled low-cost labour and low productivity.

Compared to the earlier qualitative explorations in other countries in the framework of EIP-LIC, the owners of the companies in Vietnam seem much more 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 have introduced management and organisation innovations, whereas product and process innovations are less important. The new products and processes in the innovative companies are not radical and not 'new to the world'. 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.

Innovation systems

The scientific papers within the 'Innovation Systems' in Vietnam were based on data from two main sources: (1) the World Bank Enterprise Survey (ES) conducted between November 2014 and April 2016 and (2) the Innovation Capabilities Survey (ICS) conducted from October 2016 to February 2017. The first scientific paper investigated the impact of different knowledge sources relating to product innovation in Vietnam, using small firm-level data. Specifically, the team analysed the separate impacts of (i) internal knowledge, (ii) collaborative knowledge, and (iii) regional knowledge. The research finds that some knowledge sources are more strongly associated with innovation than others. Knowledge sources from internal R&D have a positive influence on product innovation. The stronger a firm's collaborative knowledge gained from inside the supply chain, the higher the likelihood of product innovation (it might be specific to developing countries that firms need to create a network with customers, suppliers and competitors to enhance product innovation). However, there is no significant relationship between collaboration with universities or research institutes and innovation. Policies and programmes could raise awareness of and facilitate management training and education encouraging the institutionalising of explicit R&D capacity in a company. Moreover, it is important to differentiate between the level of technology required by large technologically advanced enterprises and their smaller counterparts that mostly adopt or adapt existing technology. Innovation is fundamentally the task of the private sector and entrepreneurs, and occurs through business horizontal and vertical linkages, spill-over and actors' networks involving subcontracting, interactive learning within supplier and buyer value chains and foreign direct investment

The second scientific paper within the 'Innovation Systems' theme concerns a study on innovation and export in South Africa. As a middle income country, South Africa shares many similarities with Vietnam in terms of innovation challenges, export characteristics and both countries are efficiency-driven economies rather than factor-driven economies. The study analysed the firm-level relationships between product and process innovation on the one hand and export on the other. Specifically, the research focused whether exporting raises

the probability that firms innovate in the context of an emerging economy. The study finds that The research finds that exporting firms are significantly more introducing product innovation in the South African context; product innovation is positively associated with the export status of firms. The link between exports and process innovation is much weaker or absent all together. This is broadly in line with previous research and could suggest that the product characteristics are a more crucial for foreign markets than the cost dimension. Although there is a significant relationship between exports and product innovation, the question remains whether innovation stimulates firms to export, or whether it is the other way around. This 'causality' issue was difficult to isolate in the research, partly because both activities are interconnected and mutually influencing each other. Regardless the absence of a strong causality, innovation and export do mutually strengthen each other within a firm. A more pragmatic policy approach is including an innovation dimension in export policies, and including export dimension in innovation policies. In fact for a policy the end result that counts is that both innovation and export increase.

The third scientific paper within the 'Innovation Systems' theme addresses the economic impact of trade liberalisation policies on productivity of firms. The research analysed firm-level data of the manufacturing sector in India, a country with similarities to Vietnam in terms of economic growth, human capital and growth ambitions of the government. The research determines whether the Indian economy benefitted from trade liberalisation not only through the direct effect on firms most exposed to international trade, but also through additional spillovers from the firms directly affected to other firms in the economy. The study confirms the presence of a direct effect of input and output tariffs on firm-level TFP. The research finds no evidence in favour of TFP spillovers between Indian firms. For policy, it is key to quantifying the total gains from trade liberalisation policies. When there are both direct and indirect effects, leaving out the indirect effects may lead to overestimation (if the indirect effects are positive) or underestimation (if the indirect effects are negative) of the total gain from the innovation policy. For example, a common strategy for identifying the total effect of a trade liberalisation policy on productivity is to compare those firms affected by the policy to those firms not affected. The difference is then reported as the total effect. If the latter group is indirectly affected, however, the measured difference is actually the total effect minus the indirect effect, thus only the direct effect Second, the strength of diffusion matters for the distributive consequences of a policy, the more so if the firms directly benefiting (e.g. the importers) systematically differ from other firms ex-ante. A policy with only a direct effect would then benefit one group, whereas if the spillovers affect the productivity of another group, the benefits from the policy would be distributed more fairly.

The fourth paper 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 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. 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.

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 India, which is comparable with Vietnam in the sense that both countries have an 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. There is a lesser effect on reduced informality.

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.The third scientific paper within the 'Finance for Productivity' theme that is relevant for Vietnam addresses finance and the demand for skill while referring to economic growth in emerging economies. The paper investigates the role of financial constraints in firms' skilled labour demand. pecifically, using a small business survey from Uganda, the research explored whether skilled job creation rises with access to external finance. The research shows that that the extent to which micro and small businesses expand skilled employment, as their sales and profits increase, depends significantly on access to external funding. Growing and profitable small businesses create more jobs for trained and experienced workers - which is interpreted as demand for skill - if they have access to external finance. The analysis does not reveal a significant relationship in the case of hiring casual employees or family and friends in the informal context, suggesting that financing constraints are more likely to bind in the context of employment contracts associated with experienced and trained employees with high human capital intensity.

The research findings underline the importance of well-developed financial systems for policies focusing on job creation. Firms with greater financial flexibility are more likely to hire skilled labour once their performance improves. For policy makers focusing on the challenge of creating formal and permanent jobs in a developing society, devising a complementary financial sector policy is equally important. The policy should go beyond helping firms directly to strengthening efficient financial systems and credit programmes as well. Better access to external funding can thus be an accelerator of human capital investment demand and growth. Policy makers must also acknowledge that firms who are financially constrained save a greater proportion of their additional profits (or pay other expenses associated with financial constraints) and therefore cannot invest further in greater levels of employment; if access to finance is difficult, one could question the optimal effectiveness of employment creation policies.

Highlights of DFID/World Bank EIP-LIC survey Vietnam

The innovation systems theme includes an analysis of the main descriptive statistics of the project survey conducted in Vietnam in collaboration with the World Bank. The variables such as turnover, number of fulltime employees, productivity, gender diversity of firms are categorized by four regions including the Red River Delta, North Central area and Central coastal area, South East and Mekong River Delta. Other information related to export status and import of materials are also provided and compared with regions across the globe. It indicates that firms in Vietnam used mostly domestic inputs (70.6%) that might help them to minimize the production cost. Moreover, firms in Vietnam have total direct exports of 11.6% which is almost double the average rate of the world regions. In addition, information on innovation in Vietnam is also reported in the subsequent parts of the report, such as product innovation, process innovation, sources of the information for innovation and barriers to innovation. Firms in Vietnam reported a higher degree of innovation compared to EU countries.

A possible reason for this striking result might be due to the self-reported measure of innovation; firms may focus on incremental not radical forms of innovation. Moreover, firms in Vietnam are likely to invest in equipment and formal training rather than R&D. The most important sources of innovation are feedback from customers and the internet. On the other hand, the most critical barriers are lack of funds within the firm and qualified personnel. Dynamic capabilities and trust are also reported with positive results. The trust index is above average, which might imply that Vietnam has a friendly business environment where firms feel trustful in relation to their partners. Last but not least, the information on workforce diversity is presented with slightly more than half of the firm owners being female, while only one fourth of the top managers being women.

The innovation systems research further explored the relationship between firm-level and regional-level factors with innovation activities. Firm size is a critical important factor as it affects almost all innovation activities and education positively influences the volume of R&D activities inside the firm. At the regional level, knowledge creation has a positive relationship across all innovation activities, while RIQ has a positive effect on R&D and a negative relationship with formal training. In addition, a high degree of regional institutional quality, surprisingly leads to a lower ability for firms to commercialize innovative products. The findings also points out that the most critical barrier to the innovation process is obtaining external finance. Difficulty in finding cooperating partners is the most critical barrier in getting information for the diffusion of technology in Vietnam. Furthermore, the last section in part two indicates the higher proportion of females in the workforce to lead to the possibility of higher innovation in firms in Vietnam.

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

2 Project approach and methodology

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

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

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

Project organisation

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

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

2.1 Research

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

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

Research methodology challenges: combined qualitative – quantitative approach

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

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

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

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

Qualitative studies

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

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

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

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 Vietnam. 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 Vietnam involves a series of 15 interviews with managers and/or owners of manufacturing SME in Hanoi and around. The qualitative data collection through interviews took place from 13-23 January 2016. The number of interviews may seem a limited number to justify research validity. However, the approach usually involves in-depth rich and detailed descriptions and a multidimensional analysis of the complexities and linkages of a few cases to gain an understanding of the (socio-economic) mechanisms and processes of the case subject. In the case descriptions, innovation as an economic phenomenon is the case 'subject', whereas the unit of analysis is a manufacturing SME. The case description holistically explores the type and basic features of innovation within the SME, and reviews the impact on productivity and competitiveness over the past 2 to 5 years.

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

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

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

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

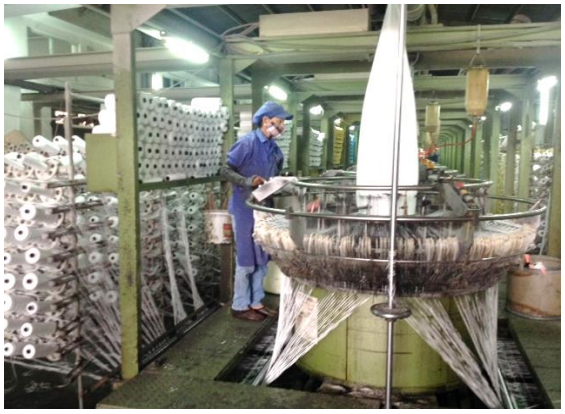
3.2 Selected cases

Rubber and plastic products – animal feed bag production (60 employees)

The first case is a agricultural products packaging company was established 20 years ago as a state-owned company. The company is located on the outskirts of western Hanoi. In 1997, the company started to produce polypropylene animal feedbags, which was a new product at that time. In 2004, it became a privatised company, with the process of equitisation accomplished through sales of enterprise shares to employees on

preferential terms, and to domestic private investors. Today, the firm is a joint-stock company managed by a board of directors, with day to day management in the hands of the managing director, who was interviewed.

The production process of the animal feedbags starts with small pieces of solid plastic, which are mechanically stretched into thin threads. The plastic threads are then woven into fabrics/tissue, and further cut and sewn manually into feedbags. Finally the bags are printed with the name and logo of the client, as well as the nutrient contents, a government requirement. For every step in the process, the company has a machine. Around 70% of the plastic raw material is imported from abroad, the remainder from Vietnam. The animal feed producers order the bags in large volumes.



Most of the customers are foreign-owned companies in Vietnam, also referred to as foreign direct investment (FDI), that sell on the local market – "FDI companies from France, Malaysia and China are very successful because the local companies cannot compete with them." It is not that the managing director does not sell to Vietnamese customers, but "the animal food industry in Vietnam has been taken over by foreign investors." Moreover, it is attractive to sell to FDI companies because they have a network of production units all over Vietnam.

The company currently employs 60 people, but employed nearly 200 in the past. In 2011, referred to by the managing director as the 'crisis year', productivity was very low and more competitors emerged. The company had to reorganise and lay off nearly three quarters of its workers, but it still maintains a production level of more than 50% of the pre-crisis level.

Innovation

During the crisis in 2011, the board of directors and the managing director concluded that there were "just too many workers" for the company to survive. They agreed to profoundly reorganise the workforce – "because of the crisis and competitors, we had to increase productivity, which implied downsizing the workforce."

The management also took steps to encourage the staff to work harder. Amongst other initiatives, they set standards of how many products a worker was expected to produce per day. "The standard of productivity, per hour or per machine, is that of a skilled employee." Another way to set this standard came from the instruction manual of the machines themselves, in which productivity per hour per person is usually indicated. Moreover, a new salary system was introduced, abandoning the old fixed salary scheme in favour of one based on individual production level.

The employees with low productivity noticed that their salary dropped within a few months – "when the employees got a low salary because of low production, and they compared this to other firms, they quit. The company did not force them out." The new production standards and salary system allowed the management team to get rid of the less productive and less experienced employees.

The company announced the new salary policy and practices openly and clearly to all employees. The policies are written down in formal procedures – "everyone knows and there are no complaints about the clarity of the policies." Today, the managing director feels that he pays his experienced workers a fair salary. Contrary to the working culture in the past, when the company was a state-owned enterprise, the managing director now sees that "production depends on the skills but also on the motivation of people." He values long-term commitment of staff to the company – "they have great experience and good skills, so I cannot pay a low salary."

The company provides in-house training in basic production skills, since there are no schools or vocational training centres offering the necessary courses. There is a company policy that encourages skilled workers to train new staff. This happens on-the-job in each step of production and takes three months. After successful completion, the skilled worker gets a reward of 1 million dong and a promotion – "if the skilled worker does the training fast, then he gets the reward fast." The manager identifies another positive outcome of the new staff policy, which is a much lower staff turnover – "since the crisis in 2011, staff turnover has become less. In fact, for the past two years, no-one has quit."

Investing in new machinery to improve productivity is not a way forward, according to the managing director, because the available technology on the market has changed little in the past decade. Previously, the company used Japanese machines, but recently bought a couple of machines from India with similar technology. Other technological changes and innovations in the production process concerned the printing of logos and nutrient contents on the bag. In the past, the print ink used to fade, but now the new print technology is very clear and clean. "Customers demanded a better quality of print at the same time as the competition was increasing. So we had to invest in a new printing machine, ink and technology." In the past, the bags were printed with just two or three colours, but now this has increased to five colours, which is much more complicated to produce, but "that is what the market demands from animal feedbag producers."

Government regulations specify what should be on the outside of the bag in terms of contents and nutrients. Accordingly, the feedbag print design changes often, to comply with the changing regulations. The animal feed producers have to officially register these changes, "involving a time-consuming process with many problems and costs."

In order to meet both government requirements and customer demand, the company also had to buy new printing machines. The company does not have a design department – "we don't have money to pay a salary for a full-time designer, so we just outsource it." Normally, the customers have an initial design, which is often fine-tuned through several print versions during the production process.

Regarding the daily running of the company, the managing director feels under pressure. One of the internal challenges is slow decision-making by the board of directors. Since it used to be a state-owned company, the culture of slow decision-making within the management still persists. The managing director needs the board's approval for most management decisions – "even in the event the company does well and makes a profit, it is very difficult to get quick permission from all members of the board." The managing director is working hard for the benefit of the whole firm. He has to be in charge of everything, "and the others just get the benefit." The

company issued shares on the stock market, so he is also under pressure to generate yearly revenue to pay interest to the shareholders.

External business and institutional environment

The managing director finds the business environment very challenging and the competition is getting fiercer by the day – "the result of the competition is a price war." He notes that one of the reasons is that today the entry barriers to this industrial subsector are much lower than before. "In the past, to invest in a factory like this, it required like 1 million USD, but now, for just a third of that, you can open a company." Apart from cheaper overall operating costs, new companies reduce costs by using recycled plastic and input materials. The managing director still considers his company to be one of the leading companies in Vietnam. The customers are somewhat opportunistic. Even though he has a good long standing network of customers, "some very big ones," customers often say that other animal feedbag producers offer lower prices, "and they walk away."

At the same time, he is aware that the customers cannot afford to be too opportunistic. It is not easy to create a new design without his company's knowledge and experience "to make the bag very nice and beautiful." So when the customers change to another company, new problems of design and printing arise, which may be costly. The managing director predicts that he will have more export opportunities in the future once Vietnam signs the TPP[2], which will bring more customers from outside of Vietnam. However, the production requirements for quality will be tougher, "so we have to invest a lot in quality, efficiency and quality control."

The managing director is aware of government innovation promotion policies, but the company has not received any support through such policies or programmes. "In the northern part of Vietnam, there is no association for animal feedbag products of this kind. The company itself has to fight for customers, for everything." There is also little support from the local district administration. For instance, the managing director hoped to recruit new workers from a state training centre. However, "they cannot support us in recruiting new workers. This is a simple example of how the government and company do not support each other."

Regarding government taxes and permits, the managing director feels that the procedures are improving, such as the convenience of paying taxes through e-banking. However, the customs fee to import the plastic input "is still a headache." It is very complicated, for example, "when you complete the application online, you have only one day to pay the money and collect your imported items." On occasion, he has paid the required amount, received confirmation from his bank, but the money failed to arrive in the account of the customs office, so they did not allow him to take the materials. Furthermore, the importing company had to pay an additional storage and transportation fee – "and many other things, so it is very complicated." His complaint received no response.

The managing director aims to expand the company in the near future, but the present available land in Hanoi is too small. He hopes to find sufficient financial means to move the company to another location outside Hanoi, which would be better because labour costs outside Hanoi are lower. However, "banks in Vietnam do not give

[2] Trans-Pacific Partnership (TPP) agreement that will enhance trade and investment among the TPP partner countries, promote innovation, economic growth and development, and support the creation and retention of jobs. The partners are Australia, Brunei Darussalam, Chile, Malaysia, New Zealand, Peru, Singapore, Vietnam, and the United States.

loans for purchasing land, which is the most expensive part." The company can only get credit from the bank for machinery. When the firm was privatised, the board of directors and shareholders provided investment funds for the land and fixed assets, whereas for the other assets, they secured credit from the bank.

Case 2 Paper products – pupil school notebooks (60 employees)

The third case concerns a company producing bound paper products such as notebooks and copybooks for pupils at primary and secondary schools. The products are sold to high-end consumers. The company is located in the northeastern part of greater Hanoi, an area of industrial parks which has seen a large amount of economic activity over the past decade. The number of employees fluctuates, depending on orders, but averages around 60 workers.

The company was established in 2007 by a group of friends and former colleagues, who had previously gained experience in running private and public (state-owned) paper production companies.

The group agreed to invest a few hundred thousand dollars and became shareholders in the joint-stock company. The company is managed by a board of six directors. The interview was held with one of the board members, who is the deputy director and principally in charge of running the business – "I am the one who manages everything here."

There has been an increasing demand in the domestic market for bound paper products since the establishment of the company. A small proportion has been exported to surrounding countries, but "it is hard to tell how much we export because it depends on the orders. Just occasionally we export to the US too, but it is not much." Soon it became apparent that the production capacity of the company was too limited, so the group decided to open a second company located in a northern province. Around 50 people work in this other company.

Recently, the first company was moved to its present location in greater Hanoi. The land at its previous location was rented on a short-term basis, but "this was risky as they could claim back their land at any time." The land at the current location is leased from the local government for 50 years, which is much safer. In fact, the company paid the full amount of the rent for 50 years at once – "it's like we bought the land, but only for 50 years."

The deputy director has not considered merging the two companies into one large company – I don't want to put all my eggs in one basket." He feels that he lacks management skills – "if it's too big I cannot control it, so things are separated." Moreover, finding sufficient land for a larger company is a serious problem in northern Vietnam. "The present location here is 10,000 m2, but that is too small to combine the two enterprises."

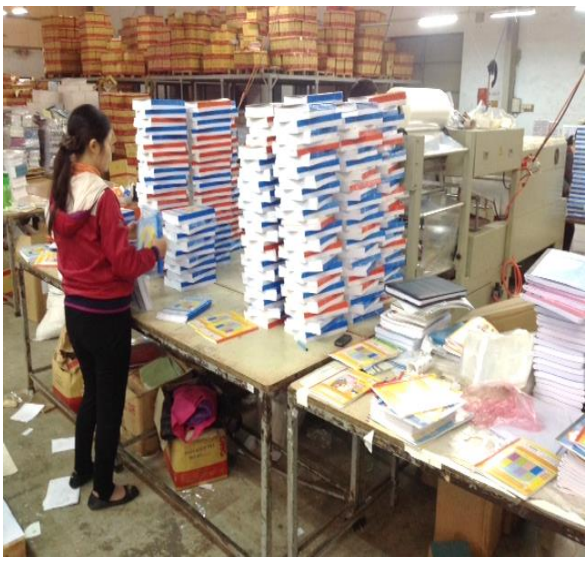
The company has 25 office staff for management administration, marketing/sales and design. The deputy director finds these employees loyal, because they have stayed with the company for many years. The remaining 35 staff work in production. There is a high turnover of production staff, around 50% per year – "the problem is that many workers do not come back after the holidays. In that period of the year, we have to recruit most of our new workers." It takes only one month to train production workers. Every six months, the management team organises a meeting for all employees about matters including the working environment, staff ideas and requests.

The manager recognises that high staff turnover is a problem common to every company in the nearby industrial parks. Employees from far away find new jobs near their family homes in the provinces or they secure a higher salary elsewhere. The Vietnamese economy is growing fast, explains the deputy director. A lot of new industrial zones have opened and provide employment opportunities for unskilled workers – "in Vietnam, it is very easy to get a job in an industrial park these days."

Innovation

Regarding technology and machinery, the company has invested in several printing machines since its inception. One machine costs half a million dollars, "so it's very expensive." The machines deliver the required quality of printing. Although there are more advanced machines available, buying newer ones is not a priority for the company at present. A more urgent concern is the product design of the note- and copybooks. In order to stay in business, the company has to change and renew the designs of the products often. This includes new types of covers, colours, material, contents, shape and even the thickness has be taken into account.

The company's design department, responsible for this, has five employees, who "come up with around 80% of the new ideas." In order to get design advice, the company regularly contracts the University of Industrial Fine Arts in Hanoi for their input. There are no other relationships with art or technical institutions for design and production issues in the company. Ideas come quite often from the staff and production workers as well. In fact, there is a company policy encouraging staff to advance suggestions. If the new product idea or design can be applied and is sold, then the person who advanced it will be rewarded with a sum of money. The designers also source ideas from fairs or at primary and secondary schools – "they bring 50 to 60 designs of products to schools and ask the children to pick what they want."



The sales teams sometimes visit the retail shops and ask customers directly for their feedback –"if customers give good advice or relevant opinions, we give them the notebook for free." The wholesalers or distributors are invited once in a while to a customer meeting and join a trip sponsored by the company. They are encouraged to give feedback and ideas. Lastly, the management team reviews patterns in new product sales and uses that information for their upcoming production plans.

The new designs are not registered. The deputy explains that the company can register the design, but before doing so, it should be clear whether the new product is in demand – "otherwise it's a waste of time. It takes a lot of effort to register." In the past, there have been instances where the company did not register a successful product, and others copied it. There is also a risk that the new products may not sell well, which also happened in the past. However, this is not a major concern, because "based on our experience, we can predict the market quite well. Eight to nine products out of ten are well received in the market."

External business and institutional environment

According to the deputy director, the domestic market is divided into products for the cities and for the countryside. "I have a cousin who owns a notebook company. He targets the mountainous area and countryside only." All over Vietnam, there are some 20 competing companies producing the same products. The company's

target group are the high-end consumers in the city – "it is, however, easier to sell the medium and low quality products than the high-end. In the countryside, the customers are easy." The deputy manager refers to the competitors as a "network of friends" as well. There is one particular relationship – "we dislike each other because we compete with each other but I can gain ideas and sometimes we share orders." The other companies have not tried to upgrade their production facility for high quality products, as the investment is considered too high and the technique too difficult. Similarly, the deputy manager does not have plans to access the markets for low and medium quality products in the provinces – "it's like the company's mission and vision: only produce high quality products." At the same time, the deputy director is entrepreneurial and keeps his options open. Some of his workers are from the countryside and the deputy director encourages them to open their own companies. He is willing to invest personally and share the profits.

The company has international competitors too: some Japanese firms in Vietnam produce the same kind of product, but with better technology – "although the quality is nearly the same, their productivity is much higher." The Japanese design is less attractive for children in Vietnam, according to the deputy director, which provides some advantage for the company. He foresees that, in the future, the Japanese competitors will learn to understand the Vietnamese children's taste. "We are thinking about what we can do in the future to compete with the Japanese companies." The owner regrets that there is no government programme to help the companies to compete with international competitors – "then again, we have to earn things by ourselves, so I don't blame the government."

One way forward to overcome the Japanese competition is to raise the productivity of the company. "However, it is hard for us to compete in productivity because the Japanese competitors have high technology and better machines." The only other way to survive, according to the deputy director, "is to continue to know what customers want before the Japanese competitors know." However, the managing director acknowledges that this is only a short-term strategy because once a product is popular and successful, then it will take little time for others to copy it. As for the import-export and tax regulations and procedures, the deputy director feels that the government policies are adequate.

He has little difficulty in dealing with civil servants – "Vietnamese people are used to giving some extra money to make things smoother and move faster." However, he feels that private companies are disadvantaged in Vietnam. For instance, a director of a provincial tax department has the authority to close down a private company. "The tax department is very strict. If we hand in the tax report three months late, then we will be fined. If we are six months late, then the company will be closed down." The state-owned companies are more privileged and cannot be closed down that easily. There must be a formal decision signed by the Vice Minister of Vietnam to do so.

Case 3: Metal processing – precision spare parts (36 employees)

The second case is a metal company producing precision and spare parts as a supplier for the machinery industry in Vietnam. It is located on a highway some 20 km south of Hanoi and has 36 employees, occasionally increasing this number to fulfil large orders. The interview was carried out with the sales manager, a technical engineer by education and a member of the company's board of directors.

The company started in 2012 with 10 employees. Before that time, the sales manager ran a trading company in metal processing and production machines, representing the Japanese company Hitachi in Vietnam. When Hitachi opened its own production plant and selling point/showroom in Hanoi, serving the Vietnamese market directly, his trading company lost an important market share – "sales were not as reliable as before."

Coincidently, more Japanese automotive and machinery companies started to invest in local plants in Vietnam. The manager quickly found out that these companies need suppliers for metal precision and mechanical parts. He saw the market opportunity to manufacture the spares himself – "the market looked very promising." His previous knowledge and experience in importing the machines and his engineering background helped significantly in developing the idea. He organised and motivated a group of friends and former colleagues to invest in the company and become members of the board of directors – "an important consideration in setting up our own manufacturing of parts was that it is more stable and much more under our control than trading."

The newly established company had to recruit skilled staff, acquire the technical knowledge of design and production, and invest in new machines. "We realised that the actual manufacturing of parts was a completely different thing than being a trading company of complete machines." Moreover, finance was required to invest in machinery, a production workshop and staff training. The previous trading income had provided the managers and former colleagues with savings. Another 40% of the investment was borrowed through informal channels and from other board members. In 2012, "borrowing from the bank was impossible because the interest rate of 25% per year was too high."

Over the years, the company gradually purchased more technologically advanced machines, using earnings from customer orders. In particular, the Computer Numerical Control (CNC) milling machines and the wire cutting machines, bought from Japan, were both technologically advanced and expensive. Drawing on his previous trading experience, the manager made this purchase "based on my knowledge and available information from the internet, and I went to similar workshops and technical companies to select the best ones."

The key customers are the Japanese companies Yamaha, Honda, Samsung, Canon and Toyota. 80% of the products are sold to the branches of these companies located in Vietnam and another 20% is exported to Japan. The manager is happy with the growth of the company – "in 2012 the revenues were 1 billion VND, in 2014 these were 3 billion VND and in 2015, 10 billion VND."

The manager expects that the company will grow further. He believes that this year "we can achieve 17 billion VND." One of the recent changes allowing the company to grow further has been the set-up of two product lines. One line is targeted at producing tailor-made products and specific spare parts to order, while the other is for mass production – "the mass products are easy to sell." For the tailor-made products, most customers come with detailed and production-ready designs but "other customers only give ideas. 50% give a detailed drawing and 50% give only the idea and we have to develop the detailed design."

The sales manager sees that the requirements and demands of the customers change, in particular in terms of increased quality. The company can deliver better product quality standards with the available technology and machines. Moreover, apart from the material and the exactness of the size, quality also concerns matters such as – "how it looks, how it is packed, time to delivery and on time delivery."

Still, new machines are essential for raising productivity and quality in the future. The recently purchased machines produce twice the amount of the company's initial machines. Every year, the manager therefore invests in new machines "but the machines became very expensive. One machine today can cost as much as the whole factory."

The challenge is to strike a balance between the higher quality requirements and working as long as possible with the same machines. The current machines cost about 200 million VND, whereas for new technology to deliver better quality, the newly advanced CNC machines cost 4 billion VND. "Thus we should not invest since the expected product quality is not too much different." If he can get a big order for a long-term partnership, he will buy the new CNC machine. "Unfortunately, short-term contracts are the usual practice in this type of supporting industry business in Vietnam."

Internal capabilities

The company has several departments, with the production department the largest. Eight staff work in the R&D and design department. The normal procedure is that customers ordering parts provide detailed drawings and technical specifications. The department analyses the drawings and specifications and develops the subsequent production process steps and production organisation – "they have to analyse how many steps the production takes, how many activities workers have to do to produce the parts."

In the short term, the manager feels the only way to achieve better quality is managing the production process inside the factory. The company has registered and obtained an ISO certification. This is not a requirement that the customers ask for – "it is just good for the company itself." The process involves a consulting company that guides the applicant through the procedures. All production and sales processes and procedures have to be written down in handbooks. An independent auditor checks if everything is covered and in order and then the company concerned is granted a certificate – "we are transparent because we want to have ISO for ourselves. This company is really transparent."

Regarding the technical knowledge of the workforce, the sales manager and many of the board members are technical engineers themselves. However, they have experienced difficulties in recruiting skilled workers since the beginning. They do hire graduates of the technical universities and colleges, but "what they learnt from universities is just 30%. We have to train the other 70% of the required skill set." The company trains the workers in-house. The turnover rate of staff is very low. The sales manager believes that the salary is quite good in comparison with his competitors. He is very confident about the working environment "and the salary bonus is good."

The employees provide advice for the design ideas and they get a cash reward if the design is good and useful. The amount depends on the idea and how much it contributes to the company, and is determined by the board and R&D department.

External business and institutional environment

The business environment is difficult, as there are various competitors producing metal components and parts nearby in the area. Most competitors have similar kinds of technical capabilities and technology, although some are different. A few times per year, the company co-operates with other competitors to fulfil a big order with tight deadlines. In order to keep their position in the market, the sales managers focus on high quality mechanical production, relying on their skilled workers to ensure product quality.

In the event of a technical problem or a design issue, where the company needs external assistance, the sales manager draws upon his large network of informal contacts. These include friends, former colleagues and teachers who work in the official government institutes, amongst others the National Research Institute of Mechanical Engineering (NARIME) in Hanoi. He does not pay, as this is not formal advice – "we are friends."

The government does not support the company. Sometimes the Ministry of Science and Technology sends an invitation to attend match-making fairs or seminars involving Japanese and Korean investors and potential contractors –"but it is not effective." There is no government support for companies – "state-owned companies have some support, but we are private company." The manager knows that the Japanese International Cooperation Agency (JICA) supports technology dissemination among local businesses – "but it is more like trade promotion."

Government agencies complain that local industries cannot produce small precision metal items as the FDI companies do. Instead, several small parts required by Vietnamese state-owned enterprises are imported from China, Indonesia and Thailand. The sales manager picked up comments by government officials wondering why small businesses do not invest in newer machines. "However, for us that is very risky because if we invest in expensive advanced machinery, how can we be sure that we can sell these products in the long run?" The manager shares his opinion that the government should ensure protection for small businesses by warranties for industry support. "The government did not do anything to protect or encourage our line of business, only saying that we cannot deliver high quality products."

Another problem, according to the sales manager, is that the policy framework has evolved in recent years in such a way that it is no longer attractive for foreign companies to invest in Vietnam. He supports his argument with the example of Honda, which has a large factory in Vietnam but plans to move production to Indonesia. "I think because in Vietnam they get no more benefits, so they move." He regrets this because Honda is an important customer for the company.

Aware that FDI companies look for other countries to invest in, the government has recently introduced new favourable regulations, such as low tax, flexibility on the timeliness of rent payments and other special FDI benefits. However, these favourable measures complicate business operations for local small businesses – "we

still have to pay the rent on time and pay all taxes. The result is that FDI companies can produce at a lower price and compete with us in a way that is unfair."

3.3 Key findings qualitative research

Several key trends and notable patterns across the Vietnamese SME cases are analysed. A first overall observation during the preparation of the fieldwork in Vietnam, compared to organising the qualitative interviewing in other countries in Asia and Africa, was the relatively high number of formally registered SMEs (10-100 employees) in the manufacturing sector in Hanoi and around.

Most interviewed owners and managers in the interviewed Vietnamese companies, in different ways, introduced new products, processes and technology in order to improve and expand their business operations. Some would clearly qualify as innovation, while others would not, depending on how innovation is defined and assessed. In advanced economies, innovation is typically measured by R&D expenditures and number of patents of new products or processes as proposed in the Oslo Manual[3] (OECD, 2005). From a radical technology perspective, many of the 'newness' introduced in the Vietnamese 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 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."*

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 in the cases all 10 countries 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.

The Global Competitiveness Report 2014-2015 of the World Economic Forum suggests that Vietnam is becoming more industrialised and competitive on the global market. Firms have become larger and are starting to exploit economies of scale. There are quite a number of formally established SMEs. Input factors are used

[3] https://www.oecd.org/sti/inno/2367580.pdf

more efficiently, raising the rate of return and increasing product quality. Productivity has to increase because wages rise with advancing development. Against this background, the set of cases explored fits best in the Porter et al. (2002) economic stage classification of an *efficiency-driven* economy. The companies interviewed in Vietnam are competing less on factor endowments, unskilled labour and natural resources, as many Sub-Saharan countries. The cases in Africa are more involved in trade (export) and processing of basic products based on their factor endowments. These activities are labour intensive, requiring unskilled low-cost labour and low productivity.

Compared to the other qualk in the framework of EIP-LIC, the owners of the companies in Vietnam seem much more 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 have introduced management and organisation innovations, whereas product and process innovations are less important. The new products and processes in the innovative companies are not radical and not 'new to the world'. 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.

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. Few companies have a design or R&D department or a specialist employee with this function.

The workforce in the companies are mostly unskilled and skilled labourers in the production workshop on the one hand, and well-educated staff in management and marketing on the other. Several owners face the difficulties of a high turnover rate of unskilled production workers. In fact, there are plenty of employment opportunities in northern Vietnam for lower educated workers, as reported by several of the managers and owners. All companies have some form of a rewards and bonuses system. The skilled production workers seemed more loyal to the company and the well-educated staff are the most loyal. The recruitment of workers is therefore an ongoing concern for the owners and managers. An additional issue is that the younger generation of Vietnamese workers are not interested in craftsmanship or manual work. Some companies move out of Hanoi and establish themselves in the provinces because of the improved availability and low cost of unskilled labour in these areas.

The Vietnamese education system does not deliver workers trained in the skills required for production work in the firms interviewed. Graduates from colleges and universities do have theoretical knowledge but lack practical skills, so most companies have to provide 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.

Typically, the companies possess technology and machinery that they have owned for a long time. The technology is still able to deliver a certain minimum product quality. Occasionally, new machinery is bought from profits and savings. The interviewed owners and managers are well-informed about technological possibilities though the internet or informal contacts. They actually 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 to commit to such extensive investments with bank credit. They are only confident about the stability of the short- and medium-term. The 'glass ceiling' situation seems to be the case among most interviewed SMEs.

The cases also show the active involvement of women in the management of enterprises. However, in all cases, the husband is ultimately in charge. Regarding family obligations and duties, the female managers all consider

women ultimately responsible for raising children and running the household. Recent reports[4] confirm that the labour force participation rate of women stands high in Vietnam. About 72 per cent of women are in the labour force, which means far more Vietnamese women have a job than in most other countries around the globe. However, Vietnam is among the few countries in the world where the gender pay gap has been widening, while the gap has declined in most nations in the period 2008-2011 (ILO, 2013).

The gap concerns the remuneration package, including benefits, bonuses or allowances. Female workers and managers have lower monthly incomes than their male colleagues in all economic sectors – state, non-state and foreign-invested. Women usually hold lower positions, whereas most management posts belong to men. Lastly, female workers often have fewer training opportunities before and during their work career compared to their male colleagues and women with families face even more difficulties in Vietnam (ibid).

External business environment and formal and informal institutions

All interviewed SME owners and managers indicate that the business environment is challenging in Vietnam. Several of them hold a negative perception of ever-changing government policies and regulations. There is no clarity about the changes, which SME owners have to navigate themselves, a very time-consuming process. Many ministries and governmental agencies have different and unpredictable regulations. The interviewees provided some examples of companies closing down because of government regulations; these companies have continued to work 'under the radar'.

No interviewed company received government support, which the owners and managers regret. They feel that they have to survive on their own. While most of them think that is reasonable, some form of credit or technical support would have been welcome, all the more because several owners and managers feel that FDI and state-owned enterprises receive preferential treatment with regard to tax obligations.

The banking system is not an attractive source of finance for SMEs. High interest rates and complex paperwork are critical issues. Moreover, banks only accept land as collateral, while many SME owners do not own land. Instead, most SME entrepreneurs find investment money from savings and via informal loans from family members. They usually invest incrementally just before or after receiving large orders.

Branch associations 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.

[4] http://www.ilo.org/hanoi/Informationresources/Publicinformation/Pressreleases/WCMS_206104/lang--en/index.htm

4 Innovation Systems

The 'Innovation System' team produced four scientific papers with special reference to Vietnam. The scientific papers within the 'Innovation Systems' in Vietnam were based on data from two main sources: (1) the World Bank Enterprise Survey (ES) conducted between November 2014 and April 2016 and (2) the Innovation Capabilities Survey (ICS) conducted from October 2016 to February 2017. The research findings of each paper are discussed and policy implications are reviewed in the paragraphs below. The associated policy briefs and many others are listed in the project website.

4.1 Internal, Collaborative, and Regional Knowledge Sources of Product Innovation

The first scientific paper within the 'Innovation Systems' theme focuses the impact of different knowledge sources relating to product innovation in Vietnam, using small firm-level data. Specifically, the team analysed the separate impacts of (i) internal knowledge, (ii) collaborative knowledge, and (iii) regional knowledge. The original working paper is entitled 'Made in Vietnam: The Effects of Internal, Collaborative, and Regional Knowledge Sources of Product Innovation in Vietnamese Firms' (2017) by Thuy Phung, Patrick Vermeulen, Joris Knoben and Dat Tho Tran.

Even though knowledge is crucial for all type of firms, the exact type of knowledge that is most useful might differ between larger and smaller firms. Large companies engaged in internationalisation pay particular attention to internal knowledge as a source of innovation. SMEs operating in a local context, on the other hand, need to draw on knowledge networks that tie together a broad set of partners, customers and suppliers to take advantage of innovation resources.

Research approach and findings

The three types of sources are characterised as follows. Internal knowledge sources might be generated by firms through in-house R&D activities, employee training or managers' experience. Collaborative knowledge could emerge from partnerships between firms and their counterparts, either from inside the supply chain (e.g. competitors, suppliers or customers) or outside the supply chain (e.g. universities or research institutes). Regional knowledge sources might come from other firms in the local area, as knowledge tends to spill over across firms, especially when the distance between them is small.

The analysis reveals that some knowledge sources are more strongly associated with innovation than others. Knowledge sources from internal R&D have a positive influence on product innovation. The stronger a firm's collaborative knowledge gained from inside the supply chain, the higher the likelihood of product innovation (it might be specific to developing countries that firms need to create a network with customers, suppliers and competitors to enhance product innovation). However, there is no significant relationship between collaboration with universities or research institutes and innovation. One explanation as to why regional knowledge sources are not effective in Vietnam is that national knowledge-producing organisations and State agencies are slow and reluctant to exchange information and knowledge.

Policy implications

The qualitative studies of EIP-LIC show examples of companies that do not have explicit R&D activities, yet having internal R&D capacity strengthens their product innovation. A policy to raise awareness of and facilitate management training and education would encourage the institutionalising of explicit R&D capacity in a company. A more critical implication is the acknowledgement that innovation occurs naturally in a good business climate and most of all through effective interactions in the business system.

It is important to differentiate between the level of technology required by large technologically advanced enterprises and their smaller counterparts that mostly adopt or adapt existing technology. Universities and research institutions have a significant role to play in the transfer of advanced technologies. However, this is not relevant for the smaller firms as the research shows.

More importantly, innovation is fundamentally the task of the private sector and entrepreneurs, and occurs through business horizontal and vertical linkages, spill-over and actors' networks involving subcontracting, interactive learning within supplier and buyer value chains and foreign direct investment. From this perspective, government innovation policy should be broader than simply providing R&D incentives and patent systems, for instance. The business sector should enjoy an institutional environment that provides information, confidence, trust and stability, which will directly and indirectly support entrepreneurs in taking risks and making investment and innovation decisions.

Most Western advanced economies adopt a policy approach based on innovation systems theory, the foundation for most Science, Technology and Innovation (STI) innovation policies. These policies strengthen the network of formal innovation systems institutions, including technology development and research centres, universities and technical education and training, finance and regulatory patent systems. The outcomes of this research indicate that this approach is unlikely to be effective in less advanced economies.

4.2 Exports and Innovation in Emerging Economies

The second scientific paper within the 'Innovation Systems' theme examined the link between exports and innovation within SMEs. Firm level evidence from South Africa. The authors belief that the conclusions hold fo remerging economies such as Vietnam. Vietnam and South Africa share similarities Specifically, the research focused whether exporting raises the probability that firms innovate in the context of an emerging economy. The research resulted into an original working paper entitled 'Exports and innovation in emerging economies Firm-level evidence from South Africa' by Gonzague Vannoorenberghe.

One possible way to promoting innovation in emerging countries is to further opening up the local economy in the globalizing world and promote international trade. In fact, liberalizing international trade and attracting foreign direct investment are at the core of many economic development policies in LICs. The underlying idea is that foreign competition increases the pressure on domestic firms to cut inefficiencies, while access to foreign markets can raise their productivity by increasing their scale, exposing them to foreign technology or raising their incentives to innovate. Although there is some research evidence that exporting firms are more productive and innovate more than non-exporters, clear insight is lacking whether exporting does trigger innovation, in particular for low or middle income countries.

There are several ideas whether and why export induces firms to innovate. One is that innovations reduce the cost of production per unit or raise the price obtained per unit (quality). Reaching a higher scale through exports makes it more profitable to invest in innovation. Another insight is that an export market may be different from the home market in many ways, as foreign consumers may have different preferences. These features of foreign markets may induce firm to concentrate on some products, adapt some of their product attributes or develop new products. There is now evidence that, in particular for firms located in LICs, selling on (typically more developed) export markets requires the firm to upgrade its product or that firms only sell their best products on export markets. Additionally, exporting exposes firms to international best practices and spillovers from abroad, potentially raising the returns to investing in the absorption capacity of these technologies.

Research approach

The research compares exporting with non-exporting South African SMEs in terms of how they were engaged in product and process innovation. The research defined product innovation as "the introduction to market of a new or significantly improved good or service" and a process innovation as "the use of new or significantly improved methods for the production or supply of goods and services".

The research analysed the firm-level relationships between product and process innovation on the one hand and export on the other. The research used a new rich dataset, collected within the DFID EIP-LIC project framework, on the innovation and exports of 500 South African SMEs collected between 2011 and 2013. The survey focuses on firms in six core manufacturing industries.

Research findings

The research finds that exporting firms are significantly more introducing product innovation in the South African context; product innovation is positively associated with the export status of firms. The link between exports and process innovation is much weaker or absent all together. This is broadly in line with previous research and could suggest that the product characteristics are a more crucial for foreign markets than the cost dimension. Although there is a significant relationship between exports and product innovation, the question remains whether innovation stimulates firms to export, or whether it is the other way around. This 'causality' issue was difficult to isolate in the research, partly because both activities are interconnected and mutually influencing each other.

The research further address this issues by exploring the firm's motivation to innovate and export. The analysis shows that exporters typically report very different motives to innovate than non-exporters. In particular, foreign competition and foreign clients provide strong incentives for exporters to innovate. The exporters are also more likely to state that they introduce product innovation to enter new markets, increase their market shares or meet standards and regulations. These answers thus suggest that exporting provides additional incentives to innovate.

Lastly, the research tests for a causal effect of exports on innovation using an instrumental variable approach. It shows that the distance between the location of a firm and the nearest transport hub predicts whether a firm exports. Firms with a higher probability to export because of their location do however not appear more likely to innovate, and this approach therefore fails to provide evidence for a causality from export to innovation.

It is worth noting that the research used traditional measures of process and product innovation and asked firms to provide exact descriptions of these innovations as well. It appeared that there was conceptual confusion

among the SME owners of the how to define product and process innovations, which often did not correspond to the researchers' definition. '…We confirm that product innovation is strongly associated with exports, even though other measures of innovation are not (e.g. process innovation). Exporters typically report very different reasons to innovate than non-exporters, which suggests that exporting provides additional incentives to innovate, and that the causality runs at least partly from exporting to innovating…'

Policy implications

An important outcome of the research is that successful exporters in emerging economies are mostly involved in product innovation and less in process innovation. While the different tests do not suggest that causality goes particularly in one way or the other, the association between exports and product innovation appears robust. This suggests that policies aiming to promote innovation and exports should be thought of hand in hand rather than designed in fully separate ways.

Then again, the research reveals conceptual fuzziness between product and process innovation too. Often, firms combine process and product innovation; new technology or production processes enable the launch of new products. The qualitative study in the framework of the DFID EIP-LIC project also show various firm cases where product and process innovation go hand in hand in firms in both Vietnam and South Africa. Usually one type of innovation comes first, then triggering, enabling of necessitating other types of innovation.

Policy therefore should not distinguish too strictly between the product and process innovation. In fact, from a development economic perspective, the distinction may not be that relevant; if value is created leading to higher productivity or better competitiveness – whether through product or process innovation - then it will contribute to economic growth.

A notable outcome of the research is that there is no clear cause-effect relation identified between innovation resulting in more export, or the other way around. The expectations of innovation policy should be realistic in terms of directly resulting into more export as well. Regardless the absence of a strong causality, innovation and export do mutually strengthen each other within a firm. A more pragmatic policy approach is including an innovation dimension in export policies, and including export dimension in innovation policies. In fact for a policy the end result that counts is that both innovation and export increase.

The research further explores the underlying motives of exporters, which offers some informative insights for policies. The exports mention that foreign competition and foreign clients provide strong incentives for them to innovate. Trade liberalization policies could therefore may thus generate some benefits in terms of innovation.

The research lastly shows that exporting firms import inputs and collaborate with multinational firms. That provides the idea of policies facilitating local firms to collaborate with multinational firms further strengthens the local innovative capacity. Government policy instruments could focus on the establishment of initial contacts through for instance match making events, business fairs or other platforms. The extent to which imports complements or substitutes for local production is however one dimension that deserves further investigation.

4.3 Total Factor Productivity Spillovers

The third scientific paper within the 'Innovation Systems' theme addresses the economic impact of trade liberalisation policies on productivity of firms. A thorough understanding of the economic impact of any policy

that affects firm productivity, including trade policy, requires research into the direct effect of that policy, as well as an understanding of the various channels through which the effect of such a policy can diffuse throughout the economy. In this regard, trade policy can have an effect on the productivity of a company whose import tariff is affected, but potentially also have an (indirect) effect on the productivity of other firms with which the company interacts. Therefore, even firms not directly affected by the productivity enhancing policy can experience an increase in productivity, through their interaction with a firm that is directly affected by the policy.

The research analysed firm-level data of the manufacturing sector in India, a country with similarities to Vietnam in terms of economic growth, human capital and growth ambitions of the government. The paper builds on existing research that has identified the positive (direct) effect of trade liberalisation on firm productivity. In particular, the empirical evidence supports the hypothesis that competitive pressures due to lower import tariffs on a firm's final good, as well as access to better inputs because of lower import tariffs on the firm's intermediate goods, raises the firm's productivity. This research goes beyond this direct effect of trade liberalisation and examines whether productivity growth at the firm level has positive (or negative) spillover effects on other firms. Such spillovers take place when one firm's productivity has an effect on the productivity of another firm. The team used the positive correlation between import tariffs and firm-level productivity as an exogenous source variation in firm-level productivity, in order to estimate the size of TFP spillovers in the Indian manufacturing economy. The original DFID research project working paper is entitled 'Total Factor Productivity Spill-overs in India' (2014) by Marijke Bos, Benedikt Goderis and Gonzague Vannoorenberghe.

Research approach and findings

The aim of the research is to determine whether the Indian economy benefitted from trade liberalisation not only through the direct effect on firms most exposed to international trade, but also through additional spillovers from the firms directly affected to other firms in the economy. The authors use a comprehensive dataset of Indian manufacturing firms and employ a spatial econometric technique to estimate the strength of inter-firm TFP spillovers. International trade policy (lower import tariffs) is used because of its exogenous nature, which is needed for consistent estimation of the effect of one firm's TFP on another's. Evidently, if spillovers exist, there could also be an effect of the latter firm's TFP on the former firm's TFP. The researchers correct for this by using the so-called Instrumental Variables technique, where the import tariff is used as the instrumental variable.

The research team considered several ways in which such spillovers could occur. Spillovers can arise among physically neighbouring firms, as observing new products or best practices is easiest at close quarters. Knowledge can also be transmitted across firms through the movement of labour, or through cheaper or better quality inputs in a vertical (supplier-buyer) relationship. Consequently, the paper estimates the spillover strength of three different channels: (1) spillovers through observation of neighbouring firms, (2) spillovers through the movement of labour between firms or (3) spillovers through cheaper or better quality of inputs in a vertical relationship. The study uses a weighted average of 'neighbouring' TFP as the spillover term. A positive effect of this spillover term on the original firm's TFP indicates that there are positive spillovers in that spatial dimension. For every channel, the authors define the relevant spatial dimension. Consider the example of a firm dyeing textiles in the province of Kerala. The first channel tests whether this firm's TFP is affected by the average TFP of firms located within a 50 km radius (the authors also use 100 km or the same state as a relevant geographical space). The second channel uses the average TFP of all other firms located in the same state, and tests whether TFP spillovers differ between a state like Kerala, where restrictions to labor mobility are low and a state like Gujarat, where constraints to labor mobility are much more severe. The third channel uses the average TFP of all input supplying firms (for example the dye producers).

In line with previous research, the authors confirm the presence of a direct effect of input and output tariffs on firm-level TFP. The research of the Tilburg University team, however, finds no evidence in favour of TFP spillovers between Indian firms. In contrast to the existing studies, which look at other countries and focus mostly on Foreign Direct Investment (FDI), the Tilburg University team did not find evidence in any of the abovementioned channels in the short run.

Because the empirical model takes an average of TFP of neighbouring firms as the spillover term, the zero result may be driven by the firms that have only a few neighbours. Theoretically, it may be possible that spillovers only occur when there are many other firms' TFP in the average. However, even for the sub sample of firms with many neighbours, the researchers found no spillover effect. ' … A decrease in the tariffs on the goods produced by a firm, called the output tariff, raises the competitive pressure from abroad - which can affect TFP either way (e.g. lower scale or higher incentives to innovate) - and may give rise to learning.…' (Bos et al. (2014)

Policy implications

Gaining deeper insights into TFP spillovers is informative for innovation policy with a view to raising productivity, for two reasons. First, it is key to quantifying the total gains from trade liberalisation policies. When there are both direct and indirect effects, leaving out the indirect effects may lead to overestimation (if the indirect effects are positive) or underestimation (if the indirect effects are negative) of the total gain from the innovation policy. For example, a common strategy for identifying the total effect of a trade liberalisation policy on productivity is to compare those firms affected by the policy to those firms not affected. The difference is then reported as the total effect.

If the latter group is indirectly affected, however, the measured difference is actually the total effect minus the indirect effect, thus only the direct effect Second, the strength of diffusion matters for the distributive consequences of a policy, the more so if the firms directly benefiting (e.g. the importers) systematically differ from other firms ex-ante. A policy with only a direct effect would then benefit one group, whereas if the spillovers affect the productivity of another group, the benefits from the policy would be distributed more fairly.

When innovation and productivity growth within firms spread within an economy, via spillovers, the overall TFP growth speeds up and therefore total economic growth does likewise. Whereas in theory, there may be different channels for TFP to spill over, the research team found no evidence for spillovers during the episode of trade liberalisation in India.

For policy makers, it is therefore essential to be cautious and conservative when estimating the total spillover effect among firms of trade liberalisation as one way to promote innovation and raise productivity. If policies are evaluated based on a cost-benefit analysis, and this includes some estimation of the positive effects on other firms, the benefit may be overestimated. This would result in the implementation of policies which will not live up to expectations.

The methodology not only provides a better understanding of the consequences of a particular episode of trade liberalisation in India, but acts as an instrument to identify spillovers arising from any kind of policy. Policy makers could apply this instrument to examine different channels through which such spillovers are commonly thought to arise, namely through observation or labour mobility between neighbouring firms or through intermediate input use.

Given the theoretical possibility that spillovers can exist (this research is only the second to examine inter-firm spillovers between domestic firms in a developing country), further research and insights on this topic are essential for policy making. The existing literature on spillovers between domestic firms is limited, but of great importance when examining the total beneficial effect of innovation policies. Expanding this type of research to

different countries and different time periods would enable researchers to examine whether this lack of spillovers is specific to the Indian case in the early '90s, or whether this is a more general phenomenon that is supported by robust evidence.

In particular, such further research should also give insight into the ways in which institutional factors may hamper spillovers. The lack of TFP spillovers may thus not only have implications for policy, but may also imply that policy or institutional changes can be devised to facilitate and enhance spillovers between domestic firms. The absence of such spillovers may be the result of a complementary institutional context not sufficiently conducive to spreading innovations. This requires a complementary holistic view in policy analysis.

The results of this paper can be generalised to any policy, not just to trade policy. In particular, a key question regarding spillovers is: 'as a result of a given policy or other event, if the TFP of a single firm is increased, will this have a positive effect on the TFP of other firms in the economy, even when they are not directly affected by the policy?'. Further research into the institutional factors affecting the lack of spillovers in India may inform policy to promote growth through TFP spillovers between firms.

4.4 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 Knoben.

Research Findings

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

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

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

Policy Implications

Based on the research results, it is essential to acknowledge the value of gender diversity for innovation and to create awareness among managers and employees that innovation emerges and blossoms from gender diversity

at the firm level. Government agencies could develop special policies and programs which encourage and support firms in hiring a more gender-balanced workforce, having more female top managers and supporting firms with a gender diverse ownership structure. This could take the form of awareness raising programs explaining the particular benefit of gender diversity for a firm's likelihood to innovate.

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

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

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

5 Finance for Productivity Growth

The 'Finance for Productivity Growth' team produced three scientific papers with special reference to Vietnam. 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 Vietnam as explained below. The third paper discusses access to finance and the demand for skill. 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.

5.1 Income variability in Vietnam – a field experiment

The first scientific paper within the 'Finance for Productivity' theme studies addresses income variability in Vietnam based in a field experiment implemented in 2015 in Hai Phong city in northern Vietnam. The paper provides a brief introduction how the RCT was set up and implemented and discussed the findings and conclusion. The sections below are copied from the original paper. It is important to stress that the chapter does not do justice to the full details of the research and its methodology and analysis. The full DFID working paper of Patricio Dalton, Nguyen Nhung and Julius Rüschenpöhler (2016), entitled 'The Right Amount of Income Variability: Evidence from Small Retailers in Vietnam' is accessible via the project website. All other working papers of the finance team are downloadable at the website.

Introduction of the field experiment in Vietnam

Most of the poor in the developing world are small entrepreneurs vulnerable to all sort of negative shocks and material constraints associated with lack of development. They spend most of their lives in the premises of their small businesses, coping with frequent income shocks, juggling expenses, and making difficult tradeoffs. Lack of access to formal credit or savings to smooth consumption worsen their realities and increases their financial vulnerability. As Banerjee and Dulfo (2011) describe with several vivid case studies, "risk is a central fact of life for the poor, who often run small business or farms or work as casual laborers [...]. In such lives, a bad break can have disastrous consequences."

Evidence from psychology and neuroscience suggests that the human cognitive system has limited capacity (Luck and Vogel, 1997; Vohs, 2013). Entrepreneurs' preoccupations with pressing budgetary concerns and income variability can impair such limited capacity, leaving them with a reduced pool of mental resources to guide their decisions. In line of this view, Mani et al. (2013) argue in an influential paper that poverty can directly impede cognitive function. The authors test this hypothesis by experimentally inducing thoughts about nuances to shoppers at a New Jersey mall. They found that this reduces cognitive performance among poor but not in well-o participants and present evidence that rules out explanations such as difference in time available, nutrition, work effort, or stress, concluding that it may be poverty *by itself* that reduces cognitive capacity.

In this paper we go a step further and investigate a possible channel through which poverty can affect cognitive function. We hypothesise that it is the income variability typically associated with poverty that impedes cognitive functioning of low-income people. To test this hypothesis, we replicate Mani's et al. (2013) experimental design with a sample of low-income small retailers who are heterogeneous with respect to the income variability they face in their businesses. We ran the experiment in their natural setting in a local market

in Vietnam and we also administered a survey to gather detailed information about the business, income and wealth of the entrepreneur.

In the experiment, each retailer was presented with four hypothetical scenarios a few minutes apart. Each scenario described a financial problem the retailers might experience and required the retailer to think about how to solve the problem. By touching on monetary issues, the scenarios were meant to trigger thoughts about the retailers own nuances. Retailers were randomly assigned either to a “hard" condition, in which the scenarios involved relatively high costs or to an “easy" condition, where costs were lower. The latter condition was expected to evoke low cognitive load in all the sample. In contrast, the large sums in the “hard" condition were hypothesized to evoke monetary concerns in the retailers who face higher financial variability, but less in the rest. After viewing each scenario, and while thinking about how they might go about solving the problem, retailers performed two paper based tests to measure their cognitive function: Ravens Progressive Matrices and a Stroop test. Upon completion of these tests, retailers responded to the scenario and they would move on to the next scenario.

The experimental results suggest the existence of a link between income variability and cognitive performance. Specifically, we found that cognitive performance has an inverted U-shaped relationship with income variability in the “hard" condition but is not correlated with income variability in the “easy" condition. This points to the existence of an optimal degree of income variability. Retailers who are used to face some intermediate degree of fluctuations in their revenues reach the highest cognitive performance in our sample when they are confronted with financially stressful situations. Too much or too little income variability seems to be, however, detrimental for cognitive capacity. This result is in line with recent literature from psychology, which reports evidence that stressful environments in childhood do not universally impair mental functioning, but can actually enhance specific types of cognitive performance in the face of uncertainty (Mittal et al., 2015). Moreover, we do not find an overall effect of the scenarios on the cognitive function of our sample of low-income retailers, irrespective of the measure of cognitive performance we use. This remains true even for the poorest retailers in our sample. This latter result is at odds with Mani's et al. (2013) results, who found that the cognitive performance of the poorer shoppers in the mall were significantly affected by the hard financial scenarios.

Description of the field experiment

The Sample

The experiment was carried out in May 2015, in Tam Bac Market, Hai Phong, Vietnam. Tam Bac Market is one of the biggest markets in Hai Phong, with about 700 registered small shops concentrated within a sheltered area of approximately 2000 square meters. These shops are typically small cubic areas with an average size of 4.5 sq. mts. (median of 3 sq mts). They are typically owned by one retailer each, with some exceptions in which one retailer owns more than one shop. The market offers a considerable variety of products and each shop specializes in some of them. The shops are quite homogenous with respect to customer base, size, supervision, tax base, rules, laws, ownership, marketing strategies.

Given that the median household income in the sample used by Mani et al. (2013) was roughly US$ 70,000 and a lower bound of roughly US$ 20,000, all entrepreneurs in our sample would correspond to the etc., which makes it a convenient sample for identification purposes and statistical power. At the same time, the shops

are rather heterogeneous with respect to revenues, profits and income variability, which makes these group suitable for our empirical approach.

We began our field study by contacting the head of the market who granted us permission to conduct the study and provided us with a map of the market, a booklet with the number of registered shops, their assortment and IDs.[4] Out of the 769 shops listed in the market, we randomly assigned 300 shops to two different treatments, 150 to a “hard" financial scenario and 150 to an “easy" financial scenario. Randomization was done by computer. To reduce noise in the data, we used randomized block design, blocking the sample by shop size and type of product. To minimize possible communication between shop owners during the period in which the experiment was carried out, we divided the market into 10 areas, and ran the experiment in one area per day. In other words, we interviewed on the same day all the shops randomly selected within the geographic area. We also randomly assigned the 300 shops to six enumerators, stratifying by treatment.

Out of the 300 shops randomly assigned to the two treatments, 127 took part of our experiment. This was mainly due to the fact that the map obtained from the head of the market was outdated and many of the shops had closed or turned into storage places. We only learned this during our visits to the shops. Table 1 (columns 1, 2 and 3) summarizes the characteristics of the shop owner who participated in our study and provides some descriptive statistics of their shops. The average shop owner in our sample is 47 years old and has been running his/her business for about 18 years. Most of them (93%) are female and 77% have no employees. Only 25% of shop owners have a bank account, about 91% own the premises of their shop and about 86% own a house. In average, they have monthly revenues (PPP equivalent) of US$ 6,347 (median US$ 2,757) and monthly profits of US$ 586, with an average pro t margin of roughly 9%. Given that the median household income in the sample used by Mani et al. (2013) was roughly US$ 70,000 and a lower bound of roughly US$ 20,000, all entrepreneurs in our sample would correspond to the poor population in Mani's et al. (2013) study.[6] Our sample population, although poor, encompasses a diverse profits range, with the median shop profits at roughly US$ 367, a lower quartile of US$ 275 and an upper quartile of US$ 551. The average entrepreneur in our sample has liabilities of about US$ 2,900 and the average market value of the businesses is estimated in US$18,905 (median of US$ 9,190). Moreover, the average entrepreneur does not seem to be liquidity constrained, at least to finance working capital. For example, 90% of the entrepreneurs reported that they could borrow the amount of their monthly profits on a normal month in one week if they needed.

Table 1: Descriptive Statistics and Verification of Randomization

Sample Characteristics	Number of observations	Full Sample		Means by treatment		Diff: Easy−Hard *p-value*
		Mean	SD	Hard Scenario	Easy Scenario	
Gender of entrepreneur (1=male)[b]	127	0.07	0.25	0.10	0.03	.12
Age of entrepreneur	127	47.23	10.07	46.56	47.96	.43
Age of firm (years)	127	18.14	8.09	16.77	19.66	.04
Size of shop (sq mts)	126	4.49	3.90	4.25	4.76	.46
Number of employees	127	0.33	0.78	0.39	0.28	.45
Proportion of firms that are registered	127	0.99	0.08	1	.98	.29
Revenues on a normal month (US$ PPP)[a]	127	6,347	21,271	8,916	3,479	.15
Profits on a normal month (US$ PPP)[a]	117	586.35	716.44	677.51	472.40	.12
Own the shop premises (1=Yes)[b]	126	0.91	0.28	0.94	0.88	.24
Market value of the shop (US$ PPP)[a]	108	18,905	28,035	20,696	16,581	.45
Income from other sources (1=Yes)[b]	124	0.75	0.42	0.76	0.75	.93
Own a house (1=Yes)[b]	126	0.86	0.06	0.89	0.81	.40
Has a bank account (1=Yes)[b]	126	0.26	0.44	0.25	0.27	.82
Current Loans (US$ PPP)[a]	125	2,892	10,085	3,810	1,832	.27
Liquidity in short notice	123	0.90	0.29	0.89	0.91	.77

Notes: Definition of variables: **Market value of the shop**:If you sold your shop today, how much it would be worth? **Income from other sources**: Do you and your family have an income besides that from your business? **Current Loans**: Total amount of loans currently holding. **Liquidity is not a problem**: Is it possible for you to borrow the amount of your profits on a normal month in one week (Yes=1, No=0)? [a] PPP conversion factor = 10,879.11 (source UNdata). [b] test of difference in means using χ (Pearson-Chi2) test because variable is dichotomous. The rest of the mean differences are checked using the `t-test`. *** significant at 1%, ** significant at 5%, * significant at 10%.

The last three columns of Table 1 compare the characteristics of the entrepreneurs and their firms assigned to the “hard" scenario with those assigned to the “easy" scenario. Firms were assigned to treatment randomly, so any differences between the treatment groups are purely due to chance. In general the randomization appears to have created groups that are comparable in terms of basic characteristics, with the only significant difference in means occurring for the years the firms were running, being the firms assigned to the easy treatment slightly younger than those assigned to the hard one. Our main specifications will include firm age as a control to improve precision and account for such chance differences between treatment groups.

The experiment

We followed as close as possible the experimental protocol of the laboratory study in Mani et al. (2013) and in addition we collected detailed information on participants businesses, wealth and financial status. As mentioned before, the intervention consisted on inducing retailers to think about scenarios describing a financial situation they might encounter in their daily lives. We constructed these scenarios by adapting the scenarios in Mani et al. (2013) to the realities of the population of retailers in our study. To that end, we performed pilot interviews with retailers from a neighbour market with very similar characteristics of Tam Bac Market. The aim of these interviews was to understand what would be a natural “hard" or “easy" financial situation for these retailers. With this information we constructed eight financial scenarios. Four “hard" ones, intended to create a hypothetical financial burden for the entrepreneur, which was hypothesized to temporarily impede cognitive load depending on their actual financial situation. The other four scenarios, the “easy" ones, described the same hypothetical situation as the “hard" scenarios, but the sums in the easy condition were “small", hence we expected this condition to evoke few of monetary concerns. For example, in the pilot interviews we learned that almost all retailers had a motorbike and also got an estimate of how much would cost to buy a new bike and how much would be a financially feasible and natural reparation of the motorbike when it breaks down. With this information, we constructed hypothetical Scenario 1, that recreates the case in which a motorbike breaks down and the cost of fixing it is either VND 1 million (approx. US$ 92) in the “easy" scenario or VND 10 millions (approx. US$ 920) in the “hard" scenario. In general, each scenario depicted analogous situations to those used by Anandi et al. (2013), but adapted to the realities of these entrepreneurs.

The sequence of the experimental intervention was as follows. The entrepreneur was first informed about the general aim of the project. After signing the informed consent form, the entrepreneur was asked a series of general questions about their business and subsequently presented with the two practice trials of Raven's and Stroop's tests. Only when they responded correctly to both trials they could start the experiment. Then, they were presented the hypothetical financial scenarios (“hard" or “easy" depending on which treatment the entrepreneur-shop pair was assigned to), and after listening to each scenario, the entrepreneur was given some time to process the information, think about its consequences and how he/she would go about solving it. During this time, the enumerator would hand out a set of 5 Raven's matrices and 20 trials of Stroop's test subsequently. Once the four scenarios were over and all the Raven's and Stroop's trials were completed, the entrepreneur was asked some additional questions about the business. The whole intervention lasted approximately 40 minutes, after which the shop owner received VND 50.000 (approx. US$ 2.3) as participation fee plus the money of the investment game they played to measure risk preferences (between 0 and VND 90.000). The average shop owner earned about VND 100.00 (approx. US$ 4.6).

Results: Estimation of experimental treatment effects

We began studying how cognitive performance of the retailers in our sample is affected by the two different financial scenarios. Given that these retailers are poor, and according to Mani et al. (2013) poverty on its own is supposed to impede cognitive load, we expected that retailers exposed to the context of a financially "hard" condition performed significantly worse than those exposed to the scenario that generated relatively trivial financial concerns. We tested this hypothesis by estimating the following simple regression model:

$$Y_i = \alpha + \beta_1 \mathbf{T}_i + \delta' \mathbf{X}_i + \epsilon_i$$

where Yi is a measure of individual performance in the Raven's or Stroop's test, Ti is a treatment dummy taking the value 1 for entrepreneurs assigned to the "hard" scenario and zero for those assigned to the "easy" scenario and Xi is a vector of individual characteristics (age and gender of the entrepreneur and the years he/she is in charge of the business). For each cognitive measure, we estimated equation 1 both with and without the individual controls. We included these controls because the two treatment groups are not balanced in those dimensions.

Estimates of equation 1 are presented in Table 2. Contrarily to what was expected, the (poor) retailers in our sample performed similarly in both scenarios, across all the three measures of cognitive performance. This is at odds with the results found by Mani et al. (2013) within the relatively poor population in New Jersey's mall. Their sample of "poor" did perform significantly worse in the "hard" condition than in the "easy" condition. The cognitive response of our sample was equivalent to that of the rich in Mani's et al. (2013) sample, i.e., the participants were uninfluenced by the scenarios.

Table 2: Overall effect of financial burden on cognitive performance

	Ordinary Least Squares					
Dependent Variable:	Raven's test performance		Stroop test: time		Stroop test: mistakes	
	(1)	(2)	(3)	(4)	(5)	(6)
Scenario (Hard=1)	6.16	3.93	-0.604	0.457	-0.556	-0.428
	(4.316)	(4.32)	(1.315)	(1.306)	(0.410)	(0.372)
Constant	41.87***	50.27***	27.62***	22.53***	1.245***	0.531
	(3.108)	(6.253)	(0.875)	(1.851)	(0.388)	(0.467)
Firm and shop owner controls		✓		✓		✓
Observations	127	126	126	126	126	126
R-squared	0.01	0.05	0.001	0.109	0.01	0.03

Notes: Robust standard errors in parentheses. Columns (2), (4) and (6) include the following control variables gender, age of t business and size of the shop. *** significant at 1%, ** significant at 5%, * significant at 10%.

One way to reconcile both results is to consider that the poor in the US have more preoccupations with pressing budgetary concerns than the poor retailers in Vietnam. Although the retailers are poorer in absolute monetary terms, they could have less monetary preoccupations than the poor shoppers in the US mall, who presumably are highly indebted and have higher material ambitions. Although Mani et al. (2013, p. 976) empirically define a poor person as someone with income below the median of their sample income distribution, they argue that their hypothesis is about how monetary concerns tax the cognitive system, so they define poverty broadly as the gap between ones needs and the resources available to fulfill them. This is based on subjective needs, so

it is plausible that the monetary concerns of the low-income individuals in the developing world are lower than that of low-income individuals in the developed world and our sample is not then poor enough in this subjective sense.

To understand this further, we looked at the poorest of our retailers, to whom material preoccupations are more likely to bind regardless the culture, level of financial indebtedness or subjective needs. To that end, we split our sample of retailers in two sub-groups, the "poorest" and the "richest" within the retailers. The conjecture was that poorest retailers would perform equally well than the richest in the "easy" scenario, but worse in the "hard" scenario.

Table 3: Heterogeneous effects of the scenarios on cognitive functioning - Raven Test

Income and wealth dimensions		Raven's performance		Diff: Easy−Hard
		Hard Scenario	Easy Scenario	
Size of shop (sq mts)	Big	50.62	38.10	0.04**
	Small	44.21	47.09	0.62
	Diff: Big−Small	0.29	0.15	
Revenues on a normal month (US$ PPP)	High	50.00	43.35	0.25
	Low	45.62	40.17	0.40
	Diff: High−Low	0.47	0.61	
Profits on a normal month (US$ PPP)	High	51.95	50.96	0.88
	Low	43.75	34.37	0.10
	Diff: High−Low	0.18	0.01**	
Market value of the shop (US$ PPP)	High	51.50	47.44	0.58
	Low	45.31	41.25	0.51
	Diff: High−Low	0.32	0.39	

Notes: *** significant at 1%, ** significant at 5%, * significant at 10%.

We defined the "poorest" and the "richest" by a median split on different dimensions, all proxies of wealth: size of the shop, revenues, profits and business market value. Tables 3, 4 and 5 show the cognitive performance for each of these groups across treatments and report the difference in performance and its corresponding p-value. Notably, we don't observe that the "poorest" retailers perform significantly worse in the hard condition than the "richest" retailers. This is true irrespectively of the dimension used to classify the poorest as sub-group (i.e. wealth, revenues, profits, etc) and regardless of the cognitive measure we use (i.e. Raven's, Stroop time and Stroop mistakes). We do observe, however, that owners of big shops perform significantly better than owners of small shops in the Raven's test, particularly when they are exposed to the hard scenario. When we divide the sample according to monthly revenues, we see that owners of businesses with higher revenues perform better in the Raven's test than those with lower revenues in both scenarios, but this difference is only statistically significant in the "easy" condition. For the rest of the comparisons, we don't observe significant differences across groups or treatments in performance in the Stroop's test, except that owners of shops with low market value spend higher response time in the Stroop test, in particular in the "easy" scenario.

All in all, we could not replicate Mani's et al. (2013) results with our sample of small retailers in Vietnam, even when we used different ways of characterizing their income and wealth. One potential explanation can be that there is not enough income dispersion in our sample, not at least as high as it was in the sample of participants in the New Jersey shopping mall.12 This argument could in principle explain the lack of treatment

differences between the poorest and the richest in our sample, but yet it would not explain the lack of treatment differences within the whole sample. If poverty on its own impedes cognitive load, we should find that our sample of poor retailers perform worse under the "hard" than under the "easy" condition, as indeed happened within the poorest sub-sample of shoppers in New Jersey.

Table 4: Heterogeneous effects of the scenarios on cognitive functioning - Stroop Test time

Income and wealth dimensions		Stroop's performance		Diff: Easy−Hard
		Hard Scenario	Easy Scenario	
Size of shop (sq mts)	Big	26.11	26.62	0.76
	Small	28.32	28.48	0.93
	Diff: Big−Small	0.27	0.29	
Revenues on a normal month (US$ PPP)	High	27.02	27.14	0.94
	Low	27.01	28.16	0.40
	Diff: High−Low	0.99	0.52	
Profits on a normal month (US$ PPP)	High	25.45	26.73	0.51
	Low	28.52	29.00	0.81
	Diff: High−Low	0.12	0.23	
Market value of the shop (US$ PPP)	High	26.44	25.47	0.68
	Low	27.59	29.07	0.41
	Diff: High−Low	0.59	0.06*	

Notes: *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 5: Heterogeneous effects of the scenarios on cognitive functioning - Stroop Test mistakes

Income and wealth dimensions		Stroop's performance		Diff: Easy−Hard
		Hard Scenario	Easy Scenario	
Size of shop (sq mts)	Big	.80	1.45	0.30
	Small	.51	1.02	0.25
	Diff: Big−Small	0.28	0.59	
Revenues on a normal month (US$ PPP)	High	.66	1.24	0.31
	Low	.72	1.25	0.33
	Diff: High−Low	0.81	0.99	
Profits on a normal month (US$ PPP)	High	.58	1.44	0.20
	Low	.78	1.35	0.29
	Diff: High−Low	0.46	0.92	
Market value of the firm (US$ PPP)	High	.68	.97	0.61
	Low	.72	.83	0.77
	Diff: High−Low	0.90	0.61	

Notes: *** significant at 1%, ** significant at 5%, * significant at 10%.

This takes us to the main hypothesis of this paper. We argue that it may not be poverty per se alone that affects cognitive load, but it is rather the variability of revenues that creates such load. While revenue variability may affect the poor more than the rich, it is neither a necessary nor a sufficient condition of poverty.

To test our conjecture that income variability matters for cognitive performance in the poor population, we split the sample of retailers by the median of our measure of revenue variability. Table 6 shows the average performance of these two groups in the two different scenarios. As it can be seen, the owner of businesses with high variability of revenues performed significantly better in the "hard" scenario than in the "easy" scenario, and significantly better in the "hard" scenario than the owners of businesses with low variability of revenues.

Table 6: Effect of income variability on the impact of the scenarios on cognitive functioning - Raven's performance

Revenues dispersion		Raven's performance		Diff: Easy−Hard
		Hard Scenario	Easy Scenario	
Revenues Good - Revenues Bad]/Revenues Normal	Stable	42.23	43.75	0.80
	Unstable	53.67	39.58	0.01**
	Diff: Stable −Unstable	0.05*	0.50	

Notes: *** significant at 1%, ** significant at 5%, * significant at 10%.

This result is in principle at odds with our initial expectations, as we would have expected that income variability would impose a cognitive load, rather than the opposite. In order to understand better this apparent puzzle, we estimated the following regression equation for each treatment group and each cognitive measure:

$$Y_i = \alpha + \beta_1 \mathbf{V}_i + \beta_2 \mathbf{V}_i^2 + \delta' \mathbf{X}_i + \epsilon_i$$

where the regressor of interest Vi is the measure of revenue variability and V2 i is the squared of the revenue variability. We estimated equation 2 for each scenario separately, both with and without entrepreneur-firm controls such as age of the business, market value of the business, size of the shop and monthly revenues in a normal month. By adding the squared term we relaxed the linear restriction implicitly assumed in the previous result. By controlling for the entrepreneur-firm characteristics, we minimized the omitted variable bias possibly present in the above means comparison results.

Table 7: Effect of revenue variability on the impact of financial burden on Raven's performance

Ordinary Least Squares Dependent Variable: Raven's test performance	Easy Scenario		Hard Scenario	
	(1)	(2)	(3)	(4)
Revenue variability	2.17	11.46	72.10***	67.65***
	(20.22)	(24.97)	(20.83)	(21.57)
(Revenue variability)²	-3.09	25.94	-27.31***	-26.32***
	(6.83)	(8.08)	(7.58)	(7.90)
Age of the firm (years)		-0.132		-0.28
		(0.46)		(0.47)
Market value of the firm		0.00		0.00*
		(0.00)		(0.00)
Size of shop		-.66		1.33
		(0.89)		(0.94)
Revenues on a normal month		0.00		-0.00
		(0.00)		(0.00)
Constant	39.73***	37.97	11.74	10.31
	(13.06)	(22.77)	(11.45)	(16.54)
Observations	60	46	67	61
R-squared	0.005	0.07	0.12	0.26

Notes: Robust standard errors in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

Results from regression equation 2 are reported in Table 7. Column 1 and 2 show the coefficient estimates and standard errors for the sub-sample assigned to the "easy" scenario, with and without controls respectively. None of the coefficient estimates are statistically distinguished from zero, suggesting that revenue variability does not play a role in explaining Raven's performance of the entrepreneurs assigned to the "easy" scenario. In contrast, as shown in columns 3 and 4, revenue variability plays an important significant role in explaining Raven's performance of the entrepreneurs assigned to the "hard" financial scenario. For the sub-sample assigned to the "hard" scenario, the coefficient of the linear term β1 is positive and significant and the coefficient of the squared term, β2, is negative and significant, indicating an inverted U-shaped relationship between revenue variability and Raven's performance in this group. The total effect of income variability on performance is $\beta 1+2\beta 2V$ which of course depends on the level of revenue variability. Making $\beta 1+2\beta 2V = 0$ and solving for V we find that the level at which the relationship has its turning point is $V* = 1.28$, which can be interpreted as the optimal level of revenue variability in terms of cognitive functioning as measured by the Raven's test. Figures 1 and 2 illustrate this result.

Conclusions and policy implications

Previous literature suggests that poverty per se reduces cognitive capacity. We experimentally investigate this relationship further in a sample of small low-income retailers in Vietnam whose businesses are exposed to all sort of vulnerabilities typical from the developing world.

We found that cognitive performance in financial stressful situations is not affected by absolute poverty as measured by wealth or income, but it has an inverted U-shaped relationship with income variability. Lack of monetary resources per se does not necessarily impose a cognitive load. However, being poor and being exposed to very low or very high income variability can be detrimental for cognitive capacity. There seems to be an optimal amount of income variability which potentiates the cognitive capacity of the retailers when they face financial stressful situations.

Our results, coupled with the results from previous literature, suggest that lack of material resources per se do not necessarily impede cognitive functioning. Instead, what seems to create the cognitive load is the subjective feeling of poverty together with the variability of income. This is in line with Mullainathan and Shafir's (2013) approach, who argue that it is scarcity, defined as "having less than you feel you need" (p. 4), which impedes cognitive functioning. This can explain why low-income shoppers at the New Jersey mall in Mani et al. (2013) are cognitive loaded, while low-income retailers in Vietnam are not. Further research is needed to better understand the role of material and non-material aspirations on the way poverty affects cognitive load.

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."

5.2 Informality and Access to Finance

The scientific 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 India, which is comparable with Vietnam in the sense that both countries have an 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.

5.3 Finance and demand for skill

The third scientific paper within the ‘Finance for Productivity’ theme that is relevant for Vietnam addresses finance and the demand for skill while referring to economic growth in emerging economies. However, recent studies indicate that this growth has not translated into similarly high growth rates in job creation. Current growth comes largely from a small base of industry and the manufacturing sector, including in Vietnam, which will not come close to absorbing the millions of new workers entering the labour force each year. What is even more challenging is that many educated and skilled workers in Asia and Africa fail to find employment. The supply of highly skilled human capital who remain unemployed raises the question of whether there is a shortage of firm-level demand for skill in emerging economies.

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

The paper investigates the role of financial constraints in firms' skilled labour demand. Specifically, using a small business survey from Uganda, the research explored whether skilled job creation rises with access to

external finance. The original working paper is entitled ‘Finance and Demand for Skill: Evidence from Uganda’ (2016) by Thorsten Beck, Mikael Homanen and Burak Uras .

Research approach and findings

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

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

Policy implications

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

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

For government, interest rates by state banks. would be a first point of attention in policy efforts to create formal employment of higher skilled labour. Against this background, policy monitoring systems for employment creation could include the degree of access to finance. Looking at it from the other side, formal credit policies and programmes could include formal job creation, since they are linked. Better performance and financial access do not explain the hiring rates of informal employees, which include casual and family employees. Labour creation policies should thus acknowledge the different policy instruments for creating employment for higher educated and skilled workers on the one hand, and informal employment on the other.

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

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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
12.	Voeten, J, A. A, Saiyed and Dev K. Dutta. 2017. Emerging Economies, Institutional Voids, and Innovation Drivers: A Study in India. DFID working paper

**) Paper accepted in 'Research Policy': http://www.sciencedirect.com/science/article/pii/S0048733316301986*
***) paper is accepted in 'Innovation and Development': http://dx.doi.org/10.1080/2157930X.2016.1195086*

'Finance for Productivity Growth'

1.	Beck, T. H. L., H. Pamuk, R.B. Uras. 2014 Entrepreneurial Saving Practices and Business Investment: Theory and Evidence from Tanzanian MSEs. Tilburg: Tilburg University. Paper accepted in journal "Review of Development Economics"
2.	Beck, T. H. L. and M. Hoseini. 2014. Informality and Access to Finance: Evidence from India. Tilburg: Tilburg University.
3.	Beck, T. H. L., H. Pamuk, R.B. Uras and R. Ramrattan. 2015. Mobile Money, Trade Credit and Economic Development: Theory and Evidence (new title: "Payment Instruments, Finance and Development" R&R for Journal of Development Economics"). Tilburg: Tilburg University.
4.	Dalton, P., Nguyen Nhung and J. Ruschenpohler. 2016. The Right Amount of Income Variability: Evidence from Small Retailers in Vietnam. Tilburg University.
5.	Beck, T. H. L.,M. Homanen and B. Uras, B. 2016. Finance and Demand for Skill: Evidence from Uganda. Tilburg University
6.	Dalton, P., H. Pamuk, D. van Soest, R. Ramrattan and B. Uras. Technology Adoption by Small and Medium Businesses: Experimental Evidence from Mobile Money in Kenya.
7.	Dalton, P., J. Rueschenpuller and B. Zia. Aspirations of Small Firms: Evidence from Jakarta
8.	Beck. T., M. Hoseini and B. Uras. 2017. Trade credit and access to finance of retailers in Ethiopia. DFID Working paper, Tilburg University
9.	Dalton, P., H. Pamuk, D. van Soest, R. Ramrattan and B. Uras. The effect of Mobile Money on Small and Medium Businesses: Experimental Evidence from Kenya.
10.	Dalton, P., J. Rueschenpuller, B. Uras and B. Zia. Learning business practices from peers: Evidence from an RCT in Jakarta. (*)
11.	Naveed Ahmed. Relationship Lending and Terms of Credit: Evidence from Firm Level Data in Bangladesh
12.	Dalton, P., J. Rueschenpuller, B. Uras and B. Zia. Framing Effects and Small Businesses Performance: Experimental Evidence from Urban Indonesia (^)
13.	Dalton, P., Ty Turley. Developing Goals for Development. Experimental Evidence from Small Cassava Producers in Ghana.

All papers are accessible at the EIP-LIC project website: https://www.tilburguniversity.edu/dfid-innovation-and-growth/

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

Annex 2 presents the key findings of the DFID EIP-LIC project data on manufacturing firms in Vietnam in order to build up an understanding of the innovation context in this country. The data used for the DFID EIP-LIC research is from two main sources: (1) the World Bank Enterprise Survey (ES) conducted between November 2014 and April 2016 and (2) the Innovation Capabilities Survey (ICS) conducted from October 2016 to February 2017. 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 manufacturing, construction, services, transport, storage, and communication sectors. In 2011 the World Bank collaborated with the Department for International Development (DFID) to launch an innovation follow up survey (IFS) for the first time, which aimed to provide the measurement of innovation in emerging economies and developing countries in Africa and South Asia. They revisited firms already interviewed during the ES to collect firms-level data on innovation. 75 percent of the ES respondents were randomly selected to be the IFS respondents (www.enterprisesurveys.org). The ICS in this study is a follow-up and complementary to the ES. The ICS comprises randomly selected respondents from the ES sample making its sample a subset of the ES. The ICS focuses on innovative activities and innovative capabilities of manufacturing firms, and is a collaboration between the World Bank, Tilburg University, and Radboud University Nijmegen within the 'Enabling Innovation and Productivity Growth in Low Income Countries' project funded by the United Kingdom's Department for International Development (DFID). This project studies innovation in ten countries including Ghana, Tanzania, Uganda, Kenya, South Africa, and Ethiopia from Africa, Bangladesh, India, Indonesia and Vietnam (http://www.tilburguniversity.edu/dfid-innovation-and-growth/). The data for this report is merged from the most recent version of the ES and the ICS in Vietnam. The measurements for all variables can be found in appendix 1 at the end of the report.

Key descriptive statistics

Distribution of firms by sector and region

Vietnam is a country in Southeast Asia with an area of 332,698 km^2. It is divided into 58 provinces and 5 municipalities in 6 regions which are: Northern midlands and mountain areas, Red River Delta, North Central area and Central coastal area, Central Highlands, Southeast and Mekong Delta. However, the ES survey was conducted in only 4 regions: Red River Delta, North Central area and Central coastal, South East and Mekong River Delta. One possible reason for that is because those 4 regions are highest in population density and included 5 municipalities which are Hanoi, Hai Phong, Da Nang, Ho Chi Minh and Can Tho. Table 1 reports the number of firms in each region in the ES sample. The South East region has the largest number of firms, followed by Red River Delta. The explanation for that could be because the South East includes Ho Chi Minh city the biggest city in term of population (8.426 million people) and the Red River Delta includes Hanoi – the capital of Vietnam and also ranks second in term of population (7.588 million people).

Table 1. Distribution of firms by region

Region	Number of firms	Percent
Red River Delta	302	30.3
North Central area and Central coastal area	204	24.1
South East	306	30.7
Mekong River Delta	148	14.9
Total	996	100

Table 2 shows the sectoral distribution of firms in each region. The largest number of firms is in the manufacturing industry across all 4 regions. The smallest number of firms can be found in Retail Services. The South East region has the highest number of firms in Manufacturing with 219 firms, which is understandable because that region contains the majority of big industrial zones in Vietnam. The Other Services sector has the largest number of firms in the Red River Delta. One possible explanation is that the geographical location of the Red River Delta contains two out of five municipalities in Vietnam, which are Ha Noi and Hai Phong. The Mekong River Delta has last in both Retails Services and Other Services, which can be the result of that location containing smaller cities and it does not have a long coastal area for tourism development as the North Central area and Central coastal area. This table also reveals that Garments is the largest sector with 150 firms and the South East has the most number of firm with 53 firms. The possible reason to explain that is Garments in Vietnam is usually for exporting. Moreover, the biggest harbor (Cat Lai) and the busiest airport (Tan Son Nhat) in Vietnam are located in Ho Chi Minh city of this region. Moreover, the highest number of firms in this sector proves why Vietnam is in the top 5 of exporting garments. Food, Fabricated metal products, and Non metallic mineral products follow Garments with a remarkable number of firms, respectively 143, 143 and 142 firms. Without any doubt, the Red River Delta region again has the largest number of firms in all the three sectors. This could be explained as Hanoi - the capital - and Hai Phong - a big harbor city - are located in this region.

Table 1. Distribution of firms by sector and region

Industry	Code	Sector	Red River Delta	North Central & Central coastal area	South East	Mekong River Delta	Total
Manufacturing	15	Food	40	36	32	35	143
	17	Textiles	6	3	10	1	20
	18	Garments	38	36	53	23	150
	19	Leather	3	0	6	1	10
	20	Wood	3	6	8	0	17
	21	Paper	1	3	5	1	10
	22	Publishing, printing, and Recorded media	4	2	6	2	14
	24	Chemicals	2	0	1	4	7
	25	Plastics & rubber	6	2	4	2	14
	26	Nonmetallic mineral products	47	38	42	15	142
	27	Basic metal products	5	2	3	1	11
	28	Fabricated metal products	47	34	39	23	143
	29	Machinery and equipment (29 & 30)	4	2	8	3	17
	30	Machinery and equipment (29 & 30)	0	1	0	0	1
	31	Electronics (31 & 32)	4	1	0	0	5
	32	Electronics (31 & 32)	0	0	1	0	1
	34	Transport machines (34 & 35)	1	1	0	0	2
	35	Transport machines (34 & 35)	1	0	0	0	1
	36	Furniture	4	5	7	1	17
Retail	52	Retail	32	32	28	18	110
Other services	45	Construction Section F	14	15	14	8	51
	50	Services of motor vehicles	0	4	4	2	10
	51	Wholesale	26	7	26	5	64
	55	Hotel and restaurants: section H	6	8	1	1	16
	60	Transport Section I: (60-64)	4	1	6	0	11
	61	Transport Section I: (60-64)	1	0	0	0	1
	63	Transport Section I: (60-64)	3	0	2	2	7
	72	IT	0	1	0	0	1
		Total	302	240	306	148	996

Descriptive statistics

Table 3 displays the distribution of firm size in each region. Size stratification was defined by the World Bank as follows: micro (less than 5 employees), small (5 to 19 employees), medium (20 to 99 employees), and large (100 or more employees).

Table 3. Distribution of firms by size and region

	Micro	Small	Medium	Large	Percent
Red River Delta	2	115	103	82	30.3
North Central area and Central coastal area	1	86	85	68	24.1
South East	3	123	102	78	30.7
Mekong River Delta	1	58	54	35	14.9
Total	7	382	344	263	996

Table 4 shows the descriptive statistics from several variables picked from the ES. Half of the firms have less than 27 fulltime employees and 25% of the firms have less than 100 fulltime employees in 2014, which means that the majority of firms in our sample are small and medium sized enterprises. The largest firm has 17,000 fulltime employees which is an impressive number in Vietnam. The firms' age shows a quite young business environment with 50% of the firms being less than 11 years old. The firms' turnover differs substantially ranging from a minimum of 50 million VND (2,000 EUR) to the maximum of 28,200 billion VND (1.1 million EUR). The labor productivity of firms has a median of 460 million VND against the mean of 1.48 billion VND. The growth in turnover in the 2011-2014 period reported at a rate of 12.5% while there was no change in employment at 50% percentile.

Table 4. Descriptive statistics

Variable	min	p25	p50	p75	max	mean	N
Turnover 2014*	50	4,600	20,000	80,000	28,200,000	171,407.7	980
Employment 2014	2	12	26.5	100	17000	201.7	996
Age	1	7	11	15	113	12.8	996
Labor productivity**	1	190	460.2	1333.3	52,000	1,483.2	980
Turnover growth 2011-14	-1	-0.2	0.1	0.5	3,577.9	8.8	901
Employment growth 2011-14	-1	0	0	0.3	9.1	0.2	901

*Turnover is reported in Vietnam Dong and is divided by 1,000,000.

**Labor productivity is calculated as Turnover 2014 divided by number of fulltime employees in 2014

Sales and exports

Table 5 represents the proportion of sales in term of national sales and export sales directly and indirectly (exported by third parties). In general, firms in Vietnam mostly produce for the domestic market as the national sales percentages are very high in all four regions with more than 70%. Red River Delta has an extremely high (87.5%) percentage for national sales. The reason could be because it has the highest population in Vietnam so firms produce goods for domestic consumers here. The South East reports the highest percentage of direct exports (15.7%) and also indirect exports (8.5%), which may be due to the fact that the South East region has

the biggest harbor and also the busiest airport. The North Central Area and Central coastal area ranks number second in direct export with 13.5%. In this region, firms in the Food sector ranks number two (36 firms). It might be due to seafood exporting as this region has a long coast with potential seafood supply. According to the Vietnam Association of Seafood Exporters and Producers, Vietnam even ranks number 5 in exporting sea products in 2015.

Table 5 Sales Status

Region	National sales	Indirect exports	Direct export	N
Red River Delta	87.5%	3.5%	8.2%	302
North Central area and Central coastal area	81.8%	3.7%	13.5%	240
South East	75.8%	8.5%	15.7%	306
Mekong River Delta	81%	8.1%	9.2%	148
Total	81.5%	5.9%	11.6%	996

The Mekong River Delta shows the lowest figure in direct export. It could be explained by the smallest number of firms locates here and also the transportation systems is not an advantages of this regions.

Table 6. Export status by world region

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

Table 6 illustrates the export status of manufacturing firms located in different regions in the world (www.enterprisesurveys.org). The figures in this table can be used to make clearer comparisons with the figures in Table 5. Total direct exports in Vietnam (11.6%) is almost double of all the 5 world regions' number. In addition, it can be observed that indirect exports in Vietnam (5.9%) reported is much higher than most of the regions in Table 6. This could be related to the fact that the Vietnamese Dong is quite weak, which provides an advantage to export with reasonably cheaper products to other markets. Moreover, it could also be due to cheap labor costs in Vietnam. Many firms here produce products for clients overseas, which probably has a positive effect on the high export figures.

Supplies and imports

Table 7 shows the proportion of material inputs and supplies purchased from domestic or foreign origin. All four regions report very high use of domestic materials. One possible explanation is that firms in Vietnam mostly produce for the national market. Importing materials could raise production costs and lead to high prices of local products, which most consumers cannot afford. Therefore, producers have to minimize the cost by using local materials. The Red River Delta has the highest amount of imported inputs (29.2%). Firms here may enjoy the benefit of being close to the capital and the transportation costs for imported materials may be cheaper. The reverse is probably the case in the Mekong River Delta. This region has the lowest figures of imported materials as its location is not close to any big airports or harbors and it also has the lowest number of firms.

Table 7: Origin of inputs and supplies

Region	Domestic origin	Foreign origin	N
Red River Delta	63%	29.2%	197
North Central area and Central coastal area	70.9%	21.1%	162
South East	73.7%	21.4%	219
Mekong River Delta	74.9%	19.6%	107
Total	70.6%	22.9%	685

In order to see how Vietnam is different from other markets, table 8 shows the figures for inputs and supplies in five different world regions (www.enterprisesurveys.org). In table 8, there is only Sub-Saharan Africa that has a high rate of foreign inputs and supplies, which might be because of their scarcity in resources or possibilities to extract these. Vietnam showed the lowest rate in comparison to the rest of the regions. The possible reason could be that firms in Vietnam produce products with relatively low cost and want to export so they try to localize the inputs as much as possible to create their advantages over their competitors.

Table 8. Origin of inputs and supplies by region

Region	Domestic origin	Foreign origin
East Asia and Pacific	74.6%	25.4%
Europe & Central Asia	62.0%	38.0%
Latin America & Caribbean	64.9%	35.1%
Middle East & North America	56.1%	43.9%
South Asia	76.0%	24.0%
Sub-Saharan Africa	35.2%	64.8%

Innovation

In this part, the ICS will be used as the main source for our measures and the EU-28 enterprises data based on the Community Innovation Survey (CIS) for the period 2010 through 2012 (ec.europa.eu) will be used for comparing some of the figures.

Product and process innovation

Table 9 shows surprising differences in reported rates of innovation. In particular, the average rate of both product and process innovation in Vietnam is markedly higher than the average rate of innovation observed in EU-28. Cirera and Muzi (2016) argue that such high levels of self-reported innovation in developing countries partly arise from a rather subjective definition of an innovation in the surveys, especially since innovations are likely to be more incremental and less radical. The reported percentage of process innovation is very high (48.8%), which might be due to the fact that firms recently bought more machines and import new technology.

Table 9: Product Innovation and Process Innovation

Region	Product Innovation	Process Innovation	N
Red River Delta	51.1%	40.9%	88
North Central area and Central coastal area	31%	38.6%	70
South East	35.9%	66.7%	93
Mekong River Delta	19.6%	48.9%	47
Total	34.4%	48.8%	298
EU-28	23.7%	21.4%	

Table 10 represents how product innovation is distributed across the different regions. Most of the firms that claim that their products are new to their firm and in Vietnam are in the Red River Delta, while firms in the Mekong River Delta report the lowest percentage. A possible reason is because firms in Red River Delta can access resources easiest due to their strategic location. On the other hand, measures in international column, the highest percentage is in the South East region, mainly because firms in this region export their product more compared to the other regions.

Table 10: Product Innovation orientation

Sampling Region	Product Innovation			N
	Local	National	International	
Red River Delta	48.3%	40.5%	5.7%	89
North Central area and Central coastal area	29.6%	25.4%	5.6%	71
South East	34.4%	32.3%	9.8%	93
Mekong River Delta	17 %	12.8%	2.2%	47
Total	32.3%	27.7%	5.8%	300

Table 11 illustrates the reasons why firms introduce their main innovative products and services. Firms in all four regions reported very high scores on extending the range of products or services with an average of 94.3%. The second reason is to open up new markets or increase market share (90.5%). Competition follows as the third reason why firms offer product innovation. Firms in Red River Delta reported the lowest score in regulation (28.3%), which means that complying with regulations or standards is not their objective to develop innovative products. Firms in the South East region have the highest figures for almost all reasons (more than 58%). Firms in the Mekong River Delta reported the highest figure for replacing a product or service already offered by the firm (66.7%).

Table 11: Objectives of product innovation

Region	Replace	Range	New markets	Cost	Competition	Regulation	Sales drop	N
Red River Delta	34.8%	95.7%	80.4%	21.7%	76.1%	28.3%	45.7%	46
North Central area and Central coastal area	36.4%	95.5%	95.5%	31.8%	63.6%	63.6%	45.5%	22
South East	58.8%	97.1%	97.1%	52.9%	72.7%	70.6%	58.8%	34
Mekong River Delta	66.7%	88.9%	88.9%	66.7%	77.8%	77.8%	55.6%	9
Total	49.2%	94.3%	90.5%	43.3%	72.6%	60.1%	51.4%	111

Table 12 shows the main reasons for introducing firms' most innovative process. The main reason why firms introduce process innovation is for increasing the quality of products or services (95.3%). Among the four regions, firms in the South East represent the highest number (98.4%). The second most popular reason is to increase the total production or amount of services offered. Firms score lowest in terms of decreasing the cost of production or offering service. One possible explanation is that products and services in Vietnam is already relatively low. Therefore, it is not easy to reduce it more. However, with an average of 67.9%, it is still possible an important reason for firms when they consider introducing innovative processes.

Table 12: Objectives of process innovation

Region	Qualy	Prodn	Flexi	Spd Prod	Spd Deli	Cost	Waste	Regul	N
Red River Delta	94.4%	80.6%	50.0%	50.0%	52.8%	30.6%	27.8%	33.3%	36
North Central & Central coastal	92.6%	96.3%	96.3%	92.6%	81.5%	74.1%	85.2%	77.8%	27
South East	98.4%	93.5%	95.2%	98.4%	98.4%	88.7%	83.9%	88.7%	62
Mekong River Delta	95.7%	95.7%	95.7%	95.7%	95.7%	78.3%	91.3%	82.6%	23
Total	95.3%	91.5%	84.3%	84.2%	82.1%	67.9%	72.0%	70.6%	148

Innovation activities

The ICS reported a low number of firms with patent registration in the period of 2011-2014. Out of 300 firms, 271 (92.8%) have no patents. The rest of the firms (7.2%) reported less than 10 patents applied in this period. This survey also reported a mean of 0.14 employee that was hired specifically for the purpose of delivering new or improved products or processes. The activities associated with the development or production of product or process innovations are also shown in table 13. The most important innovation activities are the purchase of new equipment, machinery or software. Firms in the South East region have reported the highest number, nearly 85%. Formal training for employees and Market Introduction of innovation to employees are following respectively with 36% and 32%. Once again, South East firms reported relatively high numbers in all most all columns. The reason why firms in Vietnam have low scores in number of patents applied could be the result of the low percentages in both Internal and External R&D (15.5% and 5% respectively).

Table 13. Innovation activities

Region	Inter R&D	Exter R&D	New Equiment	Purchase License &Patents	Formal Training	Mkt Intro of innovatn	Others	N
Red River Delta	12.4%	1.1%	28.1%	6.7%	21.3%	30.3%	22.5%	89
North Central and Central coastal	5.6%	1.4%	57.7%	5.6%	38.0%	21.1%	29.6%	71
South East	31.1%	8.9%	84.9%	18.3%	67.7%	59.1%	55.9%	93
Mekong River Delta	13.0%	8.5%	51.1%	17.4%	17.0%	17.4%	8.5%	47
Total	15.5%	5.0%	55.5%	12.0%	36.0%	32.0%	29.1%	300

Sources of information for innovation

Table 14 shows the sources of information for firms' innovation. The three most important sources are feedback from customers (165), the internet (147) and Products or services available in the market (128). Parent firms are the least important source, which might be because there were few firms in the survey that have parent firms. Only 48 firms reported sources of information for innovation coming from universities or research institutes. That might imply an institutional void, which are the weak linkages between firms and universities and/or research institutes in Vietnam.

Table 14. Sources of information for innovation

Source	Red River Delta	North Central & Central coastal area	South East	Mekong River Delta	Total
Parent firms	1	4	6	1	12
Competitors	38	15	49	12	114
Suppliers	32	22	49	15	118
Products or services available	38	20	55	15	128
Universities/research institutes	17	2	24	5	48
Consultancy firms	22	9	23	6	60
Business associations & conferences/exhibitions	33	14	44	10	101
Professional journals /trade publications	39	16	39	10	104
Internet	42	28	56	21	147
Customers' feedback	48	32	62	23	165

Barriers to innovation

The ICS also explores what could prevent firms from innovation. Table 15 combines all the possible factors that make firms innovate less. The survey used a 3 point-likert scale to measure the importance of the factors in hampering innovation. The level of importance is increasing from not important to very important. Firms in all regions reported lack of funds within the firm as the most important factor why they cannot proceed with innovation. Firms in the South East claim that lack of qualified personnel to be the most vital reason that firms refrain from innovation. The least important reason for this area is lack of finance from outside. One possible reason that could explain this is that firms in the South East have the highest rate of export activities, so they may get support from foreign partners in term of finance.

Table 15. Barriers to innovation

Region	Red River Delta	Central and Central Coastal area	South East	Mekong River Delta	Total
Lack of funds within the firm	1.6	1.3	1.2	1.2	1.3
Lack of finance from outside	1.4	1.0	0.9	0.8	1.0
High cost of innovation	1.6	1.1	1.2	1.1	1.2
Lack of qualified personnel	1.4	1.3	1.3	1.1	1.3
Lack of technology information	1.3	1.0	1.3	0.9	1.1
Lack of market information	1.4	1.2	1.2	1.1	1.2
Difficulty finding cooperating partners	1.4	1.1	1.2	0.9	1.2
Market dominated by established firms	1.3	1.1	1.2	0.9	1.1
Uncertain demand for innovative goods/services	1.3	0.9	1.0	0.8	1.0
N	87	71	92	46	296

Internal and external factors

Dynamic capabilities

Teece et al. (1997) define dynamic capabilities as the ability to achieve new forms of competitive advantage. Helfat et al. (2007) stated that dynamic capabilities is "the capacity of an organization to purposefully create, extend, or modify its resource base". Hence, we need to understand what capabilities firms need and their role in helping firms to achieve innovativeness and foster innovation. In ICS, dynamic capabilities were measured by using a 7-point-likert scale ranging from completely disagree to completely agree in 4 criteria: firm's ability to identify and select knowledge, firm's ability to acquire knowledge, firm's ability to recombine knowledge, and firm's ability to commercialize its products or services.

In this part of the survey, 5 items are used for measuring the firm's ability for identifying and selecting knowledge, 3 items are used for measuring the firm's ability for acquiring knowledge, and 4 items are used for measuring both the ability of transforming knowledge and commercializing products. Table 16 reports the average values of the items within each criteria measuring dynamic capabilities.

Table 16. Dynamic capabilities

Region	Identification & Selection	Acquisition	Transformation	Commercialization	N
Red River Delta	4.3	4.7	4.5	4.3	89
Central & Central coastal area	3.6	4.7	4.5	4.0	70
South East	3.8	4.7	4.4	3.9	90
Mekong River Delta	3.4	4.2	3.8	3.0	42
Total	3.8	4.6	4.3	3.8	291

Firms' ability to acquire knowledge scores highest in all four regions. One possible reason is innovation in Vietnam mainly is incremental. Moreover, firms report low rate in internal and external R&D. The main sources of information for innovation are from customers' feedback, the internet, competitors and suppliers so Red River Delta has the highest figures in most capabilities. Therefore, firms improve their ability in acquire knowledge. Transformation or recombining knowledge is also an ability comes along with incremental innovation and firms in Vietnam scores 4.3 which is quite high. Identification & selection ability scores lowest (3.8) could imply that firms don't have strong connection with outsiders such as universities/research institutes. They might also have limited access to the academic information source such as journals and magazines. Table 16 also reveals that firms in the Red river delta have highest score in most capabilities while Mekong river delta firms have the lowest scores in all four criteria.

Trust

Using a 7-point-likert scale ranging from completely disagree to completely agree, the ICS measured the level of trust from firms to their partner. Table 17 represents the average of 4 items mutual trust, frank and truthful dealings, reliability and the tendency of firms to trust others. Firms in the Red river delta have the highest mean of 4.5 while Central area & Central coastal area have the lowest mean (4.2).

Table 17. Trust

Region	min	mean	max	sd	N
Red River Delta	2.0	4.5	5.8	0.6	89
Central &Central coastal area	2.5	4.2	5.5	0.8	71
South East	2.8	4.4	6.0	0.7	93
Mekong River Delta	2.8	4.2	6.0	0.7	45
Total	2.0	4.4	6.0	0.7	298

Table 18 represents firm's trust in the court system. This may explain a firms' tendency in trusting their partner, as government performance relating to perceived corruption, judicial efficiency, and bureaucratic quality has been found to be associated with trust (La-Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997). The question asked firms to judge if they strongly disagree or strongly agree with the statement "the court system is fair, impartial and uncorrupted" based on a 7-point like scale. The mean value is 2.47 which is above the average and it is quite consistent in all four regions. In the trust index for partners, the means are also above the average, which means that the business environment in Vietnam is rather friendly.

Table 18. Trust in court system

Region	min	mean	max	sd	N
Red River Delta	1	2.5	4	0.7	56
Central&Central coastal area	1	3	4	0.8	64
South East	1	2.6	4	0.9	83
Mekong River Delta	1	2.9	4	0.8	38
Total	1	2.7	4	0.8	241

Relationship with customers and institutional actors

Four items were used to measure the relationship with customers and institutional actors on a 7-point likert scale ranging from completely disagree to completely agree. The results are shown in Table 19. Red river delta firms reported the highest score with a mean of 4.4. That indicated the close relationship between firms in the Red River Delta and their relationships with external actors. Firms in the Mekong River Delta showed the lowest score, however, the differences are rather small.

Table 19. Relationship with customers and institutional actors

Region	min	mean	max	sd	N
Red River Delta	3.3	4.4	5.5	0.5	88
Central & Central coastal area	3.0	4.3	5.8	0.5	71
South East	3.0	4.2	6.0	0.6	91
Mekong River Delta	2.8	4.0	5.5	0.6	44
Total	3.0	4.2	5.7	0.6	294

Gender Diversity

Female participation was measured on 3 levels: Owner, top manager and workforce. The results are described in Table 20, which shows a very high percentage (52.6%) of firms in the survey that are owned by women. In the Red river delta firms have reported the highest number (60.2%), followed by South East region firms

(57.6%). In contrast, the percentage of women who are in top management is relatively low with 23.3%. Almost 40% of the workforce is female and the rate is quite homogeneous between the regions, except for the Mekong delta firms (34.7%).

Table 20. Female participation

Region	Owner	Top manager	Workforce Participation	N
Red River Delta	60.2%	21.4%	39.8%	89
Central & Central coastal area	45.7%	23.2%	41.2%	69
South East	57.6%	20.4%	43.1%	93
Mekong River Delta	46.7%	28.3%	34.7%	46
Total	52.6%	23.3%	39.7%	297

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

Firm-level and regional-level factors and innovation activities

In this part, we examine the firm characteristics and regional factors that are associated with innovation activities of the firms. Firm characteristics enclose many factors but the popular ones usually are size, age, ownership, employee education level, financial ability. Regional factors contain firm location (whether it is metropolitan or rural area), knowledge creation level in the region, regional political environment such as law and regulatory quality, and corruption. A clustered robust standard errors logit model will be used to examine the relationship between the two sets of factors and innovation activities which comprise internal and external R&D, new equipment purchase, and formal training for employees. Standard errors are clustered at the regional level to account for correlation between residuals at the firm-level and the regional-level.

Table 21. Logistic regression coefficients (n = 285)

Variable	Internal R&D		External R&D		Formal training		New equipment	
Firm-level factors								
Age (log)	0.051	(0.170)	0.712	(0.544)	0.128	(0.150)	-0.0044	(0.093)
Size (log)	0.286***	(0.058)	0.137	(0.305)	0.278***	(0.093)	0.150*	(0.087)
Foreign ownership	-0.015	(0.012)	0.001	(0.005)	-0.004	(0.005)	-0.007	(0.008)
Education	0.008**	(0.003)	0.002	(0.019)	0.011***	(0.003)	-0.009	(0.006)
Access to credit	0.290	(0.347)	0.491	(0.752)	0.071	(0.282)	-0.237	(0.347)
Regional-level factors								
Location	0.153	(0.196)	-0.485	(0.301)	0.378	(0.375)	-0.251	(0.516)
Knowledge creation	0.087***	(0.004)	0.115*	(0.061)	0.067***	(0.011)	0.059***	(0.019)
RIQ	1.863***	(0.322)	6.850*	(3.504)	-5.010***	(1.268)	-4.026	(3.072)
Constant	-11.61***	(1.249)	-30.69**	(13.741)	12.51***	(4.457)	13.53	(10.809)

Clustered robust standard errors in parentheses

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

Table 21 summarizes the results of our regression analysis. For the firm-level factors, the coefficient for size is positive and significant in 3 out of 4 categories, which are internal R&D, formal training and new equipment. It indicates that larger firms are likely to conduct more innovation activities except for external R&D. The coefficients for education in relation to internal R&D and formal training are also positive and significant, which means that firms with higher percentages of employees with high school education have more internal R&D and invest more in formal training. None of the coefficients for age, foreign ownership and access to credit are significant in this model.

For the regional-level factors, knowledge creation reported a positive significant relationship with all innovation activities. It shows that firms with many knowledge sources will have the tendency to have more innovation activities. The coefficient for regional institutional quality (RIQ) is positive and significant with internal and external R&D, but negative and significant with formal training. Hence, firms in regions that have higher RIQ will probably conduct more R&D activities.

To sum up, at the firm level, firm size is a key factor as it affects almost all innovation activities. Education influences the volume of R&D activities inside the firm with a positive relationship. At the regional level, knowledge creation plays an important role across all innovation activities with all positive relationships. RIQ positive effects with R&D and a negative relationship with formal training.

Commercialization of innovative output

What firm-level and regional-level factors hinder or foster the engagement of firms in innovative activities and the commercialisation of these activities?

Table 22 reports the results of our estimation on how firm-level and regional-level factors affect firms to commercialize their innovation outcomes. We conducted an OLS regression model. At the firm level, foreign ownership has a significant inverse relationship with commercialization. Hence, a higher proportion of foreign ownership might lower the ability of firms capturing value from their innovative output. On the other hand, the coefficient for education is positive significant in relation with commercialization.

Table 22. OLS regression coefficients (n = 278)

Variable	Commercialization	
Firm-level factors		
Age (log)	-0.118	(0.093)
Size (log)	0.046	(0.041)
Foreign ownership	-0.005*	(0.002)
Education	0.011***	(0.003)
Access to credit	-0.018	(0.116)
Regional-level factors		
Location	0.214	(0.159)
Knowledge creation	-0.005	(0.007)
RIQ	-1.781***	(0.645)
Constant	8.989***	(2.325)

Clustered robust standard errors in parentheses; * p<0.10, **p<0.05, *** p<0.01

At the regional level, only RIQ is significant and it has a negative relationship with commercialization. It indicates that strong regional institutional quality might lead to low ability of appropriating returns from innovative output. Hence, at the firm level, education and foreign ownership is essential for commercializing innovative output. While at the regional level, only RIQ plays a significant role.

In-house innovation, collaborative innovation and technology acquisition

What are the most critical barriers to the process of innovation and the diffusion of technology in low income country setting? What policies are most relevant to overcoming these barriers?

Table 23 shows the answer to the question about the relationship between in-house innovation activities and collaborative innovation or technology acquisition activities, on the innovative performance of firms in Vietnam. In-house innovation indicates that a firm develops innovative products or services entirely by itself. Collaborative innovation means firms collaborate with others to develop their innovative output. Technology acquisitions implies firms produce innovative output by acquiring foreign technology. Innovation performance is measured by the percentage of sales from the main new or significantly improved product or service from the firm.

Table 23. OLS regression coefficients (n = 275)

Variable	Innovation output	
Firm-level factors		
Age (log)	-4.860***	(0.760)
Size (log)	-1.248	(1.148)
Foreign ownership	-0.025	(0.045)
Education	-0.033	(0.071)
Access to credit	-1.411	(3.757)
Regional-level factors		
Location	4.993	(9.056)
Knowledge creation	-0.950***	(0.055)
RIQ	-68.80**	(21.047)
Innovation activities (Reference: Foreign technology acquisition)		
In-house activities	-1.890	(4.553)
Collaborative activities	-5.174	(7.861)
Constant	299.5**	(70.86)
Clustered robust standard errors in parentheses		
* p<0.10, ** p<0.05, *** p<0.01		

The regression reports no significant relationship between technology acquisition for increasing innovation output. However, in this test, age has a negative and significant relationship with innovative output. This suggests that older firms have a lower likelihood of having more innovative output.

Economic spillovers and innovation

In this section we look at the role of economic spillovers within clusters of firms in fostering economic growth and innovation. Table 24 illustrates the estimation of the effects of spillovers generated by cooperative relationships with customers and suppliers on innovative performance.

Table 24. Logistic regression coefficients (n = 946)

Variable	Innovation	
Firm-level factors		
Age (log)	0.141	(0.100)
Size (log)	0.246***	(0.081)
Foreign ownership	-0.006***	(0.002)
Education	-0.007	(0.005)
Access to credit	0.162	(0.169)
Regional-level factors		
Location	0.977***	(0.085)
Knowledge creation	-0.028***	(0.010)
RIQ	-3.536**	(1.627)
Cooperative relationships		
Customer	-0.219	(0.498)
Supplier	-0.093	(0.353)
Cooperation for innovation		
Firms	-0.037	(0.343)
Private consulting company/individuals	-0.394	(0.371)
Universities/research institutions	0.440	(0.328)
Constant	9.815*	(5.110)

Clustered robust standard errors in parentheses

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

Cooperation for innovation shows no statistically significant. Therefore, for this question we cannot provide any substantive conclusion.

Barriers to innovation and technology diffusion

Table 25 represents the results of our estimation on the relation between barriers of innovation, innovative output and technology diffusion (to answer the question on what critical barriers can be identified in the process of innovation and the diffusion of technology in Vietnam. Innovation performance is measured with percentage of

sales from innovative output and technology diffusion is when firm adapts or reproduce other firms' products or services.

The most critical barrier in the innovation process is external financing. This could due to the fact that firms in Vietnam hardly get support from banks with affordable interest rates and the procedures to obtain loans are also complicated.. In addition, the difficulty in finding cooperating partners is the most critical barrier in getting information for the diffusion of technology in Vietnam.

Table 25. OLS/ Logistic regression coefficients

Variable	Innovative output		Technology diffusion	
Firm-level factors				
Age (log)	1.264	(3.855)	0.298	(0.232)
Size (log)	-5.975**	(1.392)	0.069	(0.091)
Foreign ownership	0.271	(0.236)	0	(.)
Education	-0.275*	(0.098)	-0.014*	(0.008)
Access to credit	0.668	(5.631)	-0.554	(0.948)
Regional-level factors				
Location	2.875	(4.455)	0.707***	(0.173)
Knowledge creation (log)	-0.136	(0.067)	0.386***	(0.024)
RIQ	-4.899	(7.824)	17.60***	(2.314)
Barriers to innovation				
Lack of funds within enterprise	5.833	(3.892)	1.418**	(0.646)
Lack of external financing	-9.060**	(2.556)	-0.268	(0.309)
High costs of innovation	1.353	(2.769)	0.048	(0.253)
Lack of qualified personnel	-9.425	(5.531)	-0.404	(0.485)
Lack of information technology	2.158	(4.287)	-0.217	(0.373)
Lack of information markets	-1.772	(6.963)	0.296	(0.718)
Difficulty finding co-operating partners	2.418	(3.677)	-1.371*	(0.782)
Market dominated by established firms	-0.0241	(1.333)	0.559***	(0.167)
Uncertain demand for innovative products	8.702	(5.967)	1.287**	(0.612)
No need due to prior innovation	2.600	(1.672)	-0.206***	(0.015)
Constant	93.72*	(34.765)	-71.92***	(6.279)
Observations	97		255	

Clustered robust standard errors in parentheses; * p<0.10, ** p<0.05, *** p<0.01

The role of demand side versus supply side policies

This section presents the answer for the question "what is the role of the demand versus the supply side policies?". Table 26 reports the relationship between non-financial support from the government and innovation performance. There is no statistical significant with the result.

Table 26. OLS regression coefficients (n=946)

Variable	Innovation	
Firm-level factors		
Age (log)	0.112	(0.128)
Size (log)	0.302***	(0.057)
Foreign ownership	-0.008**	(0.004)
Education	-0.007*	(0.004)
Access to credit	0.205	(0.157)
Regional-level factors		
Location	1.132***	(0.244)
Knowledge creation	-0.027***	(0.010)
RIQ	-3.339***	(0.801)
Government support for innovation activities		
Non-financial support	0.515	(0.510)
Constant	9.039***	(2.832)
Standard errors in parentheses		

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

Gender diversity and innovation

Table 27 illustrates the relation between gender diversity and innovation performance. Gender diversity indicates the proportion of female participation in the ownership for the firm, the top management and the overall workforce of the firm. Innovation is measured by whether the firm introduced new or significantly improved products or services.

The coefficient of female workforce participations has a significant positive effect in relation with innovation. This means that a higher proportion of females in the workforce lead to the possibility of higher innovation in firms in Vietnam.

Table 27. Logistic regression coefficients (n=262)

Variable	Innovation	
Firm-level factors		
Age (log)	-0.188	(0.251)

Size (log)	0.422***	(0.047)
Foreign ownership	0.002	(0.004)
Education	-0.014	(0.010)
Access to credit	0.374	(0.260)
Regional-level factors		
Location	2.037*	(1.225)
Knowledge creation	-0.011	(0.021)
RIQ	-2.090	(3.436)
Gender diversity		
Female ownership	-0.249	(0.387)
Female top manager	0.061	(0.182)
Female workforce participation	0.519**	(0.249)
Constant	5.088	(11.410)

Clustered robust standard errors in parentheses

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